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# Analysis of official internet sites of sport clubs in terms of social media and marketing communication: a study on turkish and german sport clubs

**Erkan Faruk ŞİRİN, Ali SEVİLMİŞ**

*Selçuk University, Faculty of Sports Sciences, Konya, Turkey.*
*Address Correspondence to EF. Şirin, e-mail: erkanfaruk@yahoo.com*

**Abstract**

Becoming widespread of internet use, advantages web has, compared to traditional environment, and purchaser tendencies in marketing communication have made web sites a potential social media communication and marketing tool for sport clubs. The main aim of this study is to evaluate official internet sites of soccer clubs of Super League İlhan Cavcav Season and Bundesliga in Germany in terms of social media communication and marketing communication and reveal the similarity and difference between both league by means of content analysis method. Internet site of a total of 36 sport clubs in both leagues were evaluated. During analysis of the data, MAXQDA qualitative data analysis software was used. According to the results of the study, while social network applications (Facebook, Twitter, etc.) in the official web sites of Turkey and Germany sport clubs show similarity, instant messaging applications (Snapchat), documents follow system (subscribe to RSS) and motion videos (Giphy) or blog accessing tools were seen to be given place in German clubs. In large majority of German clubs, while official internet sites include multiple language options, in Turkey, there is multiple language option in the internet site of a few number of clubs. In addition, Turkish sport clubs use marketing communication channels in similar to traditional marketing activities, and there are differences between the clubs taking place in both leagues in terms of the use of direct communication with customers through these channels (answering the questions about, comments about product, etc.), direct marketing (information about filtering detail, cargo information, safe payment, order follow, and product return), and sale development (favorite/ the most sold product, personal product design, seasonal opportunities, etc.).

**Keywords:** Internet sites, sports marketing, social media, sport clubs

## INTRODUCTION

Especially in the recent years, together with the increase of internet users of consumers and, depending on this, the time spent in social media, social media has become an important brand communication channel in terms of brands (15). Thanks to blogs, microblogs, social networks, and forums, put in order as social media channels, brands can call out to its purchasers through many channels. Together with the emergence of social media, the institutional internet sites of clubs are also used as either marketing or social media communication tool. Depending on reflection of all these developments to Turkey as in all over the world, they have effects on communication technologies, in which there is especially soccer. Argan and Katırcı (1) suggested that sport marketing underwent to change and, thanks to this change, it enabled the supporter to be more interactive. The social media studies carried out showed that social media users very intensively interested in soccer. In the studies carried out in the world and Turkey, it emerged that soccer competitions were followed in a serious rate through social media platforms. In the study carried out by Somera, it was reported that in World Cup Tournament, organized in Brazil, 524,483 Brazilian social media users followed World Cup [competitions] from social media, writing 1,329,402 messages (7).

Nowadays, as in many sectors, one of the important elements, in which soccer clubs can also provide supporter and marketing communication, is internet. Based on that sports become a global product, the importance of internet has increased and internet use of sport clubs has increased, depending on this. Certainly, as in the other sectors, the communication of soccer clubs with supporter groups from every aspect depends on their effectively using social media. Hall et al (10), for

making an effective communication with sport organizations and supporters, emphasizing the obligation to continuously develop new ways, stated that internet would play the most vital role in these ways. Clubs, thanks to their institutional web sites, just as they can provide the communication of supporter with club in maximum degree, can find opportunity to more effectively publicize the licensed products belonging to club.

Club sites and social media tools have become the fastest growing areas, in which sport broadcastings and marketing are made (16). Sport clubs and soccer players, also utilizing the features of social media, make communication with supporters (6). Especially Facebook and Twitter make effective the communication between athletes, sport clubs, and supporters. In addition, while the importance of these social sharing sites is emphasized in terms of sport marketing efforts, it is stated that they have importance in terms of possibility of athletes to express their emotions and personal lives (18). But in the year 2010, it was seen that in a conference held by Association of Sport Marketing, using social networks as advertisement tool disturbs these supporters of interest, therefore, that while sport clubs were using this social network, it is stated that they have to be careful about how many messages will send to their supporters (12). Hence, while social media is used in the studies of sport marketing, it is necessary to pay attention that target mass should not be subjected to the intensive information and advertisement in a disturbing dimension.

Social media is an alternative way of making communication with supporters and enables the relationships to be stronger and interactive (22). According to the study carried out by Broughton (5), social media has an important role in making communication with passionate young supporters. According to the results of the study, thanks to social media, supporters are more interested in leagues and come together with sponsors in more than one points. In addition, social media presents opportunities such as product publicizing, giving information about activities, and selling ticket to sport organizations (11). According to the study Williams and Chinn (22), social media tools can be effectively used with the principle to make sound the relationships with supporters. Effectively use of relational marketing dynamics in social media will make strong the relationships with supporters and increase the loyalty of supporters to the team. Also, with the activities sometimes to be organized, the sale of licensed product can be made, and clubs will be able to obtain extra income.

Social media tools takes place as an opportunity for marketing, public relations, and the other managerial applications toward supporters of sport clubs. The clubs well evaluating this opportunity is expected to step forward. In addition, with the development of Web 2.0 technology, internet media both increased the number of user and transformed into a large power because it enabled users to produce content and share it. Sport marketers, noticing the effects of social media and Web 2.0 in their own areas, are used for being able to make stronger communication with supporters and consumers (9, 22). As a result of this, the use of social media by sport clubs and athletes has rapidly increased. According to the study, carried out by Watkins (21), supporters follow the clubs in social media for identifying their social identities and developing and satisfying their supporter identities. In addition, social media enables to be able make a strong brand relationship between sport clubs and their supporters and increases brand value. Social media tools that are new communication channel presents opportunities to sport clubs and especially soccer clubs. These opportunities are not only limited with athletes and sport clubs but also brands and sponsors consider this new communication area (14).

In the direction of the importance of marketing communication, it is necessary to plan and manage each of communication tools for sport product for taking support from sports. Therefore, first of all, there is a need for analyzing sport consumer. Through these sites, the information can be obtained about average demographic characteristics of the users accessing to web page of interest (4). Thanks to this, it can be possible to obtain a comprehensive database about millions of people, who are member of webpage of sport club under consideration. Hence, if any sport club wants to reach its target mass and form marketing studies, these lists become biggest helper of it (3). In this sense, it is seen that the clearest and most remarkable benefit of internet is interested in the level and width of the content it presents. Delpy and Basetti focused on the use of internet in their marketing studies. At this point, it is suggested that internet has a considerable effect on ticket sales, sport events, sponsorship activities,

market research, sport tourism, sport products, and sport marketing activities in marketing efforts. It is seen that Duncon and Campell utter that internet presents benefits such as providing customer service, receiving advertisement of web site and advertising club, creating distribution channel, forming communication network, presenting entertainment opportunity at low cost and providing management of information system in terms of sport clubs (3).

Hence, when considered that many customers of sport market are loyal to their own sport clubs at high level and ready for consumption, it can be said that internet has a strategic importance in terms of either its developing interactive communication and sales or giving opportunity to be able to update the information toward consumers (6).

As a result, that soccer clubs are able to survive depends on their communications with their own groups of supporter. An important element in making communication between sport clubs and their supporters is official internet sites of the clubs. Internet sites of clubs present significant advantages in communication with club supporter and ticket, which is marketing product of the club, for the sale of licensed products. When social media networks and web sites of clubs provide to have a voice in marketing efforts, on the other hand, they present the opportunity to better know their target masses and be able to access to them with more effective marketing activities through internet. Certainly, making communication and supporter communication in web site of a club is related to the features that site incorporates. In this study, it is aimed to examine the contents of official internet sites of the Super League İlhan Cavcav Season in Turkey and Bundesliga clubs in Germany by considering certain criteria.

## METHOD

The method of the study was determined as content analysis, one of the qualitative analysis methods. The reason for selecting this method is that content analysis is a method, which can be used and repeated in the analysis of both visual and written contents (17, 24). The essence of content analysis consists of classification system. Content analysis is built on classification system. The aim of content solving, beyond demonstrating whether or not the categories, on which classification system is based, are existent, is to reveal what these mean and which weight have for general appearance. In this study, content analysis was discussed as classification in coding rule, social media platforms they use in internet site of the club (social networks), language options, online ticket and online product sale, bankcard promotion and information belonging to online product (product detail, and cargo detail information, filtering, being able to design product, product classification).

Study processes consist of three stages. In the first stage, the websites of the clubs in the scope of study were reached. In the second stage, determining assessment features, coding criteria were identified. In the last stage, transferring the data obtained to MAXQDA data analysis, they were coded. Before analyzing, the specialists on site designs were interviewed with and their views were taken into consideration.

In this study, as a sample, in the season 2017-2018, the internet (web) site content of Turkey (Super league İlhan Cavcav) and Germany (Bundesliga) league clubs was subjected to the analysis. The analysis of internet sites of a total of 36 clubs from both league that are subject of the study was carried out by examining between August 2017 and December. For being able to make content analysis of the features determined, classifying the features researched, only text, video, or photograph (picture) were collected in MAXQDA Qualitative Data Analysis Program.

## RESULTS

In this study, in which institutional internet sites of Turkey (Super League İlhan Cavcav) and Germany (Bundesliga) clubs are examined in the direction of the aim of the study, the analyses of club pages are presented in the following tables. Themes signed plus (+) stated in the table indicate the elements that are present in internet sites of the clubs, while the themes signed minus (-) indicate the elements that are not present.

**Table 1.** Institutional internet site of Turkish clubs: Social networks and interactive communication tools

| | Facebook | Twitter | İnstagram | Google+ | YouTube | Pinterest | Dugout | Foursquare | Vine | SnapChat | Giphy | WhatsApp | Subscribe to RSS | SoundCloud | WeChat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Galatasaray SC | + | + | + | + | + | + | + | - | - | - | - | - | - | - | - |
| Başakşehir SC | + | + | + | + | + | - | - | - | - | - | - | - | - | - | - |
| Fenerbahçe SC | + | + | + | + | + | - | - | + | - | - | - | - | - | - | - |
| Beşiktaş SC | + | + | + | + | + | - | - | - | - | - | - | - | + | - | - |
| Trabzon SC | + | + | + | - | + | - | - | - | - | - | - | - | + | - | - |
| Kayseri SC | + | + | + | - | - | - | - | - | - | - | - | - | - | - | - |
| Göztepe SC | + | + | + | - | + | - | - | - | - | - | - | - | - | - | - |
| Sivas SC | + | + | + | - | + | - | - | - | - | - | - | - | - | - | - |
| Bursa SC | + | + | - | + | + | - | - | - | - | - | - | - | - | - | - |
| Yeni Malatya SC | + | + | + | + | + | - | - | - | - | - | - | - | - | - | - |
| Kasımpaşa SC | + | + | + | - | + | - | - | - | - | - | - | - | - | - | - |
| Akhisar SC | + | + | + | - | + | - | - | - | - | - | - | - | - | - | - |
| Alanya SC | + | + | + | + | + | - | - | - | - | - | - | - | - | - | - |
| Osmanlı SC | + | + | + | - | + | + | - | - | - | - | - | - | + | - | - |
| Gençlerbirliği SC | + | + | + | - | + | - | - | - | - | - | - | - | + | - | - |
| Antalya SC | + | + | + | - | - | - | - | - | - | - | - | - | - | - | - |
| Konya SC | + | + | + | - | + | - | - | - | - | - | - | - | - | - | - |
| Karabük SC | + | + | + | - | - | - | - | - | + | - | - | - | - | - | - |
| **Total** | **18** | **18** | **17** | **7** | **15** | **2** | **1** | **1** | **1** | **-** | **-** | **-** | **4** | **-** | **-** |

SC: Sports Club

In Table 1, when institutional internet site of Turkish clubs is examined in terms of social networks and interactive communication tools, it is seen that Facebook and Twitter take place as social communication tool; that this is followed by Instagram, and that they mostly use YouTube video sharing site, one of visual- focused social media sharing sites, in club pages. In institutional internet sites of Turkish clubs are not given place to visual developing and creating tools such as SnapChat, Giphy, WhatsApp, SoundCloud and WeChat or blog accessing tools.

**Table 2.** Institutional internet site German clubs: Social networks and interactive communication tools

| | Facebook | Twitter | İnstagram | Google+ | YouTube | Pinterest | Dugout | Foursquare | Vine | SnapChat | Giphy | WhatsApp | Subscribe to RSS | SoundCloud | WeChat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bayern Münih | + | + | + | + | + | - | + | - | - | + | - | - | - | - | - |
| Bayer Leverkuzen | + | + | + | + | + | - | - | - | - | + | - | - | - | - | - |
| Schalke 04 | + | + | + | - | + | - | - | - | - | - | - | - | - | - | - |
| Eintracht Frankfurt | + | + | + | + | + | - | - | - | - | - | - | - | + | - | - |
| RB Leipzig | + | + | + | + | + | - | - | - | - | - | - | - | + | - | - |
| Borussia Dortmund | + | + | + | - | - | - | - | - | - | - | - | - | - | - | - |
| Monchengladbach | + | + | + | + | + | - | - | - | - | - | - | - | - | - | - |
| FC Augsburg | + | + | + | + | + | - | - | - | - | - | | | - | - | - |
| Hoffenheim | + | + | + | + | + | - | - | - | - | + | + | + | - | - | - |
| Hannover 96 | + | + | + | - | - | - | - | - | - | - | - | - | - | - | - |
| Hertha Berlin | + | + | + | - | + | - | - | - | - | - | - | - | + | - | - |
| Freiburg | + | + | + | + | + | - | - | - | - | - | - | - | - | - | - |
| Wolfsburg | + | + | + | + | - | - | - | - | - | - | - | - | - | - | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VfB Stuttgart | + | + | + | + | + | - | - | - | - | - | - | - | + | - | - |
| Mainz 05 | + | + | + | - | + | - | - | - | - | - | - | - | + | - | - |
| Werder Bremen | + | + | + | + | + | - | - | - | - | - | - | - | - | - | - |
| Hamburg | + | + | + | - | + | - | - | - | - | - | - | - | - | - | - |
| Köln | + | + | + | + | + | - | - | - | - | + | - | - | - | + | + |
| **Total** | **18** | **18** | **18** | **12** | **15** | **0** | **1** | **0** | **0** | **4** | **1** | **1** | **4** | **1** | **1** |

In Table 2, when institutional internet site of German clubs is examined in terms of social networks and interactive communication tools, it is seen that Facebook, Twitter and Instagram take place as social communication tool in all teams; that this is followed by YouTube video sharing site and Google (+) friendship site, which has features similar to Facebook. It was also seen that in institutional internet site of German clubs, in addition, instant messaging applications, (snapchat), document following system (subscribe to RSS) and motion videos (giphy), or blog accessing tools were given place but not much.

**Table 3** Institutional internet site of Turkish clubs: Multiple language option

| | **English** | **French** | **Arabic** |
|---|---|---|---|
| Galatasaray SC | + | + | - |
| Başakşehir SC | - | - | - |
| Fenerbahçe SC | + | - | - |
| Beşiktaş SC | + | - | + |
| Trabzon SC | + | - | - |
| Kayseri SC | - | - | - |
| Göztepe SC | - | - | - |
| Sivas SC | - | - | - |
| Bursa SC | + | - | - |
| Yeni Malatya SC | - | - | - |
| Kasımpaşa SC | + | - | - |
| Akhisar SC | - | - | - |
| Alanya SC | - | - | - |
| Osmanlı SC | + | - | - |
| Gençlerbirliği SC | - | - | - |
| Antalya SC | - | - | - |
| Konya SC | - | - | - |
| Karabük SC | - | - | - |
| **Total** | **7** | **1** | **1** |

SC: Sports Club

As seen in Table 3, when that multiple language option takes place in the institutional internet sites of Turkish clubs is examined, while there is the option of English language in seven sport clubs; in two of these, there are language options more than one in French (Galatasaray) and Arabic languages (Beşiktaş) other than English.

**Table 4.** Institutional internet site of German clubs: Multiple language option

| | **English** | **Spanish** | **Chinese** | **Japanese** | **Russian** | **Arabic** | **French** | **Korean** | **Dutch** |
|---|---|---|---|---|---|---|---|---|---|
| Bayern München | + | + | + | + | + | + | - | - | - |
| Bayer Leverkuzen | + | + | - | - | - | - | - | - | - |
| Schalke 04 | + | - | + | + | + | - | - | - | - |
| Eintracht Frankfurt | + | - | - | + | - | - | - | - | - |
| RB Leipzig | + | - | - | - | - | - | + | - | - |
| Borussia Dortmund | + | + | + | + | - | - | + | - | - |
| Monchengladbach | + | + | - | + | - | - | - | + | + |
| FC Augsburg | + | - | - | + | - | - | - | + | - |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Hoffenheim | + | - | - | - | - | - | - | - | - |
| Hannover 96 | + | - | - | - | - | - | - | - | - |
| Hertha Berlin | + | - | - | - | - | - | - | - | - |
| Freiburg | + | - | - | - | - | - | + | - | - |
| Wolfsburg | + | - | + | - | - | - | - | - | - |
| VfB Stuttgart | + | - | - | - | - | - | - | - | - |
| Mainz 05 | + | - | - | - | - | - | - | - | - |
| Werder Bremen | + | - | - | - | - | - | - | - | - |
| Hamburg | + | - | - | - | - | - | - | - | - |
| Köln | + | - | - | - | - | - | - | - | - |
| **Total** | **18** | **3** | **4** | **6** | **2** | **1** | **3** | **2** | **1** |

As seen in Table 3, when that multiple language option takes place is examined in institutional internet sites of German clubs, there is English language option for all clubs. In ten of German Bundesliga clubs, other than English language option (together with German), there are three or more language options. Bayern München, Borussia Dortmund, Monchengladbach and Schalke 04 are the clubs having the most language option their institutional internet sites.

**Table 5.** Institutional internet site of Turkish clubs: Marketing activities

| | **Licensed Products** | | | **Information belonging to product** | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Online Ticket** | **Online Store** | **Credit Card Promotion** | **Product Detail** | **Cargo Detail** | **Product Filters** | **Product Design** | **Product Classification** |
| Galatasaray SC | + | + | + | - | - | + | + | + |
| Başakşehir SC | - | - | - | - | - | - | - | - |
| Fenerbahçe SC | + | + | + | + | + | + | - | + |
| Beşiktaş SC | + | + | + | - | + | + | + | + |
| Trabzon SC | + | + | + | - | - | + | - | + |
| Kayseri SC | + | - | - | - | - | - | - | - |
| Göztepe SC | - | - | + | - | - | - | - | |
| Sivas SC | - | + | - | - | + | + | - | + |
| Bursa SC | + | + | - | - | - | + | + | + |
| Yeni Malatya SC | + | - | - | - | - | - | - | - |
| Kasımpaşa SC | - | - | - | - | - | - | - | - |
| Akhisar SC | + | - | - | - | - | - | - | - |
| Alanya SC | - | - | - | - | - | - | - | - |
| Osmanlı SC | - | - | - | - | - | - | - | - |
| Gençlerbirliği SC | - | - | - | - | - | - | - | - |
| Antalya SC | + | + | - | - | + | - | - | + |
| Konya SC | + | + | - | - | - | + | - | + |
| Karabük SC | + | - | - | - | - | - | - | - |
| **Total** | **11** | **8** | **5** | **1** | **4** | **7** | **3** | **8** |

As seen in Table 5, when that online tickets take place in Turkish clubs institutional internet sites is examined, in internet sites of seven clubs (Başakşehir, Göztepe, Sivasspor, Kasımpaşa, Alanyaspor, Osmanlıspor and Gençlerbirliğ), the sale of online ticket was not given place. While eight clubs (Galatasaray, Fenerbahçe, Beşiktaş, Trabzonspor, Sivasspor, Bursaspor, Antalyaspor and Konyaspor) give place to online product sale, only eight clubs give place product classification in internet site of it and only Fenerbahçe sports club gave place in internet site. While internet sites of seven clubs use product filtering, product design

can be made in internet site of only three clubs. Cargo detail is shown by internet site of four clubs. Five clubs gave place credit card promotions in their internet sites.

**Table 6**. Institutional internet site of German Clubs: Marketing Activities

| | Licensed Products | | | Information Belonging to Product | | | | |
|---|---|---|---|---|---|---|---|---|
| | Online Ticket | Online Store | Credit Card Promotion | Product Detail | Cargo Detail | Product Filters | Product Design | Product Classification |
| Bayern Münih | + | + | + | + | + | + | - | + |
| Bayer Leverkuzen | + | + | + | + | + | + | - | + |
| Schalke 04 | + | + | - | + | + | + | - | + |
| Eintracht Frankfurt | + | + | - | + | + | + | - | + |
| RB Leipzig | + | + | - | + | + | + | - | + |
| Borussia Dortmund | + | + | - | + | + | + | + | + |
| Monchengladbach | + | + | + | + | + | + | + | + |
| FC Augsburg | + | + | - | + | - | - | + | + |
| Hoffenheim | + | + | - | + | - | - | + | + |
| Hannover 96 | + | + | - | + | + | + | - | + |
| Hertha Berlin | + | + | - | - | - | - | - | + |
| Freiburg | + | + | - | + | + | + | + | + |
| Wolfsburg | + | + | - | + | + | + | + | + |
| VfB Stuttgart | + | + | - | + | + | - | + | + |
| Mainz 05 | + | + | - | + | - | + | + | + |
| Werder Bremen | + | + | - | + | - | + | + | + |
| Hamburg | + | + | - | - | + | + | - | + |
| Köln | + | + | - | + | + | + | - | + |
| **Total** | **18** | **18** | **3** | **16** | **13** | **14** | **9** | **18** |

As seen in Table 6, when the online ticket and online store activities taking place in institutional internet site of German clubs are examined, it is seen that all of these activities are carried out in all German clubs. Again, while product classification takes place in all internet sites of these clubs, product detail is not present in internet sites of only two clubs (Hertha Berlin, and Hamburg) and product filtering, in internet sites of four clubs (FC Augsburg, Hoffenheim, Hertha Berlin and VfB Stuttgart). Product design can be made in internet sites of nine clubs. Cargo detail is shown in internet sites of thirteen clubs. Three clubs give place credit card promotion in their sites.

## DISCUSSION AND CONCLUSION

Nowadays, clubs have obtained the opportunity to be able to be closer and reach to their supporters. Institutional internet sites of clubs are actively shaped and take advantage about all activities, publicity, marketing and communication efforts of the club, While online ticket sale can be made through institutional sites based on visual ground, they can publicize their products and services and, besides this, can present direct solutions without intermediary to the questions, suggestions, expectations, desire, constraint or problems of the supporters related to the products and services.

The first of study results emerging based on content analysis for identifying the information belonging to social media platforms (social networks), language options, online ticket and product sale, bankcard promotion and online products Turkey (Super League İlhan Cavcav) and Germany League (Bundesliga) clubs use in their internet sites is that Super League İlhan Cavcav and Bundesliga clubs mostly use Facebook, Twitter and Instagram, among "social media" channels. In Turkey League, while a few number of soccer clubs give place the tools of visual developing and creating or blog accessing, it is seen that instant messaging applications (snapchats), document follow system (subscribe to RSS) and flattening visuals (giphy) or blog accessing tools are given place but not much in German clubs. Youtube, visual focused social media video sharing site, is given place mostly and equally in internet site of both club. In the world, social networks such as Facebook, Twitter, YouTube, MySpace, Instagram etc. are mostly used. In respect of January 2017, Facebook became the first social network exceeding 1 million of recorded account. Instagram, which is a photograph sharing application and takes place in 6th order, has an active account more than 600 million. Twitter taking place in 10th order has accounts more than 300 million (25). In Turkey, in respect of third and fourth quarters of the year 2016, the most popular social network as social network penetration is Youtube with the use rate of 57%. This is followed by Facebook, İnstagram and Twitter in order (19). The reflection of these statistics related to general users also similarly showed itself as social media tools sport clubs use the most. In digital sport media prepared by Perform Group, it was reported that 55% of Turkey population learnt the scores of soccer matches with the messages and videos coming through Facebook and Twitter (13). Atalı and Çoknaz (2) studying the activities of sport clubs being in active Sport Toto Super League in Facebook, a social media platfor, explained that supporter demands, technological developments, reaching supporters, and communication factors played important role in deciding of soccer clubs to take place in Facebook applications. Social media networks present an opportunity to the supporters of soccer clubs for marketing, public relationship, and the other managerial applications. The clubs well evaluating this opportunity is expected to come forward in competition (13).

While English language option takes place in internet sites of all Germany league clubs about "different language options", which can be deemed as one of preconditions of being able to shown itself in international sport market, the second one of the study results is that in internet sites of Turkey league, there are English language option in only seven sport clubs. In Turkey, in only two sport clubs, there are more than one language options other than English as Arabic (Beşiktaş) and French (Galatasaray) languages. In German league, in internet sites of ten clubs, English language option (Together with German), three or more language option were given place. In the institutional internet sites of Bayern Münih, Borussia Dortmund, Monchengladbach and Schalke 04 clubs, German league clubs are the ones having the most language

option. This case can arise from that the most of Turkey league clubs do not take place in

international organizations and do not pay attention to international information.

In this study, as marketing activity of sport clubs in internet sites, when "online ticket sale", "licensed products", and "detailed information about these products" are examined, while eleven clubs make online ticket sale in internet sites of Turkey league clubs, online ticket sale is made in all of internet sites of German League clubs. In specific to Turkish clubs, while intermediary (pasolig.com.tr), is used. German clubs directly make sale from their own pages. Ekmekçi et al (8), in the study they carried out on super league teams, identified that in similar way, eight teams of super leagues made the product and ticket sale through sites. Çavuşoğlu et al (6), in the study they carried out related to that the sport clubs having the most championship in the last ten year in Turkey and United Kingdom use internet in marketing studies, while intermediary in specific to Turkish clubs is used in related to ticket sales, the clubs of United Kingdom stated that they directly made sale from their own pages.

In internet sites of Turkey league clubs, while eight clubs (Galatasaray, Fenerbahçe, Beşiktaş, Trabzonspor, Sivasspor, Bursaspor, Antalyaspor ve Konyaspor) make online product sale, in all internet sites of the clubs related to Germany, clubs make the sale of their own products through internet site. In internet sites of Turkey league clubs, eight clubs give "product classification" and only Fenerbahçe sport club presents "product detail". In internet sites of German league clubs, while the option of "product classification" in all clubs, sixteen sport clubs gives the option of "product detail". In internet sites of Turkish league clubs, while seven clubs use "product filtering" in their sites, only three clubs can make "being able to design" in internet site. In internet sites of German league clubs, while fourteen clubs use "product filtering", nine clubs make "being able to design" used in internet site. In internet sites of Turkey league clubs, while four clubs show "cargo detail" after product sale, thirteen clubs in German League show it internet sites. This case reveals that the clubs taking place in Turkey Super league do not effectively use online marketing methods or are not aware of online marketing opportunities, while German Bundesliga clubs use online marketing tool more successfully in online marketing. In the study, only Turkey league clubs more gave place "credit promotions" compared to internet sites of German League clubs. Çavuşoğlu, et al (6) reached similar results in comparative analysis on a different league. They reached the conclusion that sport clubs of United Kingdom league were more successful in the use of either marketing or social media. Yıldız and Özsoy (23), in the study they carried out, examined official internet sites of the clubs in Sport Toto Super league and observed that clubs had active internet sites. However, it was concluded that sites did not have sufficient level and infrastructure in terms of marketing.

When the study results are generally evaluated, it was identified that both league clubs had similar features in terms of social networks and interactive communication tools. But when

marketing activities are evaluated in terms of all criteria [online ticket/product sale and information belonging to online products (product detail, product filtering, being able to design product, product classification and cargo detail information) and bankcard promotion], in internet sites of Germany Bundesliga clubs, it is seen that more features were taken place compared to the clubs of Turkey Super League İlhan Cavcav season and they are unsuccessful in terms of online marketing. That internet page does not have interactive product features (product detail, product filtering, being able to design product, product classification) in online marketing should be accepted as a disadvantage in terms of the existing and potential products and this is the leading feature that is necessary to be changed. For, that sports clubs being in active in sport sector can survive depends on the communication they make with their own supporter groups and at international level. Clubs especially use internet media for product sale and not only present soccer that is the main product to the global market but also their licensed side products. The giant clubs of Europe work as if they are company and develop new marketing strategies to be able address to global market (20). In this case, online marketing strategies (product design, product campaigns/seasonal opportunity, product return, questions and comments about product, cross promotion, membership discount, safe payment option) taking place in the sites using online marketing and internet sites of the clubs of German Bundesliga clubs are suggested to take place in institutional internet sites of Turkey super league clubs.

On the other hand, one of the important results of the study is that language options presented in the clubs of Turkey Super League İlhan Cavcav season. In order to be able to show both national and international publicity, it is necessary for Turkey Super League team's tom give place at least English language option and especially clubs taking place in international organizations to increase their language options. In addition, this case can affect the access of potential foreign club shareholders of the clubs processing in stock market and the relationships of foreign investors in negative direction. Also considering international possible successes in the future, it is necessary to update language option in such a way that it will contain at least four different languages and then to develop it.

There are also some limitations of the study. As in all other studies mentioning about assessing internet site contents, this study also has an important risk in respect of continuously changing and updated structure of internet sites. The data collected in the scope of the study, in case that a few soccer clubs given place in the study change their web sites or update, have the possibility to loss their validity and reliability feature. Another limitation of the study emerges in determining assessment criteria. The use of internet technology that continuously develops can present the different features every passing days to the users or can be customized by the users. These change that cannot be predict have the risk to be able to change the existent results of the study. For this case to be able to prevent as much as possible, web sites of soccer clubs were revived at the end of the study.

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# The relationship between isokinetic knee strength and jumping in young male volleyball players

**Barbaros ÇELENK[1], Elif ÖZ[2], Akif Gökhan ÖNER[3], Elvan ÖZ[4]**

[1]*Hacettepe University, Department of Exercise and Sport Sciences, Ankara, Turkey*
[2]*Gazi University, Department of Trainer Education, Ankara, Turkey*
[3]*Turkish Volleyball Federation, Head Coach of Male Volleyball Team, Ankara, Turkey*
[4]*Gazi University, Institute of Health Sciences, Ankara, Turkey*
*Address correspondence to E. Öz, e-mail: elifoz@gazi.edu.tr*

**Abstract**
Volleyball is a dynamic physical game that does not have a definite match duration but is based on high tempo, quickness, strength, flexibility, endurance and jumping. The aim of this study is to research the relationship between isokinetic knee strength and jumping height in young male volleyball players. 8 male volleyball players aged between 18-22 participated in the research voluntarily. In the study, the physical characteristics of the subjects (body height, body weight, body mass index) were determined, vertical jump heights were measured and at low ($60°.s^{-1}$) and high ($300°.s^{-1}$) speeds, the right and left knee flexion/extension concentric isokinetic strength test was applied. Data was analyzed with paired sample t-test and Pearson correlation coefficient test was used to determine the relationship between vertical jump and isokinetic strength ($p<0.05$).The right and left knees peak torque of the athletes were compared at low and high angular speeds and no significant difference was found. A significant positive correlation was detected between the jumping height and the right knee peak torque at low angular speed ($r = .817$, $p<0.05$). This result can be explained by the fact that quadriceps femoris, which is the biggest muscle of the lower extremity, is in the foreground during the jumps that volleyball players perform frequently. It may be advisable to give importance to leg strength training to increase the jump height.

**Keywords:** volleyball, vertical jump, isokinetic strength, peak torque

## INTRODUCTION

The fact that the elite volleyball players jump 100-150 times during a match reveals the need for volleyball players' leg strength for jumping (14). In another study conducted on elite men volleyball players, 250 - 300 high-power activity was reported in which athletes jumped in various ways (50% of them require the hip extension, knee extension and ankle plantar flexion) (8).

Explosive strength and jump strength of the leg muscles in volleyball players are undoubtedly important neuromuscular performance characteristics (10). In volleyball, quadriceps and hamstrings muscle groups participate in important motor skills such as jump (13). When the jump movement is considered, it is found that flexor and extensors are effective in these muscle groups. The most powerful group of knee extensors is the quadriceps muscle group that performs the most powerful extension movement. Due to the need for greater power in terms of duty, they are 2.5 times larger in volume than hamstrings (10).

Volleyball nowadays is one of the most explosive and fast sports branches including much improved muscle strength, power, agility and speed (2,5,6,7). In addition to the technique, it is known that the muscular strength is important in increasing the vertical jump used in the spikes and isokinetic exercises are the most effective method of gaining strength and isokinetic dynamometers where these exercises can be performed.

Vertical bounce is frequently encountered in volleyball in spike, block and service techniques (When the setters set up a game by jumping, they perform vertical jump). Sattler et al. (16) found that the isokinetic strength data was more closely related to block jump than the spike jump in female volleyball players. However, they reported that the eccentric isometric measurements were an important determinant for spike jump.

We assume that there may be a relationship between the vertical jump, in which the most powerful extensor quadriceps femoris muscle played an agonist role, and the isokinetic strength produced at the knee joint extension at different angular velocities. Therefore, the aim of this study is to research the relationship between isokinetic leg strength and jumping height in young male volleyball players.

**MATERIAL & METHOD**

8 (healthy) male volleyball players aged between 18-22 participated in the study voluntarily. Each participant was informed about the content of the study and their consent was obtained.

The body height and body weight were measured after taking the position in anatomical posture in such a way that heels adjacent, holding breath, head on the frontal plane, overhead plate touching the vertex point and the measurements were recorded in "cm" and "kg". The body height of the subjects was measured with stadiometer with a precision of ± 1 mm (Seca 213)**.** The body weights were measured with an electronic scale with a precision of ± 100 g (Seca 760).

Vertical jumps of the subjects were measured by the Vertical Jump meter T.K.K. 5106 Jump-MD. The athletes started the test in half squat position that the knees would not cross the toes and the hands were in the waist. Attention was paid that the athletes' falling positions and body postures were equal.

The isokinetic strength test was performed with CSMI-Cybex Humac Norm Isokinetic Test and Exercise System. Subjects were subjected to isokinetic strength measurement after 10 min general and 5 min special warming. The range of motion belonging to that joint was found by the computer by having the subject make a movement. After the test measurements were taken, the test values specified according to the protocol were transferred to the computer. Isokinetic tests were applied concentric for right and left knees as 5 repeats at 60 $°.s^{-1}$ angular speed and 15 repeats at 300 $°.s^{-1}$ angular speed by eliminating the effect of gravity. In the measurements made in these joint movements, the gravity effect, which may cause incorrect results, is also reset by the device.

Physical characteristics of athletes, descriptive statistics on data obtained from vertical jump and isokinetic strength measurements were calculated. The normality test was applied to the data analysis and data showed normal distribution. Paired sample t-test was used in the analysis of measurements and Pearson correlation test was used to determine the relationship between vertical jump and isokinetic strength. SPSS 22.0 package program was used for statistical analysis of the data. The significance level was taken as $p < 0.05$.

**RESULTS**

Physical characteristics of subjects, jump data and peak torque at different angular speeds are presented in Table 1.

**Table 1.** Physical characteristics and vertical jump of the subjects.

| | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| Age (years) | 18 | 22 | 20.5 | 1.69 |
| Body height (cm) | 187 | 202 | 196 | 5.33 |
| Body weight (kg) | 82 | 98 | 90.4 | 6.30 |
| Body mass index ($kg/m^2$) | 22.3 | 25 | 23.5 | 0.78 |
| Vertical jump height (cm) | 62 | 94 | 79.1 | 9.42 |

Right & left knee peak torque of the athletes at low and high angular velocities were compared and no significant difference was found (Table 2).

**Table 2.** Comparison of quadriceps femoris peak torque at low and high angular velocities of subjects

| Peak torque (Nm) | Mean | SD | p |
|---|---|---|---|
| Right knee 60°.s$^{-1}$ | 340 | 42.1 | 0.455 |
| Left knee 60°.s$^{-1}$ | 327 | 47.3 | |
| Right knee 300°.s$^{-1}$ | 177 | 23.7 | 0.245 |
| Left knee 300°.s$^{-1}$ | 166 | 19.5 | |

A significant positive correlation was determined between the jump height and the right knee peak torque at low angular speed (r =.817, p<0.05) (Table 3).

**Table 3.** The relationship between vertical jump and isokinetic strength of subjects.

| | Vertical jump (cm) | |
|---|---|---|
| | r | p |
| Right knee 60°.s$^{-1}$ peak torque (Nm) | .817 | .013 |
| Right knee 300°.s$^{-1}$ peak torque (Nm) | .313 | .450 |
| Left knee 60°.s$^{-1}$ peak torque (Nm) | .629 | .095 |
| Left knee 300°.s$^{-1}$ peak torque (Nm) | .669 | .069 |

## DISCUSSION and CONCLUSION

In this study, the relationship between jumping performance and isokinetic knee strength of the male volleyball players was studied and a meaningful positive relationship was found between the jump height and right knee peak torque in low angular velocity (r=.817, p<0.05).

The performance of a volleyball player is directly affected by the power generation capacity. The strongest players reach a good strength level in a short time (17). One of the most important characteristics of volleyball is the need for athletes to reach the highest jump height in movements such as attacks and block. For this, high power generation is required, especially in the lower extremity (16).

Isokinetic dynamometer tests, include strength, torque and power measurements through the performance of constant-speed joint movements (3). The speeds used in isokinetic dynamometer evaluations allows measurement of strength at different angular speeds from lower angular speeds allowing larger torque production (30 ve 60°.s$^{-1}$), to higher angular speeds such as 300°.s$^{-1}$ which is closer to the contraction rate of the knee joint muscles used in sports applications (4). Considering that the jumps are multiple joint movements with the contribution of 49% knees, 28% hip and 23% ankles, (9), tests performed on an isokinetic dynamometer may be associated with the jump performance of the volleyball players (including knee flexion and extension) (17).

Bosco et al. (1) used squat jump, counter movement jump and depth jump tests to measure vertical jump height. In these three jumps, the highest correlation between the strength of the knee extensor applied in the isokinetic dynamometer occurs through counter movement jump (r = 0.74), followed by a squat jump (r = 0.71) and depth jump (r = 0.60). In other studies, the authors found a positive correlation between knee strength and jumping performance at low speed (60°.s$^{-1}$). ((12), r = 0.40; (17), r = 0.82).

In the study, where Sattler et al. (16) examined the relationship between volleyball players' block & spike jump heights and isokinetic strength, determined that the data of the subjects (women & men) had a higher correlation coefficient with block jump ($r^2$ = 0.39 and $r^2$ = 0.36, respectively) compared to the spike jump ($r^2$ = 0.42 and $r^2$ = 0.37, respectively).

In the study conducted by Laudner et al. (11), while there was a low correlation found between peak torque of knee flexors and jump height (r = 0.39 to r = 0.58), a high correlation was found between peak torque of knee extensors and jump height (r = 0.63 to r = 0.74). This result shows that knee extensors are more important than knee flexors in jumping.

Yapici et al. (18), at the speed of 60°.s$^{-1}$, there was a higher correlation found between concentric pe ak torque and squat jump, counter movement jump (squat jump - r = 0.80 and counter movement jump - r = 0.82) compared to eccentric peak torque of knee extensors (squat jump - r = 0.50 and counter movement jump - r = 0.48). These data are consistent with the correlation we found between the knee extensor concentric contractile strength and the vertical jump at low angular velocity (60°.s$^{-1}$) (r=.817).

In another study in which the isokinetic evaluation was associated with sporting skill, Saliba and Hrysomallis (15) examined the relationship between isokinetic strength and shot performance, vertical jump in Australian football players. In their study, they applied knee flexion/extension at angular velocities of 60-240-360°.s$^{-1}$. There was no significant relationship found between isokinetic strength and maximal shot velocity, but they found a significant relationship between muscle strength and vertical

jump in isokinetic measurements ($r = 0.55 - 0.69$, $p < 0.05$).

Consequently, at the low and high angular velocities, the right and left knee (dominant vs. non-dominant) peak torque values of the athletes were compared and no significant difference was found. In addition, a significant positive relationship was found between the right knee peak torque value at low angular velocity with jump height. Due to the need to produce a larger torque at low angular speed; it is advisable to give importance to leg strength training in order to increase the jump height of athletes.

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# The effect of leisure benefits on leisure satisfaction: Extreme sports

Ersin ESKILER[1], Yasin YILDIZ[2], Cihan AYHAN[3],

[1] *Department of Sports Management, Faculty of Sports Sciences, Sakarya University of Applied Sciences, Sakarya, Turkey*
[2] *Department of Physical Education and Sport Teaching, Faculty of Sports Sciences, Aydın Adnan Menderes University , Aydın, Turkey*
*3Department of Physical Education and Sport Teaching, Faculty of Sports Sciences, Sakarya University of Applied Sciences, Sakarya, Turkey*

*Address Correspondence to E. Eskiler, e-mail: eeskiler@sakarya.edu.tr*

**Abstract**

In this study, it was aimed to investigate the effect of leisure benefit on leisure satisfaction in extreme sports athletes. In order to determine the leisure satisfaction level of participants, Leisure Satisfaction Scale developed by Beard and Ragheb (1980) and adapted to Turkish by Gökçe and Orhan (2011) was used. Leisure benefit scale developed by Ho (2008) and adapted into Turkish by Akgül, Ertüzün, and Karaküçük (2018) was used to measure the perceived benefit from recreational activities. The conventional sampling method was used for sample selection, and a face-to-face survey method was used for data collection. Descriptive statistics, Pearson Correlation Analysis, and Regression Analysis were used in the analysis of obtained data. A total of 202 people (105 male and 97 female) participated in the study voluntarily. According to the results of the present study, it was determined that there was a positive significant relationship between Leisure benefit and Leisure satisfaction. In addition, it was determined that Leisure satisfaction was predicted by the sub-dimensions of Leisure benefit approximately 84%. This result showed that providing leisure benefits in extreme sports had a significant effect on Leisure satisfaction of extreme athletes.

**Key words:** Extreme sports, Leisure benefits, Leisure satisfaction.

## INTRODUCTION

Nowadays, individuals give importance to leisure by creating some strategies to get rid of work pressure and to renew and strengthen themselves (22). The busy and tiring parts of working life and other compulsory activities has made leisure activities an essential part of life (18, 37). Leisure is the remaining time period of the work or other activities that an individual has to keep living (4, 30). According to another authors, leisure time is defined as the time part in which one can choose whatever he wants except for tasks and obligations in the official life (32). Individuals in this time period participate in the activities such as recreation, sight-seeing, health, being together, excitement, obtaining different experiences, outside or outside the home, in open or closed areas or in active-passive forms, in urban or rural areas (24). At the same time, leisure activities provide leisure benefits in terms of increasing life experiences, realizing oneself (increase in life energy inside them), conscious use and renewal of people's energies (6, 14).

The leisure benefit is defined as the positive effects experienced by participants during leisure activities (15). Leisure benefits are a subjective concept and relates to personal experiences (23). This concept has been widely discussed and researched in the fields of physiology, psychology, sociology, and economics. Leisure benefits in these areas were examined as a subjective experience for each individual. These experiences help people to improve their mental and physical health and to satisfy their physical and mental needs (12). Leisure benefits are classified under three headings: physical, psychological and social benefits (20). Physical benefits refer to physical appearance preservation, energy gain, development of abilities for activities, regular resting, fatigue removal, and extra energy release. Psychological benefits include relief from life pressures, emotional relaxation, creative thinking, relaxation of mind and body, and enjoyment of life. Social benefits include the creation of new friendships and relationships, to be considered by other people, understanding the feelings of the people and gaining the trust of others (12). While the characteristic, social background and leisure environment affect the peoples' motivation, attitude, preference, and expectation for participating in a leisure activity, people

participating to the leisure activities has many benefits in return (23). Therefore, it is possible to say that there was a mutual exchange.

The benefits of participating in leisure activities are unlimited. Individuals who participate in activities gain benefits in terms of psychological, physiological, educational, social and relaxation. In addition, fatigue, anxiety and job stress decrease (36, 38). Individuals enjoying leisure activities gain a leisure satisfaction (5). Leisure satisfaction is the positive satisfaction or emotions that a person receives as a result of participation in leisure activities (8). These activities, in addition to strengthening the connections of individuals with life, provide health and spiritual personality development (2). In accordance with the benefits of leisure activities, it is likely that individuals who are satisfied with leisure are happy and healthy.

People often want to participate in leisure activities to meet their psychological needs related to feel good and happy. Therefore, the more leisure activities meet the basic needs, the higher it contributes to the subjective well-being of individuals (26). Newman et al., (2014) explained this link as the bottom-up spillover theory of subjective well-being (31). According to this theory, if a person satisfied with a leisure activity, this satisfaction contributes to the leisure life satisfaction and in return to the subjective well-being of a person (35). It was thought that determining the effects of leisure benefits of the athletes participating in extreme sports on leisure satisfaction was important. Therefore, the aim of this study was to investigate the effect of leisure benefits on leisure satisfaction in extreme sports athletes.

## MATERIAL AND METHOD

Because it is easily accessible by the researcher, the study universe was determined as extreme athletes in Istanbul. A total of 202 extreme athletes (105 male (52%) and 97 female (48%) participated in the study voluntarily. The average age of the participants was 23.48 $\pm$ 6.36 (years).

The questionnaire form was applied to the sample mass, which was determined by conventional sampling method, between 28 January 2018 and 15 March 2018 by using face to face survey technique. In this study based on quantitative research method, general screening model was used. A Total of 48 items were used in the questionnaire form.

In order to determine the leisure satisfaction level of participants, Leisure Satisfaction Scale developed by Beard and Ragheb (1980) (8), and adapted to Turkish by Gökçe and Orhan (2011) was used. Leisure Satisfaction Scale in 5-point rating (1 = Almost Never True, 4, 5 = Almost Always True) 24 items and consists of six sub-dimensions as Psychological (4 items), Educational (4 items), Social (4 items), Relaxation (4 items), Physical (4 items) and Aesthetics (4 items). Items 1-4 were related to the psychological sub-dimension, 5-8 educational sub-dimension, 9-12 social sub-dimension, 13-16 relief sub-dimension, 17-20 the physical sub-dimension, and 21-24 the aesthetic sub-dimension. In addition, leisure satisfaction scale total scores were calculated as arithmetic means of all items (17).

The leisure benefit scale developed by Ho (2008) (19), and adapted to Turkish by Akgül, Ertüzün, and Karaküçük (2018) was used to measure the perceived benefit of participants from leisure activities. Leisure Benefit Scale is a 5-point Likert type (1 = Strongly Disagree, ..., 5 = Strongly Agree), has 24 items and 3 sub-dimensions as Physical benefits (7 items), Psychological benefits (8 items) and Social benefits (9 items). Items 1-7 were related to sub-dimension of physical benefits, 8-15 sub-dimension of psychological benefits, and 16-24 sub-dimension of social benefits (1).

## INTERPRETATION OF ANALYSIS AND FINDINGS

Descriptive statistics, Correlation, and Regression analysis were used to analyze the data. Durbin-Watson coefficient values for the regression model, binary correlations (binary r <0.80), tolerance values (1-R2> 0.20), variance magnification factor (VIF = [1 / (1)] -R2)] <10) and the highest status index value (CI <30) were examined and it was determined that there was no autocorrelation problem between the variables. For the social benefit sub-dimension of the Cronbach $\alpha$ internal consistency values of each factor was determined as $\alpha$ = 0.92, for the physical benefit sub-dimension $\alpha$ = 0.91 for the psychological benefit sub-dimension $\alpha$ = 0.91, for the sum of the leisure benefit scale $\alpha$ = 0.97 and for leisure satisfaction scale $\alpha$ = 0.97 and was found to be greater than the recommended value of 0.70 (3, 10). Significance was set at p <0.01.

Table 1. The Relationship between Participants' Leisure Satisfaction and Leisure Benefit Sub-dimensions

| Variables | | | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| Level of Total Leisure Satisfaction[1] | | r | 1 | .840 | .843 | .868 |
| | | p | | .001** | .001** | .001** |
| Leisure Benefits | Physical Benefits[2] | r | | 1 | .859 | .784 |
| | | p | | | .001** | .001** |
| | Psychological Benefits[3] | r | | | 1 | .777 |
| | | p | | | | .001** |
| | Social Benefits[4] | r | | | | 1 |
| | | p | | | | |

**p<0.01

According to the correlation analysis, high positive relationship between leisure benefit sub-dimensions (physical, psychological and social benefit) was determined. In addition, it was determined that the leisure benefits sub-dimensions (physical benefit r = .840, psychological benefit r = .843 and social benefit r = .868) were highly correlated with leisure satisfaction.

Table 2. The Effect of Leisure Benefit Sub-Dimensions on Leisure Satisfaction Level

Dependent Variable: Level of Total Leisure Satisfaction

| Variables | B | Standard Error | β | t | p |
|---|---|---|---|---|---|
| (Constant) | .205 | .112 | | 1.819 | .070 |
| Physical Benefits | .198 | .051 | .235 | 3.917 | .001** |
| Psychological Benefits | .270 | .058 | .277 | 4.678 | .001** |
| Social Benefits | .447 | .047 | .468 | 9.588 | .001** |
| $R^2$=.837, $_{adj.}R^2$=.835 | | | | | |
| F=339.94, p=.001 | | | | | Method : Enter |

Linear regression analysis was used to determine the effect of leisure benefit levels of the participants on leisure satisfaction. As a result of the analysis, it was determined that leisure benefit sub-dimensions predicted leisure satisfaction approximately 84% (adj. R2 = .835). Furthermore, independent variables were found to affect the dependent variable positively and significantly (p <.001). In addition, the highest effect on leisure satisfaction was determined as a social (β = .468, p <.01), psychological (β = .277, p <.001), and physical benefit (β =. 235, p <.001), respectively.

## CONCLUSION AND EVALUATION

According to the primary findings of the study, it was determined that there was a high positive relationship between all sub-dimensions of leisure benefits and leisure satisfaction. This result indicates that the higher leisure satisfaction level the participants have, the more leisure benefit levels will increase. Thanks to participation in leisure activities, individuals move away from work pressure and monotonous lifestyle and their social environment and lifestyle change (13). Individuals gain psychological, physiological, social, educational and aesthetic benefits through recreational activities. These benefits increase the level of satisfaction of individuals (23). Lewis, Cooper, Smithson, and Dyer (2001) have reported that recreation policies are an important way to reduce work pressure and a significant source of leisure satisfaction (27).

According to the main findings of the study, the results of the regression analysis to determine the effect of the leisure benefit levels on leisure satisfaction shows that the leisure benefit sub-dimensions predicted the leisure satisfaction by approximately 84% and positively. It can be thought that the remaining 14% of the missing time to complete the leisure satisfaction may constitute other variables (motivation, coping with participation in activities, level of care, life satisfaction, subjective well-being, and socio-economic status, etc.).

The recreational activities that the extreme athletes participated can contribute to discovering their special abilities, experiencing the sensation of curiosity, struggle and success and enjoying the life. These benefits, which they achieve in line with their expectations, can ensure that they are satisfied with the activities they participate in. Chang (2002) has reported that the benefits of participation in leisure activities increased the sense of satisfaction of individuals towards activities and their behavioral motivation, and showed a positive attitude towards the activity and strengthened their intention to rejoin (11). Yang (2006) has reported that recreational activities will contribute to the preservation and maintenance of mental and physical health of individuals, the development of teamwork and the increase of positive effect on daily work (40). Kelly and Godbye (1992) have reported that individuals can satisfy their daily life and leisure needs through recreational activities (25). These results show that the increase in the levels of

benefits that achieved as a result of their participation in the activities will contribute to the increase of their behavioral intentions and satisfaction levels.

Some researchers have reported that leisure benefits are effective in achieving feelings of satisfaction for individuals in their leisure activities. Accordingly, benefits such as body weight control, physical health protection, and energy regeneration are effective in satisfying individuals' physical characteristics (7, 9, 33). Benefits such as the feeling of freedom, the development of self-efficacy and the reduction of the earthquake-anxiety-nervous system are effective in the psychological satisfaction of the individual (12, 21, 29, 39). Benefits such as the discovery of new information and technologies, originality and the desire for potential talent are effective in educational satisfaction (7, 12).

The positive changes in the mood are effective in satisfying the stresses of work and everyday life, reducing energy, improving energy efficiency and improving work efficiency, reducing stress and anxiety (7, 12). The benefits such as satisfying the spiritual needs of the individual and enriching his life are effective in aesthetic satisfaction (7). The benefits of social and cultural identity acquisition, family bond development, social relations and the development of skills are effective in social satisfaction (7, 9, 28).

As a result, it was found that the leisure benefits were an important determinant of leisure satisfaction. The physical, psychological, and social benefits of individuals as a result of their participation in leisure activities (34) help to meet their expectations from recreational activities. In this context, the happiness and satisfaction of participation in recreational activities contribute to the development of personal satisfaction (39). Finally, individuals need to be directed to activities that provide leisure benefits to increase their leisure satisfaction. Thus, individuals can be increased leisure satisfaction levels.

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# The analysis of the pacing profiles based on performance level of the male finishers in the istanbul marathon

**Celil KAÇOĞLU[1]**

*[1]Eskişehir Technical University, Sport Sciences Faculty, Coaching Education Department, Eskişehir, Turkey*
*Address correspondence to C. Kaçoğlu, ckacoglu@eskisehir.edu.tr*

**Abstract**
The aim of this study was to determine, on the basis of performance levels, running pace profiles of the male runners (n = 2095) who completed the 40th International Istanbul Marathon in less than 6 hours. While 0-35 km of the marathon was divided into 5 km long sections, 35-42.2 km of it was determined as the last segment which was 7.2 km. The average speeds of the running pace of the athletes in the determined segments were calculated. Performance groups were evaluated in 8 different groups with the athletes completing the race in the finishing time slower than the winner's race time. In these context, the independent variables were performance levels and the segments, dependent variable was mean running times in all these segments. The difference between performance groups and successive segments was evaluated with Two-way repeated measures ANOVA. The results also showed that mean pacing alterations between successive segments throughout the race had some similarities and were correlated between the performance levels. Analysis showed that there were statistically significant alterations between successive segments pacing profiles depending on for each performance levels ($p<0.000$). Overall, the athletes showed an increasing pace in all the performance groups in the first 10 kilometers of the race ($p<0.001$). The highest level of the performance group showed an even pace in the segments between 10 and 25 km, while it fell between 25 and 30 km and continue at this level between 30 and 35 km. In other groups, it was observed that the speeds fell inversely proportional to the performance in the segments between 10 and 35 km ($p<0.05$). In the last 7.2 km segment, it was observed that the athletes with the highest level of performance had a decrease in pace and the rate of decrease in the pace was lower in the groups with lower performance level. Only in the slowest group of athletes, the pace was observed to increase in the last segment. Considering the whole race, it was seen that the athletes showed a pace profile close to the positive pace profile in general.
**Keywords:** endurance running, race strategies, pacing, speed, running

## INTRODUCTION

The best running pacing strategy during middle and long-distance running races and the control of this strategy throughout the race play an important role in an athlete's ability to complete the race in the best time by maintaining the physiological reserve (5). Therefore, an athlete should avoid wasting kinetic energy and should use all energy stores before finishing the race. Yet consuming all the existing energy resources while there is a long distance to the finish line might cause a significant decrease in the running pace (9). In such a case, the muscle glycogen or blood glucose level (or both) decrease significantly before the finish and it causes a sharp decrease in the pace. The opposite of this is the case where the athlete leaves too much reserve at the end of the race. The athlete's passing the finish line with loaded energy stores and strength is the result of an error in the pacing strategy he/she follows during the race (10). That is to say, a runner who follows an extremely low pace with a fast-finishing strategy might finish the race with a poor performance despite speeding at the end of the race (33).

When the studies in the literature are analyzed through a physiological perspective, there are studies stating that during an 800m run, the $VO^2$ values of the elite middle distance runners were higher with the positive racing strategies with fast-starting compared to the even pace (30). The all-out

pacing strategy with fast starting in the two-minute canoe ergometer performance was shown to be more effective than the even pacing strategy, although speed and $VO^2$ declined steadily (4). The declines in speed and $VO^2$ in the last 100m of the middle distance 400 and 800m races are similar to the aforementioned results (16). It is stated that fast-starting strategies between 4-12 minutes at maximal running speed cause positive effects such as longer distance and exercise duration by forcing the adaptation of oxygen transport system and intracellular oxidation metabolism and ensuring higher $VO^2$ and lower metabolic acidosis values (37). In addition, the similarity of blood lactate and Ph values in slow, even and fast-starting strategies reveals that pacing strategies do not affect some physiological parameters (2).

While elite runners can sometimes run more slowly than their ideal pace as a strategy, some runners at lower levels can push themselves to run faster than their own pace to avoid fall behind the front group. However, this may lead to earlier fatigue and steady decrease in pace (34). In addition, for an athlete to maintain his/her predetermined pacing strategy, internal factors such as the existing energy stores, hydration level, neuromuscular fatigue, cardiorespiratory performance, external factors such as the convenience of the race track and environmental conditions and also decision-making processes such as psychological readiness, mental competence, tactical changes, effort perception, nationality, psycho-biological status, and behavioral characteristics play an important role (3,8,13,25,26,28,36). Therefore, it is stated that it is more appropriate to use the concept of pace profile instead of pacing strategy in studies related to pace profiles (31).

The marathon has recently become one of the most popular events for long-distance runners, both in the World and Turkey. Although running pace has an important role in optimizing the individual performances of runners, research results regarding the race running pace profiles related to the marathon races at the national level have not been found (19,21,31). It is clear that Istanbul Marathon, which is one of the most important and longest-running sports organizations in Turkey, has an important value for this kind of research. The organization, which started in 1979 with the name of Asia-Europe run and a small group of athletes, took the name of Intercontinental Istanbul Eurasia Marathon in 2013 and then the name of İstanbul Marathon (17). Over 28,000 registered participants participated in this big organization arranged for the 40th time in 2018, and Felix Kimutai won by setting a 2:09:57 track record (18).

IAAF and Olympic marathon medalist male athletes had even strategy with negative splits and end-spurt, slower athletes had positive strategy with end-spurt (14). On the other hand, in the city marathons, the male finishers who completed the New York Marathon showed more even strategy, besides that fastest athletes finished the races without end-spurt but slower ones finished with end-spurt. The authors stated that excessive fast start may cause a decrease in speed in the second part of the race (23, 31). Fast finishers (both sexes) in Major marathons like Chicago, London and New York maintain a more constant pacing than the slower ones (19). According to these results, there may be different pacing profiles between Olympic and city marathons, but also some pacing differences can be seen between elite and non-elite athletes. Therefore, in this study, it is thought that focusing on a specific marathon may be useful for athletes in determining race pace strategies on the basis of achievable goals suitable for their performances. Accordingly, the aim of this research was to describe the basic running pace profiles on the basis of the performance levels of male runners who completed the 40th Istanbul Marathon organized in 2018.

## MATERIAL & METHOD

In this observational study conducted to define race pace profiles, the data of the 40th Vodafone Istanbul Marathon held in 2018 were used. Permission has been asked from Istanbul Metropolitan Municipality Sports Inc., which is the race organizer, for the scientific use of the data publicly accessible from the official website of the organization (18).

### *Participants*

For the analysis of the data, the marathon times of the athletes who participated in this marathon and finished in 6 hours and less were used. The marathon times were based on the times of the athletes' passing the starting and finish lines of the race. The athletes with a total race time of more than 6 hours and those with a change rate of

more than 30% in the successive inter-segments average pace were not included in the study due to the possibilities of intolerable fatigue, disability or quitting the run. Since the number of women who finished the race (n=266) was about 10% of the number of men (n=2592), only the data of the male athletes were included in the study. Among 2592 male athletes who completed the Istanbul Marathon, only those who were matching the determined inclusion criteria were included in this study (n=2095).

### *Data Collection*

Because of the speed is more symmetrical, normally distributed and linearly correlated with other data, the race times were converted to average running speeds for 8 equal splits of the race (min/km) (22,27). Race paces (min/km) were analyzed in a total of 8 segments consisting of 5 km parts (0-5 km, 5-10km, 10-15 km, 15-20 km, 20-25 km, 25-30 km, 30-35 km) and in addition to the last 35-42.2 km part of the race. Running times (min/km) of these separate splits were included in the analysis.

### *Data Analysis*

Performance groups of the athletes were evaluated on the basis of the finishing time according to the winner's time. In other words, on the basis of the performance all athletes were divided into 8 different groups consisting of the athletes who finished with a time were less than 20% slower than winner's time (Perf-1 group), athletes whose finishing times were 21 to 40% slower than the winner's time (Perf-2 group), 41 to 60% (Perf-3 group), 61 to 80% (Perf-4 group), 81 to 100% (Perf-5 group), 101 to 120% (Perf-6 group), 121 to 140% (Perf-7 group), and more than 141% (Perf-8 group) slower than the winner's finish time of the race (11,12,13,14).

### *Statistical Analysis*

All the data were given as average and standard deviation. The data in Normal Q-Q Plot and De-trended Q-Q Plot Graphs showed normal distribution. Runners with extreme values (n= 143) were identified with the box graphics and their data were not included in the analysis. Marathon transition periods were evaluated as a group. In these context, the independent variables were performance levels and the segments, dependent variable was mean running times in each segments. Two-way repeated measures ANOVA was used in repetitive measurements in order to determine both the difference in pace changes between segments and the difference between the groups for the same segment. Mauchly sphericity test was used to determine the variance and covariance equality, and Greenhouse-Geisser correction was used when this assumption was not provided. Effect size was determined with partial eta square. The level of statistical significance was set at $p<0.05$. A suitable one of Tukey and Games-Howell post-hoc tests (the one which is suitable for non-equilibrium variants) was used in order to determine in between which two values the significant difference identified in ANOVA test is. SPSS v.20 software was used for all statistical calculations.

## RESULTS

Running pace averages determined as the average km running time (in every segment) of the athletes in the performance groups are given in Table 1.

**Table 1.** Descriptive statistics related to average segment pace of the performance groups (min:sec)

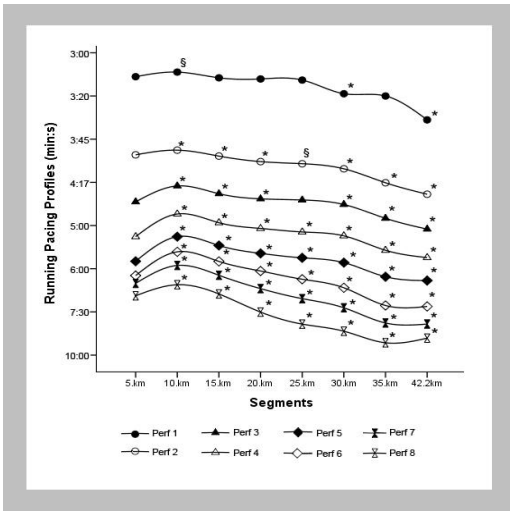
| | N | 5.km | 10.km | 15.km | 20.km | 25.km | 30.km | 35.km | 42.2km |
|---|---|---|---|---|---|---|---|---|---|
| **Perf 1** | 19 | 03:10±12 | 03:11±10 | 03:13±11 | 03:13±12 | 03:14±12 | 03:19±13 | 03:21±16 | 03:34±09 |
| **Perf 2** | 51 | 03:57±14 | 03:52±12 | 03:57±13 | 04:00±12 | 04:01±11 | 04:05±10 | 04:18±13 | 04:29±05 |
| **Perf 3** | 186 | 04:36±22 | 04:21±12 | 04:28±12 | 04:32±13 | 04:34±12 | 04:39±12 | 04:53±17 | 05:06±03 |
| **Perf 4** | 416 | 05:16±26 | 04:49±15 | 04:58±14 | 05:04±13 | 05:08±13 | 05:13±14 | 05:33±22 | 05:45±02 |
| **Perf 5** | 480 | 05:50±31 | 05:15±19 | 05:26±16 | 05:36±17 | 05:43±16 | 05:52±19 | 06:17±29 | 06:25±02 |
| **Perf 6** | 423 | 06:14±32 | 05:36±22 | 05:49±20 | 06:04±20 | 06:19±22 | 06:36±24 | 07:16±34 | 07:22±02 |
| **Perf 7** | 283 | 06:30±34 | 05:56±26 | 06:13±22 | 06:38±24 | 07:00±25 | 07:20±27 | 08:05±35 | 08:06±02 |
| **Perf 8** | 237 | 06:56±40 | 05:00±31 | 06:51±29 | 07:33±31 | 08:06±31 | 08:29±34 | 09:10±39 | 08:53±02 |

(Mean±Standard deviation)

Two-way repeated measures ANOVA analysis showed that there were similarities between the performance levels in average pace in successive segments. Accordingly, it can be said that pacing profiles are correlated with throughout the race, in other words there is a similarity in the pace profiles based on the performance levels (Figure 1). As seen in Figure 1, the pace in the segment between 5 and 10km shows a significant increase in all performance groups. In the following segments, it is seen that the paces show a significant decrease in the performance groups in general, except for the Perf 1 group, until the last segment ($p$<0.05). In the Perf 1 performance group, it is seen that there is a more even pace in between 10-25 km and a decrease at a certain ratio in between 25-30 km ($p$<0.05), and that this pace remains unchanged in the segment between 30-35 km. In the last segment, while the pace shows significant decreases in all the performance groups, it is seen that there is an increase in the 8th group ($p$<0.001).

According to the Tukey Post-hoc multiple comparison results it was seen that there was a statistically significant difference between all successive segments ($p$<0.05). It was seen that according to the results of simple basic effects for the segments, there were statistically significant differences between the successive segments. It was seen that according to the Tukey Post-hoc multiple comparison results, there were significant differences in the successive inter-segments running pace ($p$<0.05) (Figure 1).

**Figure 1.** The differences in the successive inter-segments average pace times of the athletes in the performance groups $p$<0.05 (§), $p$≤0.001 (*).




## DISCUSSION

The aim of this study was to define the race pace profiles of the male athletes participating in the Istanbul Marathon and to compare the pace profiles of the athletes at different performance levels. According to the findings, it was seen that there were statistically significant differences in the running pace profiles based on the performance levels. However, some similarities were observed in the pace profiles. For example, although it was in varying proportions, it was seen that the pace increased in the 5-10 km segment in all performance groups and then it decreased except for the 1st group. In the first performance group, they showed more even pace profiles until the 25-30th km segment. Again in the first group, it was seen that there was a decrease in the pace in the 30-35 km segment, in the next segment, this pace level was maintained and in the last 7.2 km of the race there was a decrease again. This means that the pace profiles of the elite athletes in the Istanbul Marathon track were ranging relatively more balanced and at the last part of the race, there was no pace increase which could be defined as end-spurt. While this profile might be a tactic for elite runners, it also suggests that it might be due to the interaction of the front group in the race or the structure of the track, because construction and environment interactions such as weather conditions, hypoxic conditions, air temperature may affect the pace (7,29,32,35,20). There was an upward slope on the last one kilometer of the Istanbul Marathon, where there was no slope except for the first and last parts of the race. The end-spurt was not seen in any group except for the 8th performance group. The end-spurt in this performance group points to the fact that during the race the athletes at this performance maintained their energy stores highly and insufficient potential use in terms of using energy stores in an even way throughout the race.

Except for the first segments of the race, it was observed that the running pace of the lower performance groups decreased gradually and showed a pace profile closer to the positive pacing strategy. It is noteworthy that the race was at the fastest pace for all the performance groups in the first segments, especially between 5-10 km. Male and female cross-country athletes' showing a positive pace profile with a fast-starting (15) bears a resemblance to the results of this study. While the male athletes who won medals in the IAAF and

Olympic marathons showed an even pacing strategy with negative split and end-spurt, the athletes with longer finishing times compared to the medal winners showed a positive pacing strategy with end-spurt at varying rates based on the performance levels (14). It was seen that the pace profiles of the athletes with 5% and longer finishing times compared to the IAAF and Olympic marathon medal winners were similar in the pace profiles of the male runners participating in the Istanbul Marathon. While male runners competing in the Athens classic (24), the New York Marathon (23,31) and in other major marathons (19) showed a more even pace profile, the fact that there are also similarities between the pace profiles, based on the performance level, of the male runners competing in the New York Marathon (31) and the pace profiles of the runners competing in the İstanbul Marathon suggests that there are some common points between the pace profiles of elite, sub-elite and recreational runners participating in the İstanbul marathon and the pace profiles of the runners of some city marathons.

When looking at the race in general, it can be said that the running pace profiles for all the performance groups were close to the positive pacing strategy which tended to accelerate relatively in the first segments of the race. It is stated that during a race, the acceleration time can significantly affect the pacing strategy especially in short-distance races (1). In positive pacing strategies, the accumulation of metabolites that cause fatigue with increases in oxygen consumption causes fatigue feeling to increase in the first parts of the race (1). The segments with acceleration in the first parts of the race in the Istanbul Marathon suggest that the pace decreased due to physiological fatigue in the following parts and thus this caused a positive pace profile. At this point, if athletes integrate training that includes adaptation to pacing strategies specific to the start and the first parts of the race in their programs, it would have positive impacts on optimizing and applying pacing strategies.

While the pace profiles of the runners with Marathon World record showed a positive structure in the past years, in more current records, in the last 5 kilometers of this race, which was the fastest part, they began to change towards negative profiles. However, strategies characterized by minimum speed changes are indicated to be the most effective pacing strategies (6). From this point of view, differentiation of the results of this research from the pace profiles shows that the İstanbul Marathon is open to change and development in terms of pace profiles and pacing strategies. In addition to all these, it is emphasized that long-distance runners competing for medal goal must run as close as possible to the group leading the race from the beginning to the end of the it (8).

## CONCLUSION

In conclusion, according to the results of this study, the pace profiles of the male runners at different performance levels competing in the Istanbul Marathon showed mostly a positive pacing strategy feature with a relatively fast-starting. In positive strategy, the speed of the athlete gradually decreases throughout the race (1). While a similar pace profile in the elite runners also included a positive pace profile with relatively less pace declines, there was no end-spurt in any group except for the 8th performance group. It is possible to interpret this situation with the relatively overloaded energy stores resulting from inadequacies in distributing energy to the whole race. As for the pace profiles, it would not be wrong to say that the runners participating in this race did not follow a distinct strategy in general.

Trainers' and athletes' taking into account the features of the pacing strategies and pace profiles specific to the Istanbul Marathon event would contribute positively to performances. However, while there might be environmental factors such as weather conditions, oxygen level and humidity (29,35), there are also many factors such as kinetic, biomechanical and physical or mental fatigue before the race (32), affecting an athlete's performance in a big and challenging race like marathon. In this study, these factors were evaluated as the limitations of the study as uncontrollable factors. In addition, the results of this study showed that the characteristics of different race tracks and the participant group could affect the pacing strategies. Thus, in future studies it is possible to compare pacing strategies between specific city marathons or pacing strategies of same athletes in different races.

Considering that this research was designed to provide results that were focused on a particular marathon activity, this research will be a resource for trainers and sports professionals to use in their programming aimed at developing pacing strategies in athletes' training or try runs. This study will be a

source in the literature for different and more holistic future studies to reveal cause and effect relation and for runners to get information about how to distribute their energies evenly to the whole race during important marathon races and about consuming the remaining energy stores entirely with end-spurt at the right time in the last part of the race.

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# An investigation of the reasons for and expectations from boxing participation of male athletes who participated in the school sports young adults b category boxing turkey championship

Metin YAMAN, Hüseyin ÇİÇEK

*Gazi University, Faculty of Sports Sciences, Ankara, Turkey*
*Address Correspondence to , e-mail: cicekhuseyn@hotmail.com*

**Abstract**

The present study aims to investigate the reasons for and expectations from boxing participation of male athletes who participated in the 2018 School Sports Young Adults B Category Boxing Turkey Championship held in Erzincan. Method: The present study enrolled the licensed athletes who participated in the 2018 School Sports Young Adults B Category Boxing Turkey Championship. A total of 150 athletes participated in this Championship. It was conducted with the voluntary participation of the male athletes participating in the Turkey Finals of the School Sports Young Adults B Category. The population of the study consists of 150 athletes, and the sample consists of 102 male athletes. Personal information form developed by Ayilgan (2017) was used to collect the data. The data were analysed by frequency distribution and percentage distribution in SPSS 17.0 package program. Findings: Of the participants, 2% were in the 10-14 age range while 98% were in the 15-19 age range. Besides, 33.3% of the participants reside in metropolises, 51.0% in cities and 15.7% in districts. It was also found that 31.4% of the participants were engaged in boxing for one year, 18.6% for two years, 18.6% for three years, 15.7% for four years, and 15.7% for five years and more. A majority (52%) of the participants planned to be national athletes in the future and received sufficient support from their social circles. 47% of the participants received rewards or bonuses from their clubs whereas 53% received no awards or bonuses. Conclusion: Considering the responses of the athletes who participated in our study, it can be seen that they are fond of boxing and their social circles have sufficient knowledge of boxing.

**Key words:** Boxing, Participation, Expectation, Sports.

## INTRODUCTION

Sport is a tool that provides physical, mental, emotional and social development of individuals and enhances their knowledge, skills and leadership abilities. Sport helps one to discipline himself and to overcome psychological and physiological problems. Sports enable international friendship and peace and provide positive benefits to the countries' economy. In addition, nowadays, both the media's approach to sports and the efforts of people to get rid of stress and keep their bodies in shape and above all, the success of national athletes in international sports events have given sport an important place in the daily life of people (1,3).

Boxing, one of the oldest sports in the world, has been described in various ways by sports scientists. Some of these are as follows: A sport known as fighting, attacking, defending or reciprocal fighting based on the fist fighting of two people wearing special gloves following certain rules (13). Boxing is a struggle of two athletes in a square-shaped area surrounded by three rows of rope (ring) in the framework of certain rules by wearing specially produced gloves (16). Boxing is a sports branch where two people are wearing special gloves hit each other with their fists by the rules (8). Boxing is a sport between two people using their fists within a certain time (round), in a certain area (ring), and by certain rules (15). Boxing has a complex structure due to the highest dynamic and static properties. It is also among the combat sports that require a maximum force (11).

Boxing is one of the sports branches that require physical contact and struggle. Boxing training develops aerobic and anaerobic power and provides maximal improvements in flexibility and reflexes (5).

Boxing is a sport that has to be done according to certain rules. If we examine this fact in terms of defence and attack based contact sports, we can better understand the reasons. When the rules are applied with rigidity and precision, sports activity takes a standard dimension (14).

Up to date, studies have been conducted investigating the reasons for and expectations from participation in sports of athletes and students in different fields; however, no studies have been conducted on this with students in sports schools. It is the primary purpose of this study to identify the main reasons why these individuals start sports and why they choose a certain sports branch, and to investigate the future expectations of these individuals.

## MATERİAL AND METHOD

Conducted to investigate the reasons for and expectations of the athletes who participated in the 2018 School Sports Young Adults B Category Boxing Turkey Championship, the present study utilised relational (survey) model.

The universe and sample of the research The universe of the research consists of a total of 102 licensed male athletes who participated in the 2018 School Sports Young Adults B Category Boxing Turkey Championship, and who participated in regional, national and international competitions.

Personal information form developed by Ayilgan (2017) was used to collect the data. The data collection tool consists of three parts including personal information. The first part, the personal information part contains ten demographic questions. In the second part, the athletes were asked ten questions about the environmental factors affecting them. The data were evaluated and interpreted using appropriate statistical methods.

In the study, frequency distribution and percentage distribution of SPSS 17.0 Package Program were used as test statistics, and demographic information and expectation levels of the participants were examined.

## INTERPRETATION OF ANALYSIS AND FINDINGS

Table 1. Distribution of residences of the participants

| Place of Residence | F | % |
|---|---|---|
| Metropolis | 34 | 33.3 |
| City | 52 | 51.0 |
| District | 16 | 15.7 |
| Total | 102 | 100 |

Table 1. Of the athletes who participated in the study, 33.3% live in metropolises, 51% in cities, and 15.7% in districts.

Table 2. Distribution of occupations of the fathers of the participants

| Occupations of the Fathers | F | % |
|---|---|---|
| Civil Servant | 22 | 21.6 |
| Worker | 30 | 29.4 |
| Self-employed | 36 | 35.3 |
| Farmer | 3 | 2.9 |
| Retired | 10 | 9.8 |
| Unemployed | 1 | 1.0 |
| Total | 102 | 100 |

Table 2. Of the fathers of the athletes, 21.6% are civil servants, 29.4% are workers, 35.3% are self-employed, 2.9% are farmers, 9.8% are retired, and 1% is unemployed.

Table 3. Distribution of occupations of the mothers of the participants

| Occupations of the Mothers | F | % |
|---|---|---|
| Civil Servant | 8 | 7.8 |
| Worker | 9 | 8.8 |
| Self-employed | 6 | 5.9 |
| Retired | 18 | 17.6 |
| Unemployed-Housewife | 61 | 59.8 |
| Total | 102 | 100 |

Table 3. Of the mothers of the athletes, 7.8% are civil servants, 8.8% are workers, 5.9% are self-employed, 17.6% are retired, and 59.8% are unemployed/housewives.

Table 4. Distribution of the monthly income levels of the parents of the participants

| Monthly income | F | % |
|---|---|---|
| <500 | 3 | 2.9 |
| 501-1000 | 7 | 6.9 |
| 1001-1500 | 15 | 14.7 |
| 1501-2000 | 30 | 29.4 |
| 2001 and above | 47 | 46.1 |
| Total | 102 | 100 |

Table 4. Of the parents of the athletes, 2.9% have a monthly income level of <500 TL, 6.9% 501-1000 TL, 14.7% 1001-1500 TL, 29.4% 1501-2000 TL, and 46.1% 2001 TL and above.

Table 5. Distribution of how many years the participants have been doing this sport

| How many years the participants have been doing this sports | F | % |
|---|---|---|
| 1 | 32 | 31.4 |
| 2 | 19 | 18.6 |
| 3 | 19 | 18.6 |
| 4 | 16 | 15.7 |
| 5 and more | 16 | 15.7 |
| Total | 102 | 100 |

Table 5. Of the athletes, 31.4% have been doing this sport for one year, 18.6% for two years, 18.6% for three years, 15.7% for four years, and 15.7% for five years and more.

Table 6. Of the athletes, 2% train one day a week, 7.8% two days a week, 25.5% three days a week, 24.5% four days a week, and 40.2% five days a week.

Table 7. Distribution of the hours the participants train

| The hours the participants train a day | F | % |
|---|---|---|
| 1 hour | 9 | 8.8 |
| 1.5 hour | 76 | 74.5 |
| 2 hours and more | 17 | 16.7 |
| Total | 102 | 100 |

Table 7. Of the participants, 8.8% train one hour a day, 74.5% 1.5 hours, and 16.7% 2 hours and more.

Table 6. Distribution of the number of weekly training sessions

| The number of weekly training sessions | F | % |
|---|---|---|
| One day | 2 | 2.0 |
| Two days | 8 | 7.8 |
| Three days | 26 | 25.5 |
| Four days | 25 | 24.5 |
| Five days | 41 | 40.2 |
| Total | 102 | 100 |

Table 8. Distribution of the opportunities provided by the clubs

| Opportunities provided by the clubs | F | % |
|---|---|---|
| Social Security | 11 | 10.8 |
| Health Guarantee | 25 | 24.5 |
| Employment Guarantee | 13 | 12.7 |
| Economic Earnings | 5 | 4.9 |
| Equipment | 38 | 37.3 |
| Shelter | 4 | 3.9 |
| None | 6 | 5.9 |
| Total | 102 | 100 |

Table 8. Of the clubs of the athletes, 10.8% provide social security for the participants, 24.5% health guarantee, 12.7% employment guarantee, 4.9% economic earnings, 37.3% equipment, 3.9% shelter, and 5.9% provide none of these.

Table 9. Distribution of whether the participants receive any rewards or bonuses from their clubs

| Whether the clubs give rewards or bonuses | F | % |
|---|---|---|
| Yes | 47 | 46.1 |
| No | 55 | 53.9 |
| Total | 102 | 100 |

Table 9. Of the athletes, 46.1% receive rewards or bonuses whereas 53.9% do not receive any rewards or bonuses.

Table 10. Distribution of whether the participants are provided with sufficient facilities

| Are the facilities sufficient? | F | % |
|---|---|---|
| Yes | 66 | 64.7 |
| No | 36 | 35.3 |
| Total | 102 | 100 |

Table 10. Of the participants, 64.7% are provided with sufficient facilities whereas 35.3% are not.

Table 11. Distribution of plans of the participants

| Future Plans | F | % |
|---|---|---|
| Academic Training | 10 | 9.8 |
| Continue at the Club | 5 | 4.9 |
| Be a Coach | 26 | 25.5 |
| Be a Manager | 3 | 2.9 |
| Be a National Athlete | 56 | 54.9 |
| No Plans | 2 | 2.0 |
| Total | 102 | 100 |

Table 11. Of the participants, 9.8% plan to receive academic training in the future, 4.9% plan to continue at the club, 25.5% plan to be a coach, 2.9% plan to be a manager, 54.9% plan to be a national athlete, and 2% have no plans.

Table 12. Distribution of whether the participants receive sufficient support from their social circles

| Yes | 71 | 69.6 |
|---|---|---|
| No | 31 | 30.4 |
| Total | 102 | 100 |

Table 12. Of the athletes, 69.6% stated that they receive sufficient support from their social circles whereas 30.4 stated that they do not.

Table 13. Distribution of whether the participants believe their social circles have sufficient knowledge of boxing

| Do you believe your social circle has sufficient knowledge of boxing? | F | % |
|---|---|---|
| Yes | 79 | 77.5 |
| No | 23 | 22.5 |
| Total | 102 | 100 |

Table 13. Of the participants, 77.5% believe that their social circles have sufficient knowledge of boxing whereas 22.5% do not believe so.

**CONCLUSION AND EVALUATION**

Every individual is born as a part of society. The beliefs, lives, tastes and choices of individuals are shaped by the society to which they belong. The cultures of societies are shaped by the traditions and customs from the past to the present, religious beliefs, and geographic region. Similar situations can be observed in the selection of sports branches. By determining the socio-economic and demographic characteristics of the male athletes participating in the selected branch (Boxing), the present study aims to increase the levels of participation in such branches and to make a more positive contribution to the expectations (9).

When we look at the residences of the participants, 33.3% live in metropolises, 51% in cities, and 15.7% in districts. Devecioglu and Sarikaya (2004) reported that 62.5% of students engaged in sports reside in city centers. This finding indicates that this branch is preferred in all three different places. Most of the athletes participating in our study live in cities and metropolitan areas. The reasons for this are the excess of facilities in the cities (sports halls, sports clubs, coaches, etc.). When we examine whether the participants are provided with sufficient facilities, 63.7% stated that they have sufficient facilities whereas 35.3% stated they do not. This finding indicates that most of the participants believe that they have sufficient facilities. The presence of suitable fields, facilities and materials can be the determining factors for the participants to choose a sports branch. A study conducted in 2008 in Canada reported that children away from playgrounds or parks are less engaged in sports than those close to playgrounds or parks (12).

Of the fathers of the athletes, 21.6% are civil servants, 29.4% are workers, 35.3% are self-employed, 2.9% are farmers, 9.8% are retired, and 1% are unemployed. This finding indicates that a majority of the fathers of the participants are self-employed. Of the mothers of the athletes, 7.8% are civil servants, 8.8% are workers, 5.9% are self-employed, 17.6% are retired, and 59.8% are unemployed/housewives. Similarly, in a study by Ayilgan, 62.8% of the mothers of the participants were unemployed or housewives. This finding is consistent with the finding of our study. This finding also indicates that a majority of the mothers of the participants are either unemployed or housewives.

Of the parents of the athletes, 2.9% have a monthly income level of <500 TL, 6.9% 501-1000 TL, 14.7% 1001-1500 TL, 29.4% 1501-2000 TL, and 46.1% 2001 TL and above. This finding indicates that the parents of the participants had a monthly income level that is close to the minimum wage.

Of the athletes, 31.4% have been doing this sport for one year, 18.6% for two years, 18.6% for three years, 15.7% for four years, and 15.7% for five years and more. In the study by Ayilgan (2017), 32.7% of the participants were engaged in boxing for 1-2 years, which is consistent with the finding obtained in this study. This finding indicates that 15.7% of the participants have been engaged in boxing for 5 or more years. Of the athletes, 2% train

one day a week, 7.8% two days a week, 25.5% three days a week, 24.5% four days a week, and 40.2% five days a week. In the study by Ayilgan (2017), 64.5% of the participants trained five days or more a week. This finding indicates that most of the participants train 3 or 4 days a week. Of the athletes, 8.8% train 1 hour a day, 74.5% 1.5 hours, and 16.7% 2 hours and more. This finding indicates that most of the participants who participated in the championship preferred training 2 hours a day at most. Of the clubs of the athletes, 10.8% provide social security for the participants, 24.5% health guarantee, 12.7% employment guarantee, 4.9% economic earnings, 37.3% equipment, 3.9% shelter, and 5.9% provide none of these. In the study by Ayilgan (2017), 28.7% of the clubs provided no opportunities for the participants. This finding indicates that clubs mostly provide equipment for the participants. Of the athletes, 46.1% receive rewards or bonuses whereas 53.9% do not receive any rewards or bonuses. In the study by Ayilgan (2017), 59.7% of the participants received no rewards or bonuses from their clubs.

Of the athletes, 9.8% plan to receive academic training in the future, 4.9% plan to continue at the club, 25.5% plan to be a coach, 2.9% plan to be a manager, 54.9% plan to be a national athlete, and 2% have no plans. It can be seen that a majority of the athletes want to be national athletes in the future. Being a national athlete and being selected for the national team is very important for the sports career of the athlete and his expectations from the sports he does (7).

Of the athletes, 69.6% stated that they receive sufficient support from their social circles whereas 30.4 stated that they do not. This finding indicates that most of the athletes receive support from their social circles. Of the participants, 77.5% believe that their social circles have sufficient knowledge of boxing whereas 22.5% do not believe so. This finding indicates that most people in the social circles of the participants have sufficient knowledge of boxing.

From this result, we can conclude that the participants are fond of being engaged in boxing and that they believe that their social circles have sufficient knowledge of boxing. M. Kumartasli and E.Atabasin (2014) reported that individuals are fond of doing the sports that they do. Demanding sports such as boxing requires ultimate motivation and sacrifice.

In conclusion, the athletes engaged in boxing have poor socio-economic conditions and low incomes, their parents are mostly self-employed, or housewives and most of the participants are primary school graduates. We can argue that despite their poor socio-economic conditions and low incomes, poor educational background, and unfavourable conditions, the participants want to be national athletes and increase the quality of their lives. Furthermore, we have found that most of the participants, unfortunately, did not receive any rewards or bonuses from their clubs. For this reason, the conditions of the athletes need to be improved, and the athletes need motivation.

Future research may be conducted on the reasons for engagement in other sports branches.

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# Effects of electromyostimulation training on body composition

Mehmet KİRİŞÇİOĞLU[1], Mürsel BİÇER[1], Zarife PANCAR[1], İlkay DOĞAN[2]

[1]*Gaziantep University School of Physical Education and Sports, , Gaziantep, Turkey*
[2]*Gaziantep University, Department of Biostatistics, faculty of Medicine, Gaziantep, Turkey*
*Address Correspondence to M, Biçer, e-mail: mbicer@gantep.edu.tr*
This study was designed from Master Thesis of Mr. Mehmet KİRİŞCİOĞLU with same title.

**Abstract**

The purpose of this study is to examine the variables such as weight, body fat percentage and amount, lean body mass (FFM) and body mass index (BMI) occurred on body as a result of realization of voluntary contraction and involuntary contraction together with training by electromyostimulation (EMS) system. 41 voluntary women joined the study as treatment (n=20) and control group (n=21). a 25-minute training program was arranged for treatment group with Bodytec EMS device twice a week for 8 weeks. Training was done as strength and durability exercises for 12 minutes, cardio exercises for 8 minutes and active rest for 5 minutes. Ages, genders, lengths, weights, fat percentages, lean body masses and body mass indexes of groups were measured both whole and regional, and then these parameters were compared before and after treatment. Measurements were donetwice as pre-test and post-test. Tanita bc 418 body analyzer belongs to Bio Electricity Impedans method was used for all measurements. In data analysis, 2*2 Repeated Measures Varians Analysis (Repeated Measures ANOVA) was used to compare pre-test and post-test measures. Statistical results were evaluated at $p<.05$ significance level. Consequently, $p<.05$ significance level was identified in favor of the post-tests analyzes of pre-tests and last tests of experimental group in body weight , BMI , fat % (body fat ratio) ,values of fat mass (amount of fat), value of right foot fat percent , value of right foot fat mass , value of left foot fat percent , value of left foot fat mass ,body fat mass in value of right-left arms fat percent. Statistically, $p<.05$ significance level was determined between pre-tests and post-tests of control group's measurements. It was seem to occur significant changes on body compositation values of experimental group as a result of EMS training.

**Key words:** Electromyostimulation (EMS), Training, Body Composition, Body Mass Index, Body Fat Percentage.

## INTRODUCTION

Training with electromyostimulation (EMS) training system is a new and different technology (6). Electromyostimulation (EMS), which was initially applied for rehabilitation and treatment purposes, attracted the attention of coaches, athletes and sports scientists as a popular training method. EMS can be defined as electrical currents applied to muscle tissue or motor spots (5). Modern EMS devices stimulate all the main muscle groups simultaneously at the determined intensity during slow movements (2). Therefore, its applications in the health, fitness and beauty sectors are increasing. Besides its having wide range of applications, it is frequently mentioned that because of its practicality and easy application due to its orthopedic nature, EMS saves time and affects body composition positively (9.6.2). In recent years, instead of local EMS, TB-EMS devices have been widely used in training (3). Time-consuming low intensity exercises, exercise programs that have an impact on fitness and body composition are increasingly encouraged by the fitness industry (11). The positive effects of EMS are indicated in body composition and fitness parameters in recent years.

The aim of this study was to investigate the effect of EMS on body composition and to examine the changes in the body parameters.

## MATERİAL AND METHOD

The present study was including 8-week training program, at Fit In Time Gaziantep fitness center (n: 20 training groups and n: 21 control groups). The mean age and height of the participants (n: 41) were 34.05 ± 8.94 years and 1.63 ± 0.06 cm, respectively. The mean age and height of the experimental group (n: 20) and the control group (n: 21) were 33,40 ± 10,29 years and 1,66 ± 0,04 m, respectively; 34.67 ± 7.65 years and 1.60 ± 0.05 m. Power analysis was performed to determine the number of subjects (GPower 3.1). Measurements were performed in the sportive performance

laboratory of Gaziantep University School of Physical Education and Sports.

Each training lasted 25 minutes, 2 days a week for 8 weeks. For each workout, classic physical movement applications (squat, lunge, jumping, burpees, jump squat, scissor kick, bench press, dumbbell curl, and crunches) were done by using the EMS computer application. The measurements were recorded at the beginning and at the end of the 8-week training with Tanita's Bc 418 model using the Bioelectric Impedance Method. Five different parts of the body were analyzed. The measurements of the participants' body compositions were recorded a day before and a day after the 8-week training program. In our 8-week study, a total of 25-minute training programs were organized with the miha bodytec EMS. The workout program was planned as 12 minutes of strength and endurance training, 8 minutes of cardio and 5 minutes of active rest. The participants' height, weight, fat ratios, body fat mass and body mass indexes were measured before and after the study, and at the end of eight-week training these measurements were compared.

## INTERPRETATION OF ANALYSIS AND FINDINGS

The Statistical analysis was done by using SPSS software program. 2*2 Repeated Measurements Variance Analysis was used to compare the pre-test and post-test scores of the variables. Statistical results were evaluated at p<.05 significance level.

Table . Body Composition Values of Experimental and Control Groups.

| Variables | Groups | N | Pre-test $\overline{X} \pm SS$ | Post-test $\overline{X} \pm SS$ | |
|---|---|---|---|---|---|
| **Body weight (kg)** | **Experimental** | 20 | 69,54±12,39 | 67,39±12,04 | $F_g$=1,912; p=0,175 |
| | **Control** | 21 | 73,94±15,46 | 75,08±15,59 | |
| | **Total** | 41 | 71,79±14,05 | 71,32±14,33 | **$F_{int}$=56,399;p=0,001*** |
| | | | **$F_t$=5,378; p=0,026** | | |
| **Body-Mass Index** | **Experimental** | 20 | 25,29±3,90 | 24,48±3,81 | **$F_g$=7,390; p=0,010** |
| | **Control** | 21 | 29,09±6,21 | 29,52±6,24 | |
| | **Total** | 41 | 27,24±5,49 | 27,06±5,74 | **$F_{int}$=58,438;p=0,001*** |
| | | | **$F_t$=5,287; p=0,027** | | |
| **Body fat Rate (%)** | **Experimental** | 20 | 33,36±6,14 | 31,72±6,53 | **$F_g$=4,780; p=0,035** |
| | **Control** | 21 | 37,65±8,29 | 37,54±8,45 | |
| | **Total** | 41 | 35,55±7,55 | 34,70±8,04 | **$F_{int}$=7,608;p=0,009*** |
| | | | **$F_t$=9,958; p=0,003** | | |
| **Body fat mass (kg)** | **Experimental** | 20 | 23,88±8,40 | 22,06±8,26 | $F_g$=3,596; p=0,065 |
| | **Control** | 21 | 28,87±11,72 | 29,20±11,93 | |
| | **Total** | 41 | 26,43±10,42 | 25,72±10,80 | **$F_{int}$=19,193;p=0,001*** |
| | | | **$F_t$=9,110; p=0,004** | | |
| **Fat-Free Mass (kg)** | **Experimental** | 20 | 45,68±4,36 | 45,33±4,11 | $F_g$=0,001; p=0,982 |
| | **Control** | 21 | 45,07±4,93 | 45,87±5,20 | |
| | **Total** | 41 | 45,36±4,62 | 45,61±4,65 | **$F_{int}$=10,580;p=0,001*** |
| | | | $F_t$=1,692; p=0,201 | | |

$F_g$: F value for group comparison; $F_t$: F values for time comparison; $F_{int}$= F value for group*time interaction; *p<0,05

Group-time interaction for body weight, body mass index, body fat ratio, body fat mass and body fat-free mass variables were statistically significant (p<.05). According to this, body weight, body mass index, body fat ratio, body fat mass and body fat mass were decreased while the mean of the control group increased.

## CONCLUSION AND EVALUATION

The present study was carried out to determine the effect of electromyostimulation (EMS) training system on body composition. In our study, the parameters of body weight, body fat percentage and amount, body fat-free mass (FFM) and body mass index (BMI) were investigated.

In this research, it was confirmed that the mean body weight of the experimental group decreased

while the mean weight of the control group increased as a result of 8-week EMS training.

Scientific studies have concluded that regular exercise programs affect body weight and physical performance (4.2). In many studies, the positive effects of EMS training on body weight, which is one of the determinants of physical fitness, is frequently emphasized(9.2.6). EMS training is a training method applied by sending electrical warnings on muscles. The effectiveness of EMS training is related to the intensity of electrical currents during training. Within the scope of this information, there are few studies on the tolerance of muscles and nerves to electrical currents. Today, Electromyostimulation (EMS) system is preferred as an alternative training method because it is both portable and economical. The EMS system is also used for rehabilitation purposes after injuries. Sedans, elderly and overweight women and men who do not spend much time in sports in daily life often prefer EMS applications (5). In 2016, Özdal and Bostancı reported a significant difference in body weight values in their study on women for 8 weeks with EMS.In 2017, Çetin et al. found significant differences in body weight values as a result of their training in 24 volunteer women, 8 weeks with EMS (9.2). The duration, method and results of the two studies above are in parallel with our study. When we compare the results obtained in our study with the results of the studies in literature, it can be said that the exercises performed with EMS significantly affect the body weight value.

In our study, it was determined that the mean BMI of the experimental group decreased while the mean BMI of the experimental group was slightly increased (10). World Health Organization women's BMI classification is as follows. The BMI is 1st degree obese between 18.5 kg / m2 weak, 18.5 and 24.9 kg / m2 normal, between 25.0 to 29.9 kg / m2 excessively heavy, between 30.0 to 34.9 kg / m2 and if the value is above 35.0, it is II. or III. Degrees obese (1). Ound a significant difference in their BMI values at p <.05 level in a study conducted on women in 8 weeks with TB-EMS study in 2016 (9). In 2017, Çetin et al. found significant differences in BMI values at p <.05 as a result of their 8-week EMS training with 24 volunteer women (2). In 2005, Porcari et al. applied electrical muscle stimulation training for 8 weeks and 5 times a week on healthy adults and found no significant difference in body mass index value with some similar values (12). The results of the other studies and the BMI values of our study are in parallel. In addition that the reason of the difference of the results having been studied by Porcari et al. 2005, might be the frequency and duration of training.

In our study, it is confirmed that the mean body fat ratio of the control group didn't change while the body fat ratio average of the experimental group decreased. In many studies, it has been reported that the muscle workout performed with EMS application is effective on body fat content (7.8). The results of the present studyin terms of body composition are in parallel with other studies such as (6.2.9). In 2005, Porcari et al. applied electrical muscle stimulation training for 8 weeks and 3 times a week on healthy university students and although they found decrease in body composition values in pretest and posttest mean, unlike this study and above mentioned studies they didn't find statistically significant differences (12). It is observed that subject group of Porcari et al. 2005, consists of male and female athletes. Some sources stated that there are important morphological differences between men and women and one of the most important of these is the amount and distribution of fat tissue. The average body fat is 27% for women and 15%for men. Adipose fat ratio is 15% for females and 12% for males. Total body fat contains different essential fat ratio between the genders which is 12% for women and 3% for men (14). Therefore, we can say that the reason why the results of Porcari et al.' s study and the present study and the studies mentioned abovewere differentis due to the fact that men and women are in the same experimental group (9). found a significant difference in body fat mass values at p <0.05 level in a study conducted on women in 8 weeks with TB-EMS study in 2016. In 2017, Çetin et al. found significant differences in body fat mass values at p <0.05 as a result of their training, which was carried out on 24 volunteer women by EMS for 8 weeks and 2 days a week (2).

In our study, body fat-free mass averages of both groups did not show any statistical difference after 8-week EMS training. Counter-resistance trainings can cause changes in body composition; thus, it can be said that body fat ratios may be reduced by this kind of training. Trainings focusing on short-term muscle contraction can also lead to slight increases in lean mass (13). In 2016, in a study conducted by Özdal et al. the pre-test for lean body mass index was found as 45.56 ± 8.60 and the post-test score was found as 45.33 ± 8.20. There was no

significant change in body fat-free mass after EMS training and the results obtained from this study are in accord with the results of our study. When we look at the studies in the literature above, it is reported that EMS training applications generally have positive effects on sport performance and body composition parameters.

As a conclusion, it was observed that the exercises performed with EMS system applied to sedentary women twice a week for 8 weeks have positive effects on body composition parameters such as body weight, body fat percentage and amount, and body mass index (BMI). It is determined that the training with EMS system is beneficial on sedentary women and even active sportsmen taking part in training protocols. It can also be recommended that both sports scientists and coachesuse EMS applications.

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# A scrutiny on the factors affecting the participation of women doing sports and not doing sports in sportive events

**Ali Osman KIVRAK[1], Kadir PEPE[2], Şirin PEPE[3], Barbaros Serdar ERDOĞAN[2]**

[1]*Selçuk University, Faculty of Sports Sciences, Konya, Turkey.*
[2]*Burdur Mehmet Akif Ersoy University, Physical Training and Sports School of Higher Education/Burdur, Turkey*
[3]*Erenköy Zeki Altındağ Secondary School, Physical Training Teacher/ Konya, Turkey*
*Address Correspondence to AO Kıvrak, e-mail: aokivrak@selcuk.edu.tr*

**Abstract**

The study has been conducted in order to scrutinize the factors affecting the participation of women doing sports and not doing sports in sportive events.The population of the study is constituted by Selcuk University, Mehmet Akif Ersoy University, Uludağ University, and Gazi University, with the thought that we can find the individuals from all sections of the Turkish society all together and its sampling group consists of the female students studying at those universities. The data were obtained from written sources and by means of the questionnaire method. A questionnaire oriented to the objective has been developed. The understandability of the questionnaire as well as the validity and reliability of its scope were ensured. The questionnaire's CronbachAlpha reliability coefficient was found as 0,60. The coefficient is a valid coefficient according to the researchers as well. The questionnaires were filled in through one-to-one discussions in the sampling group by means of the random sampling method. Total 828 women, being 538 doing sports and 290 not doing sports, took part in the study in its state mentioned above. The data obtained were transferred to the computer environment for statistical transaction. As the statistical process, the Chi-Square test processes were conducted for identifying the frequency, %, Crosstab, and differences. In the determination of the differences, 0,05 was accepted as the level of significance. Upon the assessment of the data obtained, it was determined that the factors affecting women's participation in sportive events are religious reasons, family pressure, government policy, the fact the some branches of sports are not suitable for the physical properties of women, the fact that sportive events inflict damage on their beauties, presence of no suitable areas and venues to perform sports, and the inability of sports culture to take place within the society etc. and that significant differences are present at the 0,05 statistical significance level in the views of the women doing sports and not doing sports in regards to some questions. We can conclude that there are religious, familial, political, physiological, cultural, and spatial factors affecting the participation of women in sportive events.

**Keywords:** Woman, Sportive event, Participation, Factor

## INTRODUCTION

It appears that the technological advancements whose utilization is becoming more and more widespread in every area of the lives of people today have negative impacts on them along with positive ones. Addiction to technology poses negative impacts on humans in terms of physical, social, psychological, and cognitive aspects. Scientists consider sportive events as the only tool that unites people and that has positive impacts in physical, social, psychological, and cognitive grounds.

Sports are the primary basic physical movement of humans within the flow of life in the societies of today. It is known that people take part in sportive events in a regular manner in every location of the world. They have had a lifestyle that intertwined with sports since the very early periods. Hence, it can be said that the existence of sports as a significant social phenomenon is presently an expected outcome. In addition, it appears it is not possible to alienate sports, which have been a social fact presently, from everyday life (5).

We observe that the concept of sports is defined in various ways in line with the viewpoints of the scientists involved with sports, although all

are essentially the same. Among them, Şahin (16) defines sports as the overall physical, mental, and spiritual activities that aim at the satisfaction of individuals like defeating and becoming capable, that are performed under some particular rules, that are based on competition, and that are socializing and integrating, while the definition of Mirzeoğlu (15) is the physical activities performed in the form of teams or individually in line with predetermined rules, oriented to compete or contest, and attainment of personal perfection.

As can be understood from the definitions, sports and sportive events have some objectives that have physical and social impacts on humans. Among such objectives, the most outstanding ones like the one that is "to create a society that is happy, hardworking, healthy, modern, and dynamic and that has high level of morale and to train generations that know their social duties and responsibilities well, that have proper mental and physical health and morality, and that are creative, productive, constructive, wise, and virtuous, by ensuring that members of families perform sports (18). Sports performed in every section of societies and at any age made people dependent on them directly or indirectly, attracted their attention at all times, and managed to remain vibrant at all times. The fact that sportive activities that bind people to themselves by fulfilling their psychosocial and physiological needs are presently as social institution and harbor symbols regarding people's behaviors, views, beliefs, and thoughts shows that sports have a social structure (12).

People are born to this world in a certain social and geographical environment. The socioeconomic and geographical environment where people are born and grow up causes the emergence of positive or negative impacts on them. Numerous factors affecting people's tendency towards and participation in sportive events that occupy a significant room in their lives are available. Some of such factors are listed by Güner (10) as the individuals' socioeconomic structure, geographical environment, family structure, religious beliefs, social support, and motivation.

The objective of the study has been set to assess the factors and reasons that affect the participation of women in sportive events, which are important in terms of people's physical, social, psychological, and mental development and life quality, in the Turkish society in view of the women doing sports and not doing sports.

The study is important in terms of identifying and analyzing the reasons considered as preventions for the participation of women in sportive events in the Turkish society, ensuring the participation of women in sportive events at utmost levels, as well as creating a society that is happy, hardworking, healthy, modern, and dynamic and that has high level of morale and training generations that know their social duties and responsibilities well, that have proper mental and physical health and morality, and that are creative, productive, constructive, wise, and virtuous, by ensuring the participation in sportive events in every gender and age in the Turkish society.

## MATERIAL AND METHOD

The study has been conducted in order to scrutinize the factors affecting the participation of women doing sports and not doing sports in sportive events.

The population of the study is constituted by Selcuk University, Mehmet Akif Ersoy University, Uludağ University, and Gazi University and its sampling group consists of the female students studying at those universities.

The theoretical data were obtained from written sources and the onsite data were acquired by means of the questionnaire method. A questionnaire oriented to the objective has been developed. The understandability of the questionnaire as well as the validity and reliability of its scope were ensured. The questionnaire's Cronbach Alpha reliability coefficient was found as 0,60. The coefficient is a valid coefficient according to the researchers as well. The questionnaires were filled in through one-to-one discussions in the sampling group by means of the random sampling method. Total 828 women, being 538 doing sports and 290 not doing sports, took part in the study in its state mentioned above.

The data obtained were transferred to the computer environment for statistical transaction. As the statistical process, the Chi-Square test processes were conducted for identifying the frequency, %, Crosstab, and differences. In the determination of the differences, 0,05 was accepted as the level of significance.

## FINDINGS

| Variables | N | % Distribution |
|---|---|---|
| Yes | 538 | 64.1 |
| No | 290 | 35.0 |
| Total | 828 | 100.0 |

The "states of the participants' doing sports" is questioned in Table 1. Accordingly, it appears that 64,1 % responded as yes and 35,0 % as no, among the 828 participants taking part in the study.

**Table 2.**The distribution of the responses of the participants to the proposition of "Women do not take part in sportive events due to the fact that women do not attach importance to sports."

| Variables | Yes | Partially | No | Total |
|---|---|---|---|---|
| Doing sports | 94 | 226 | 213 | 533 |
| | 17.6 % | 42.4 % | 40.0 % | 100.0 % |
| Not doing sports | 44 | 105 | 137 | 286 |
| | 15.4 % | 36.7 % | 47.9 % | 100.0 % |
| Total | 138 | 331 | 350 | 819 |
| | 16.8 % | 40.4 % | 42.7 % | 100.0 % |
| $X^2$ =4.796 P= .091 P>0.05 | | | | |

The proposition of "Women do not take part in sportive events due to the fact that women do not attach importance to sports" was questioned in Table 2. It appears in view of aggregate answers of 819 participants answering the question that they were no by 42.7 %, partially by 40,4 %, and yes by 16,8 %. When the responses are scrutinized in terms of the women doing sports and not doing sports, there is no statistically significant dissension in the responses given between the women doing sports and not doing sports (P>0,05).

**Table 3.** The distribution of the responses of the participants to the proposition of "Women do not take part in sportive events due to religious reasons"

| Variables | Yes | Partially | No | Total |
|---|---|---|---|---|
| Doing sports | 92 | 264 | 182 | 538 |
| | 17.1 % | 49.1 % | 33.8 % | 100.0 % |
| Not doing sports | 44 | 106 | 140 | 290 |
| | 15.2 % | 36.6 % | 48.3 % | 100.0 % |
| Total | 136 | 370 | 322 | 828 |
| | 16.4 % | 44.7 % | 38.9 % | 100.0 % |
| $X^2$ =17.148 P= .000 P<0.05 | | | | |

The proposition of "Women do not take part in sportive events due to religious reasons" was questioned in Table 3. It appears in view of aggregate answers of 828 participants answering the question that they were partially by 44.7 %, no by 38,9 %, and yes by 16,4 %. When the responses are scrutinized in terms of the women doing sports and not doing sports, there is statistically significant dissension (P>0,05).

**Table 4.** The distribution of the responses of the participants to the proposition of "Women do not take part in sportive events due to family pressure"

| Variables | Yes | Partially | No | Total |
|---|---|---|---|---|
| Doing sports | 116 | 241 | 179 | 536 |
| | 21.0 % | 45.0 % | 33.4 % | 100.0 % |
| Not doing sports | 48 | 115 | 128 | 291 |
| | 16.0 % | 39.5 % | 44.0% | 100. % |
| Total | 164 | 356 | 307 | 827 |
| | 19.8 % | 43.0 % | 37.1 % | 100.0 % |

$X^2$ =9.517 P=.009 P<0.05

The distribution of the responses of the participants to proposition of "Women do not take part in sportive events due to family pressure" is present in Table 4. It appears in view of the aggregate answers of the 827 participants responding to this question that they were partially by 43,0 %, no by 37,1 %, and yes by 19,8 %. When it comes to the responses of the participants doing sports and not doing sports, 45,0 % of the ones doing sports responded as partially while 44,0 % the ones not doing sports responded as no. This result shows that there is statistically significant dissension (P<0,05).

**Table 5.** The distribution of the responses of the participants to the proposition of "Women are unable to do sports due to the fact that the state has no policy for women to do sports"

| Variables | Yes | Partially | No | Total |
|---|---|---|---|---|
| Doing sports | 79 | 203 | 243 | 525 |
| | 15.0 % | 38.7 % | 46.3 % | 100.0 % |
| Not doing sports | 33 | 57 | 197 | 287 |
| | 11.5 % | 19.9 % | 68.6 % | 100.0 % |
| Total | 112 | 260 | 440 | 812 |
| | 13.8 % | 32.0 % | 54.2 % | 100.0 % |

$X^2$ =39.305 P= .000 P<0.05

The proposition of "Women are unable to do sports due to the fact that the state has no policy for women to do sports" was questioned in Table 5. It appears in view of aggregate answers of 812 participants answering the question that they were no by 54.2 %, partially by 32,0 %, and yes by 13,8 %. When it comes to the responses of the participants doing sports and not doing sports, 46,3 % of the ones doing sports responded as yes while 68,6 % the ones not doing sports responded as yes. We can say according to those responses that there is a statistically significant dissension (P>0,05).

**Table 6.** The distribution of the responses of the participants to the proposition of "They are unable to take part in sportive events due to the fact that some branches of sports are not suitable for women's physical and physiological structures"

| Variables | Yes | Partially | No | Total |
|---|---|---|---|---|
| Doing sports | 159 | 272 | 101 | 532 |
| | 29.9 % | 51.1 % | 19.0 % | 100.0 % |
| Not doing sports | 89 | 133 | 65 | 287 |
| | 31.0 % | 46.3 % | 22.6 % | 100.0 % |
| Total | 248 | 405 | 166 | 819 |
| | 30.3 % | 49.5 % | 20.3 % | 100.0 % |

$X^2$ =2.176 P= .337 P>0.05

The proposition of "They are unable to take part in sportive events due to the fact that some branches of sports are not suitable for women's physical and physiological structures" was questioned in Table 6. It appears in view of aggregate answers of 819 participants answering the question that they partially by 49,5 %, yes by 30,3 %, and no by 20,3 %. When it comes to the responses of the participants doing sports and not doing sports, there is a

statistically significant dissension in the answers given (P>0,05).

**Table 7.** The distribution of the responses of the participants to the proposition of "They are unable to take part in sportive events by reason of the fact that sports might deteriorate women's physical beauty"

| Variables | | Yes | Partially | No | Total |
|---|---|---|---|---|---|
| Doing sports | | 90 | 171 | 266 | 527 |
| | | 17.1 % | 32.4 % | 50.5 % | 100.0 % |
| Not doing sports | | 28 | 49 | 209 | 286 |
| | | 9.8 % | 17.1 % | 73.1 % | 100.0 % |
| Total | | 118 | 220 | 475 | 813 |
| | | 14.5 % | 27.1 % | 58.4 % | 100.0 % |

$X^2$ =39.063 P=.000 P<0.05

The proposition of "They are unable to take part in sportive events by reason of the fact that sports might deteriorate women's physical beauty" was questioned in Table 7. It appears in view of the aggregate answers of the 813 participants responding to this question that they were no by 58.4 %, partially by 27,1 %, and yes by 14,5 %. When it comes to the responses of the participants doing sports and not doing sports, 50,5 % of the ones doing sports responded as no and 32,4 % as partially, while 73,1 % the ones not doing sports responded as no and 17,1 % as partially. This result is statistically significant (P<0,05).

**Table 8.** The distribution of the responses of the participants to the proposition of "Many women are unable to take part in sportive events due to their lack of time for doing sports"

| Variables | | Yes | Partially | No | Total |
|---|---|---|---|---|---|
| Doing sports | | 190 | 260 | 87 | 537 |
| | | 35.4 % | 48.4 % | 16.2 % | 100.0 % |
| Not doing sports | | 128 | 116 | 44 | 288 |
| | | 44.4 % | 40.3 % | 15.3 % | 100.0 % |
| Total | | 318 | 376 | 131 | 825 |
| | | 38.5 % | 45.6 % | 15.9 % | 100.0 % |

$X^2$ =6.820 P= .033 P>0.05

The proposition of "Many women are unable to take part in sportive events due to their lack of time for doing sports" was questioned in Table 8. It appears in view of aggregate answers of 825 participants answering the question that they were partially by 45.6 %, yes by 38,5 %, and no by 15,9 %. When the responses of the participants are analyzed in terms of doing sports and not doing sports, there seems to be no statistically significant dissension in the answers given (P>0,05).

**Table 9.** The distribution of the responses of the participants to the proposition of "Women cannot take part in sportive events due to the fact that women are alienated in the field of sports as in many areas in our society"

| Variables | | Yes | Partially | No | Total |
|---|---|---|---|---|---|
| Doing sports | | 176 | 266 | 91 | 533 |
| | | 33.0 % | 49.9 % | 17.1 % | 100.0 % |
| Not doing sports | | 115 | 123 | 53 | 291 |
| | | 39.5 % | 42.3 % | 18.2% | 100.0 % |
| Total | | 291 | 389 | 144 | 824 |
| | | 35.3 % | 47.2 % | 17.5 % | 100.0 % |

$X^2$ =4.717 P=.095 P>0.05

The proposition of "Women cannot take part in sportive events due to the fact that women are alienated in the field of sports as in many areas in our society" was questioned in Table 9. It appears in view of aggregate answers of 824 participants answering the question that they were partially by 47.2 %, yes by 35,3 %, and no by 17,5 %. When the responses of the participants are analyzed in terms of doing sports and not doing sports, there seems to be no statistically significant dissension in the answers given (P>0,05).

**Table 10.** The distribution of the responses of the participants to the proposition of "Women cannot take part in sportive events due to the fact that there are no areas and venues to do sports"

| Variables | | Yes | Partially | No | Total |
|---|---|---|---|---|---|
| Doing sports | | 230 | 241 | 65 | 536 |
| | | 42.9 % | 45.0 % | 12.1 % | 100.0 % |
| Not doing sports | | 127 | 120 | 42 | 289 |
| | | 43.9 % | 41.5 % | 14.5 % | 100.0 % |
| Total | | 357 | 361 | 107 | 825 |
| | | 43.3 % | 43.8 % | 13.0 % | 100.0 % |

$X^2$ =1.392 P=.499 P>0.05

The proposition of "Women cannot take part in sportive events due to the fact that there are no areas and venues to do sports" was questioned in Table 10. It appears in view of aggregate answers of 825 participants answering the question that they were partially by 43.8 %, yes by 43,3 %, and no by 13.0 %. When the responses of the participants doing sports and not doing sports are analyzed, there seems to be no statistically significant dissension in the answers given (P>0,05).

**Table 11.** The distribution of the responses of the participants to the proposition of "Women are unable to take part in sportive events due to the failure of creating a sports culture in the society

| Variables | | Yes | Partially | No | Total |
|---|---|---|---|---|---|
| Doing sports | | 206 | 252 | 74 | 532 |
| | | 38.7 % | 47.4 % | 13.9 % | 100.0 % |
| Not doing sports | | 133 | 117 | 40 | 290 |
| | | 45.9 % | 40.3 % | 13.8 % | 100.0 % |
| Total | | 339 | 369 | 114 | 822 |
| | | 41.2 % | 44.9 % | 13.9 % | 100.0 % |

$X^2$ =4.385 P= .112 P>0.05

The proposition of "Women are unable to take part in sportive events due to the failure of creating a sports culture in the society" was questioned in Table 11. It appears in view of aggregate answers of 822 participants answering the question that they were partially by 44.9 %, yes by 41,2 %, and no by 13,9 %. When the responses of the participants doing sports and not doing sports are analyzed, there is no statistically significant dissension in the answers given (P>0,05).

## DISCUSSION AND RESULT

The study has been conducted in order to scrutinize the factors affecting the participation of women doing sports and not doing sports in sportive events. 828 female participants took part in the study. 64,1 % of them do sports and 35,0 % do not do sports (Table 1).

The responses of the participating women doing and not doing sports for the questions regarding their participation in sportive events were statistically assessed and discussed.

The proposition of "Women do not take part in sportive events due to the fact that women do not attach importance to sports in the Turkish society" was responded by 819 participants. It appears in view of their aggregate answers that they were no by 42,7 %, partially by 40,4 %, and yes by 16,8 %. The comparative $X^2$ analysis value of their responses was found as 4,796 (Table 2). This value is not significant at the 0,05 significance level (P>0,05). That is to say, there is no significant dissensus in the responses provided for the questions for the women doing sports and not doing sports. According the foregoing values obtained, we can say that the idea that women do not take part in sportive events due to the fact that women do not attach importance to sports in the Turkish society is not an effective view. That is to say, the idea that for the women doing sports and not doing sports, they do not attach importance to sports does not affect the participation in sportive events.

The proposition of "Women do not take part in sportive events due to religious reasons" was

responded by 828 participants. It appears in view of their aggregate answers that they were partially by 44,7 %, no by 38,9 %, and yes by 16,4 %. When it comes to the responses of the participants doing sports and not doing sports, 49,1% of the ones doing sports responded as partially and 33,8 % as no while 36,6 % the ones not doing sports responded as partially and 48,3 % as no. The comparative $X^2$ analysis value of their responses was found as 17,148 (Table 3). This value is significant at the 0,05 significance level (P<0,05). That is to say, there is dissensus in the responses provided for the questions regarding the fact that participation of women doing sports and not doing sports in sportive events is affected by religious reasons. According the foregoing values, we can say as compared with women not doing sports that the women doing sports think that the participation of women in sportive events is affected by religious reasons. The findings of the study conducted by Arab-Moghaddam et al. (1) that the level of participation of Muslim women in leisure and sportive events is low as well as the view of Fasting and Pfister (7) and Grant (8) that religious views have significant share in the fact that the women are almost second to none in the sportive institutions and participation in sports in Islamic countries are supportive of our finding.

The proposition of "Women do not take part in sportive events due to family pressure" was responded by 827 participants. It appears in view of their aggregate answers that they were partially by 43,0 %, no by 37,1 %, and yes by 19,8 %. When it comes to the responses of the participants doing sports and not doing sports, 45,0 % of the ones doing sports responded as partially while 44,0 % of the ones not doing sports responded as no. The comparative $X^2$ analysis value of their responses was found as 9,517 (Table 4). This value is statistically significant at the 0,05 significance level (P<0,05). That is to say, there is dissensus between the ones doing sports and not doing sports. According the foregoing values obtained, we can say as compared with women not doing sports that the women doing sports think that family pressure is effective in women's participation in sports. The view in the researches of McIntyre and Rhodes (14) that the support provided particularly by families to women affects the participation in leisure and sportive events as well as the finding of Biddle et al. (3) on a study on young women regarding the fact that family support has significant role in the tendency toward sports are in parallel with the finding of our study.

The proposition of "Women are unable to do sports due to the fact that the state has no policy for women to do sports" was responded by 812 participants. It appears in view of their aggregate answers that they were no by 54,2 %, partially by 32,0 %, and yes by 13,8 %. When it comes to the responses of the participants doing sports and not doing sports, 46,3 % of the ones doing sports responded as yes while 68,6 % the ones not doing sports responded as yes. The comparative $X^2$ analysis value of their responses was found as 39,305 (Table 5). This value shows that a significant dissensus is present (P<0,05). According the foregoing data, we can say as compared with women doing sports that the women not doing sports think that lack of a state policy for women to do sports is effective in women's participation in sports.

The proposition of "They are unable to take part in sportive events due to the fact that some branches of sports are not suitable for women's physical and physiological structures" was responded by 819 participants. It appears in view of their aggregate answers that they were partially by 49,5 %, yes by 30,3 %, and no by 20,3 %. The comparative $X^2$ analysis value of the responses of the participants doing sports and not doing sports was found as 2,176 (Table 6). This value is not statistically significant at the 0,05 significance level (P<0,05) That is to say, there is no dissensus between the ones doing sports and not doing sports. Upon the foregoing data obtained, we can say that according to the participants doing sports and not doing sports, women do not take part in sportive events due to the fact that some branches of sports are not suitable for women's physical and physiological structures.

The proposition of "They are unable to take part in sportive events by reason of the fact that sports might deteriorate their physical beauty" was responded by 813 participants. It appears in view of their aggregate answers that they were no by 58.4 %, partially by 27,1 %, and yes by 14,5 %. When it comes to the responses of the participants doing sports and not doing sports, 50,5% of the ones doing sports responded as no and 32,4 % partially, while 73,1 % of the ones not doing sports responded as no

and 17,1 % as partially. The comparative $X^2$ analysis value of the responses of the ones doing sports and not doing sports was found as 39,063 (Table 7). This value shows that a significant dissensus is present (P<0,05). According to the values obtained, we can say that the participants not doing sports are in more disagreement than the ones doing sports that women are unable to take part in sportive events by reason of the fact that sports might deteriorate their physical beauty. That is to say, we can consider in view of the results obtained, the reason of deterioration of the beauty of women is not an efficient factor in terms of not participating in sportive events.When the research findings taking place in the literature is assessed, it appears that the prime factor steering women toward sports and leisure events is the wish of weight loss (Aytan) (2) and having a good physical appearance (13, 17). These findings are supportive of our finding.

The proposition of "Many women are unable to take part in sportive events due to their lack of time for doing sports" was responded by 825 participants. It appears in view of their aggregate answers that they were partially by 45.6 %, yes by 38,5 %, and no by 15,9 %. The comparative $X^2$ analysis value of the responses of the ones doing sports and not doing sports was found as 6,820 (Table 8). This value is not significant at the 0,05 significance level (P>0,05). That is to say, there is no dissensus between the ones doing sports and not doing sports. According to the values obtained, we can say that women are unable to take part in sportive events due to their lack of time for doing sports in general. Currie (4) has found that women, who are mothers, cannot take time for leisure and sportive events and Kraus (11) conducts studies for increasing the life quality of the families of the women who are married and have a profession. Hence, women cannot take time to participate in sportive events. Their views are supportive of our finding.

The proposition of "Women cannot take part in sportive events due to the fact that women are alienated in the field of sports as in many areas in our society" was responded by 824 participants. It appears in view of their aggregate answers that they were partially by 47.2 %, yes by 35,3 %, and no by 17,5 %. The comparative statistical $X^2$ analysis value of the responses of the ones doing sports and not doing sports was found as 4,717 (Table 9). This value is not significant at the 0,05 significance level (P>0,05). According to the values obtained, we can say that the participants consider that the reason for women to be unable to take part in sportive events is due to the fact that women are alienated in the field of sports as in many areas in our society. Eitzen and Sage (6) think that particularly modern sports have developed as the most important indicator of the strength and superiority of men and Giulianotti's (9) view is that the impact of the powerful paternalistic understanding in societies alienate women from sportive events and has a negative aspect. This view tallies with the finding of the study.

The proposition of "Women cannot take part in sportive events due to the fact that there are no areas and venues to do sports" was responded by 825 participants. It appears in view of their aggregate answers that they were partially by 43.8 %, yes by 43,3 %, and no by 13 %. The comparative statistical $X^2$ analysis value of the responses of the ones doing sports and not doing sports was found as 1,392 (Table 10). This value is not significant at the 0,05 significance level (P>0,05). According to the values obtained, we can say that participants mainly think that presence of no areas and venues to do sports are effective in women's failure to take part in sportive events.

The proposition of "Women are unable to take part in sportive events due to the failure of creating a sports culture in the society" was questioned. It appears in view of aggregate answers of 822 participants answering the question that they were partially by 44.9 %, yes by 41,2 %, and no by 13,9 %. The comparative statistical $X^2$ analysis value of the responses of the ones doing sports and not doing sports was found as 4,385 (Table 11). This value shows that there is no dissensus at the 0,05 significance level (P>0,05). That is to say, there is no dissensus in terms of the view of "Women are unable to take part in sportive events due to the failure of creating a sports culture in the society" among the participant women doing sports and not doing sports. According to the values obtained, we can say participants mainly think that women are unable to take part in sportive events due to the failure of creating a sports culture in the society.

In the study conducted by Fasting and Pfister (7) in terms of women's participation in sports in Turkey, they state that the factors like the social status and place of residence, family relations,

importance of the success at school, consideration that sports are male-specific activities, aggravated conditions of working, importance of family, the fact that women do not consider sports as entertainment, body and beauty perception, and covering, affect women's participation in sports negatively. Such findings and views generally tally with the findings of our study.

As a result of the research findings obtained, we can say that the participation of women in sportive events in the Turkish society are affected by the factors like religious beliefs, family pressure, the fact that the state has no policy for women to do sports, the fact that some branches of sports are not suitable for women's physical and physiological structures, women's inability to take time for sportive exercises, alienation of women from participation in sportive exercises, insufficiency of place and venue for sportive exercises, and failure of the existence of a sports culture in the society.

Suggestions:

- A sports policy that will ensure women's participation in sports must be developed
- The fact that the religious beliefs are not prevention for participation in sports must be explained to public
- Areas and venues where women will take part in sportive exercises must be prepared
- A sports culture must be created within the society
- Awareness must be raised among families in terms of exercises to be done by women
- Benefits of sports must be made known at the educational institutions and students must be provided with the habit of performing sportive exercises
- Alienation of women from sportive activities in the society must be prevented
- Women's participation in sports must be encouraged
- The reasons that prevent women from participating in sports must be researched from time to time and the preventions identified must be eliminated

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# Electromyography Activity of Selected Leg-dominant Lower Limb Muscles during Stance Phase of Running on Treadmill and Overground

Amir Reza SEDIGHI [1], Mehrdad ANBARIAN [*2], Mohammad Hossein GHASEMI [1]

*1- Faculty of Sport Sciences Sports Biomechanics Department,, Bu-Ali Sina University, Hamedan, Iran.*
*2- Faculty of Sport Sciences, Sport Biomechanics Department, Bu-Ali Sina University, Hamedan, Iran.*
*Adress Corresponding Author: Mehrdad Anbarian Sport Biomechanics Department, Faculty of Sport Sciences, Bu-Ali Sina University, Hamedan, Iran.*

**Abstract:**

The aim of present study was to compare electromyography activity of selected leg-dominant lower limb muscles during stance phase of running on treadmill and overground. Fourteen male students ran at 3.3 m/s in both treadmill and overground conditions. Electromyography activity of some selected lower limb muscle was recorded during initial 50% and terminal 50% of stance phase. Paired t-test was employed for data analyses. The results showed a significant difference in total activity of selected lower limb muscles between treadmill and overground running conditions ($P<0.05$). Rectus femoris, vastus medialis, vastus lateralis, and biceps femoris activation during overground running were found significantly higher than running on the treadmill in initial 50% stance phase ($P<0.05$). No significant electromyography change was observed for selected muscles during terminal 50% of stance phase in both treadmill and overground conditions ($P>0.05$). It was concluded that treadmills running condition may be possibly useful in designing specific training programs that are aimed to control or reduce lower extremity muscles activity. According to the results of this study, treadmills running condition caused lower muscle activity consequently, may increase biomechanical efficiency or used in clinical setting.

***Keywords*:** Electromyography, lower limb muscles, running, sport surfaces, treadmill.

## INTRODUCTION

Overground and treadmill running are two popular modes that used in scientific investigations, physical therapy practice and physical training raises issues on differences in running patterns on a treadmill and on overground surfaces (1,13,12,23). Previous studies have been shown that different biomechanical changes are created in the user, while running on different surfaces (9,15,14,24,21,19) .The running's surface has been defined as the fundamental aspects in designing the exercises that should be considered (9,24). Despite pattern similarity on treadmill and overground running, several studies have been shown the major differences between running on treadmill compared to overground (5,2). Numerous studies have been reported that there are biomechanical and physiological differences, such as metabolic energy consumption during treadmill and overground running or walking (6,17,26,16,20). For example, Nigg et al (1995) reported that most of the lower extremity kinematic variables were substantial differed depending on the individual subject's running style, running speed in treadmill and overground conditions (16). Nonetheless, Watt et al (2010) showed kinematic and kinetic patterns of walking are similar in older adults while walking on treadmill and overground situations. Conversely, while walking on the treadmill step length and stride time was shorter and joints torques was reduced compared to overground condition (26). According to the results of these sample studies, it seems that different surfaces have different effects on biomechanics of the human locomotion.

Runners usually adapt themselves in biomechanical features such as their landing style while running on different surfaces (24, 8). This adaptability may associate with neuromuscular adaptation while running on different surfaces (24). However, still this is debated that what neuromuscular changes will created in result of biomechanics alterations on the treadmill (25). Hong et al. (2012) and Baur et al. (2007) reported that the maximum plantar pressure is reduced while running on the treadmill in comparison to other surfaces (5, 4). Though, if we accept the biomechanical differences between treadmill and overground running conditions, then we should expect changes in muscles activation. Subsequently, these changes may help to design of some specific exercise protocols with the aim of reducing the muscles activity for injured individuals (14) or increasing the level of muscles activity for increasing the exercise intensity. Although considerable studies have been devoted to kinematic and kinetic variables of the treadmill and overground running, rather less attention has been paid to muscle activations. One of the few studies carried out by Wang et al. (2014) suggests that the activity of lower limb muscles has a significant reduction while treadmill running in comparison to other surfaces (8).

In contrast, some studies have indicated that there are no differences in muscles activity between treadmill and over-ground walking (19, 2, 7). For example, Di Nardo et al (2014) evaluated the activity of lower limbs muscles while treadmill walking vs overground walking condition. They found no significant difference in the tibialis anterior muscle activity between the two conditions, but activity of gastrocnemius muscle was increased on the treadmill in footflat phase (7).

Nevertheless, the different subjects, different research methods, evaluating the different muscles in the body and substantial differences in the objectives of the researches could create these contradictory results. Furthermore, the results of related studies of the walking cannot be extended to other activities such as running. Therefore, this study aimed to compare electromyography activity of selected leg-dominant lower limb muscles during stance phase of treadmill and overground running conditions.

## MATERIAL & METHOD

**Subjects:** A total of 14 male students (age: 22.5±5.5, weight: 6.7±66.6 kg, height: 177±7 cm, dominant leg: right) were selected to participated in this study. Subjects were free of any cardiovascular pathology, neurological disorders, lower extremity injuries, and foot or ankle surgeries. Also, all subjects had normal foot posture with no foot deformities. Participants were active recreational runners engaging in training at least three times per week whilst completing a minimum of 25km per week and had previous experience of treadmill running (22). Bu Ali Sina University Graduate Studies and Research Council (The code of approval: 1184255, Date: 2015), in agreement with the Declaration of Helsinki, approved all the procedures before the beginning of the investigation. Subjects enrolled in this study after they agreed to contribute, all procedures were explained, and informed written consent was obtained.

**Procedures:** Surface electromyography (sEMG) signals were collected using a 16-channel electromyography system (Biomonitor ME6000 T16, Mega Electronics Ltd., Kuopio, Finland) at 2000Hz sampling rate and a signal-to-noise ratio of over 110 db. Before placement of the electrodes (disposable electrodes of Ag/AgCl with the conductive gel), subjects' skin was prepared with shaving hair in the site and the skin was cleaned with alcohol wipe to reduce the electrical resistance of the skin (24).

The electrodes were placed on the vastus medialis (VM), rectus femoris (RF), vastus lateralis (VL), biceps femoris (BF), gastrocnemius lateralis (GL) and tibialis anterior (TA) muscles of the dominant leg of the participants according to the SENIAM recommendations (10). A ground electrode was placed on the tibial tuberosity. The electrodes placed in the interface between the nerve center of the muscle and distal tendon. Center to center spacing of the electrodes was 20 mm (24) (Figure 1). The reason for choosing these muscles is because of their important roles in running and also, the availability of them in surface electromyography. Subjects' dominant legs were determined by using three tests of hitting the ball, stepping up, and restoring the balance, at the beginning of their entrance to the laboratory. Foot that was used commonly (for at least 2 out of 3 tests) was identified as the dominant leg (18).

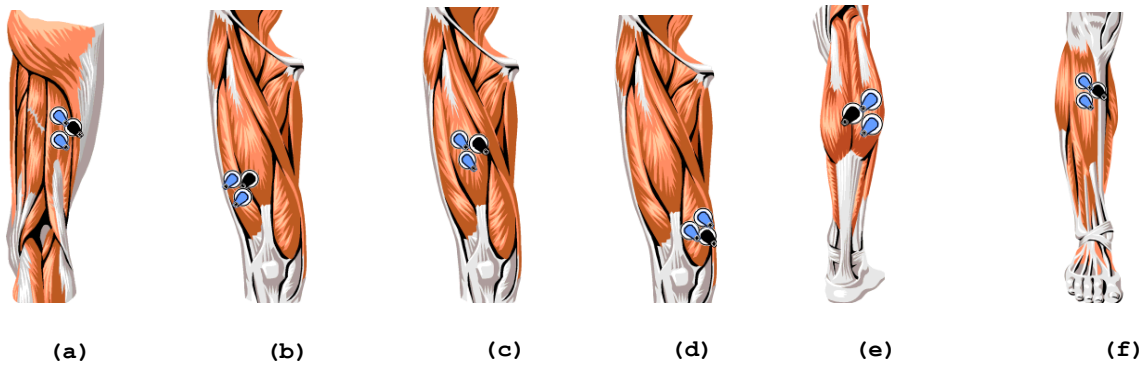


**Figure 1**. Electrode placement on: (a) vastus medialis, (b) rectus femoris, (c) vastus lateralis, (d) biceps femoris, (e) tibialis anterior, (f) gastrocnemius lateralis (3).

Subsequently, Maximum Voluntary Isometric Contraction (MVIC) was done to normalize the muscles activities data. Each subject asked to sit on a chair and put his knee at a flexion angle of 90 degrees, then his leg was fixed and he was asked to make every effort to do the knee extension to 5 seconds due to collect data of quadriceps MVIC. The subject was lie prone on a bed and his knee was bent to 70 degrees for hamstring; then he was asked to make every effort to do the knee extension to 5 seconds. The subject sat on the chair and he was asked to his knees and put soles of his feet against the wall for gastrocnemius (so that the angle of the foot and leg to be 90 degrees), he was asked to make every effort to do the plantar extension to 5 seconds. The subject was asked to do ankle dorsiflexion motion for 5 second in stand-up mode for tibialis anterior. The made resistance was applied by the tester in all movements. MVIC test was done twice for each muscle and the subject was given one minute rest between each test.

Two foot switches (Motion Lab Systems, Inc., USA) were attached under the most posterior part of the heel and on the first joint of foot-toe under the shoes in order to identify the key points of the running stance phase. In the present study, stance phase was introduced as the time of external area of the posterior part of the heel crash to the ground until the separation of the first joint of the foot-toe bottom from the ground.

In the treadmill running condition, participants were given a 6-minute habitation period to run on the treadmill at a speed of 3 meters per second for warm-up and to become familiarized with treadmill running (1, 24). Then, they ran on the treadmill at a speed of 3.3 m/s for 2 min for data collection. Five successful steps of the dominant foot stance phase during the last minute were selected for data analysis. In the overground condition, subjects ran at 3.3±5% m/s across a 25 meter long laboratory floor while running speed was monitored by two sets of infrared photocells. As the other condition, five successful steps of the dominant foot stance phase selected for analysis. On each running condition, participants completed five successful trials. Both treadmill and overground running were measured based on the method of Wang and Colleagues (24). All tests was done by using same running shoes were made by Asics company, in order to eliminate the interaction effect of the surface with the shoes.

All electromyography raw were processed using Megawin software. The raw EMG signals were rectified and bandpass filtered filter with bandwidth ranging from 20 Hz to 500 Hz. The linear envelope was then treated using the RMS to obtain the EMG amplitude. Then, the average EMG amplitude of each muscle was calculated. The average EMG amplitude of the muscle activation was normalized by dividing by the MVIC of each muscle while running in two phases of primary 50% and final 50% of the stance phase.

**Statistical analyses**: The Shapiro–Wilk statistic for each condition was used to demonstrate normal distribution. Paired t-tests were utilized with an adjusted $\alpha$ level of $p \leq 0.01$ based on the number of comparisons made for each muscle at the first 50% and the final 50% of running stance phase. All statistical procedures were conducted by SPSS 18.0 (SPSS, Inc., Chicago, IL, USA).

## DISCUSSION & CONCLUSION

Comparing the muscles activity amount at the first 50% of the stance phase: At the first half of the stance phase of running, the muscle activation of rectus femoris, vastus lateralis, vastus medialis and biceps femoris significantly decreased in treadmill condition compared to overground running (Table 1). For tibialis anterior and gastrocnemius lateralis, treadmill condition exhibited lower muscle activation, but there was no significant.

**Table 1.** Mean and SD of normalized electromyography activity from selected leg-dominant lower limb muscles at the first 50% of stance phase of running on treadmill and overground.

| Muscle | Overground | Treadmill | t-test value | p value | $\omega^2$ |
|---|---|---|---|---|---|
| Rectus femoris | 39.2±17.6 | 23.9±8.7 | 4.26 | 0.001 | 0.38 |
| Vastus medialis | 59.3±32.8 | 40±17.8 | 3.26 | 0.006 | 0.256 |
| Vastus lateralis | 56.1±18.9 | 35.1±10 | 6.02 | 0.001 | 0.558 |
| Biceps femoris | 36±19 | 22.3±16.9 | 3.47 | 0.004 | 0.284 |
| Tibialis anterior | 16±7 | 9.4±7.2 | 1.63 | 0.126 | - |
| Gastrocnemius lateralis | 64.7±29.7 | 52.1±20.3 | 1.81 | 0.92 | - |

Comparing the muscles activity amount at the final 50% of the stance phase**:** As Table 2 shows, there was significant decreased activation for gastrocnemius lateralis, vastus medialis and rectus femoris muscles in treadmill condition at the final 50% of the stance phase. No significant difference was found between treadmill and overground running conditions for other selected muscles activation

**Table 2.** Mean and SD of normalized electromyography activity from selected leg-dominant lower limb muscles during the final 50% of stance phase of running on treadmill and overground.

| Muscle | Overground | Treadmill | t-test value | p value | $\omega^2$ |
|---|---|---|---|---|---|
| Rectus femoris | 18.4±12.7 | 6.9±4.1 | 4.061 | 0.001 | 0.356 |
| Vastus medialis | 26.3±31.3 | 20.8±10.5 | 2.954 | 0.01 | 0.216 |
| Vastus lateralis | 28.7±30 | 11.2±7.5 | 2.327 | 0.037 | 0.136 |
| Biceps femoris | 31.7±17.2 | 35.8±22 | -1.253 | 0.232 | - |
| Tibialis anterior | 8.5±3.6 | 9.4±4.2 | -0.391 | 0.702 | - |
| Gastrocnemius lateralis | 52±20.8 | 38.8±14.3 | 4.058 | 0.001 | 0.356 |

The aim of this study was to compare the EMG activity of the selected lower limbs muscles in stance phase of running on the treadmill and overground surfaces. The results of this study showed that there is a significant difference in the activity amount of the lower limbs muscles in the primary 50% of stance phase between two different surfaces. Activities amount of rectus femoris, vastus medialis, vastus lateralis; biceps femoris was significantly higher while running at the overground running condition than while running on the treadmill. The activities amount of gastrocnemius and tibialis anterior increased insignificantly in comparison to running position in gym on the treadmill. Also, there was no significant difference in activity amount of the lower limbs muscles in final 50% of stance phase between both surfaces. While running at the gym, activities of rectus femoris, vastus medialis, and vastus lateralis are significantly higher than while running on the treadmill, but biceps femoris and tibialis anterior activities was increased insignificantly while running on the treadmill in comparison to the overground. The activity amount of the muscles has been different in both surfaces, according to the biomechanical differences of running on the treadmill and over ground and exercising has different effects on the activity amount of the lower limbs muscles. This is because the runners coordinate themselves with kinematic features and the surface hit force while running on different surfaces (24, 8) and this coordination is associated with the neuromuscular changes in running on different surfaces (25). However, still this is debated that what neuromuscular changes will created in result of biomechanical changes on the treadmill (24). Results of Hong et al. (2012) and Baur et al (2007) showed that the maximum pressure of foot and the maximum force of foot plantar are reduced while running on the treadmill in comparison to other surfaces (5, 4).

According to the results of their studies and the observed differences in this study, it can be concluded that while running on the treadmill reduces the ground reaction force and plantar pressure force consequently reduces muscle activity. This issue can be useful in designing the specific exercise program for injured individuals or people who require less activity in their lower limbs. Wang et al (2014), evaluated the activity of lower limbs muscles while running on the treadmill in comparison to other surfaces such as cement and natural grass. They reported that the activity of lower limbs muscles significantly reduced while running on the treadmill in comparison to other surfaces. They concluded that the kinematic adjustment of the lower extremity may explain the electromyography difference when running on different surfaces (24). Lee et al (2008) showed that the tibialis anterior and gastrocnemius activities decrease while walking on the treadmill and as a result the rehabilitation exercises can be done on the treadmill for people with nerve damages (14). Moreover, Hunter et al (2014) evaluated the activity of lower limbs muscles while running on the treadmills with the positive pressure and observed that most muscles showed decreases in activation as more body weight was supported. So these kinds of treadmills may useful intervention for certain running related injuries (12).

However, some studies also have been showed no significant difference (or increase) in the amount of muscle activity between the treadmill in comparison to other surfaces (7, 2, 19, 13). For example, Arsenault et al (1986) showed that the activities amount of soleus, rectus femoris, biceps femoris, vastus medialis and tibialis anterior increased while walking on the treadmill in comparison with walking overground (2). Furthermore, Di Nardo et al (2014) observed no significant difference in the tibialis anterior muscle activity between the treadmill and overground walking conditions, but activity of gastrocnemius was higher on the treadmill condition (7). Kalantari et al (2015) similarly showed that walking at different speeds on the treadmill increased the activation amount of gastrocnemius, biceps femoris, half tendinous, vastus medialis and vastus lateralis and medius gluteus muscles compared to the overground (13). On the one hand, these contradictions indicate the need for further research. On the other hand, there is a difference between walking and running. Due to these reasons, the results of this research can be helpful especially for rehabilitation of injured individuals.

Our findings emphasized the activation of the lower limbs muscles decreased while running on the treadmill during the stance phase among our subjects. It seems that using of the treadmill will be useful for reducing the level of lower limbs muscles activity and designing the specific exercising plans for injured individuals.

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# The Types of Injury, Regions and Frequency in Athletes Participating Universities Taekwondo Championchip

Ekrem BOYALI[1], Süleyman PATLAR[1], Murat ERGİN[2], Ali Osman KIVRAK[1], Tayyar KARADAĞ[1], Hasan YILDIZ[1], Ali Kemal BOZTAŞ[1], Süha GÜNDOĞDU[1]

[1] *Selcuk University, High School of Physical Education and Sport, Selçuklu, Konya*
[2] *Kırıkkale Üniversitesi, Spor Bilimleri Fakültesi, Kırıkkale*
*Corresponding author: Dr. EBOYALI e-mail:eboyali@selcuk.edu.tr*

**Abstract**
This study aims to determine the rates of injuries, the types of injuries and what part of the body is mostly injured in professional taekwondo sportsmen during competitions. This study involves 287 sportsmen participated in the interuniversity Taekwando championship in Ordu. Injuries during a match of the championship was determined by a team. The characteristics and types of injuries, the sportsmen's verbal expressions were registered by a pre-determined team, and it was mentioned about how these injuries occurred, in which part of the body the injuries were seen. Among 287 sportsmen in this study, 178 sportsmen were male, 109 ones were female. 46 universities took part in this championship. The championship lasted three days and total 271 competitions were done. 539 injuries were determined in total. The mostly seen type of injury was hematoma (43%), the mostly injured part was in lower extremities 416 (77%), most of the injuries were ones seen in defense (36%). No injuries were not observed in neck, shoulder, spine or trunk and cerebral injuries were not also observed. As a result of the study, it was explained that most of the injuries seen in the taekwondo competitions did not require the medical intervention and the lower extremities were mostly injured in these competitions. In the light of these findings, it could be said that these parts be protected during the competitions and the defense techniques be different.
**Key words:** İnjuries, Taekwondo, University championchips,

## INTRODUCTION

The art of fighting has been around for thousand of years. There are even references to martial arts in ancient Greece and Egypt. There are many styles of martial arts some commonalities may be found in techniques and training methods (15). In general styles may be broken down in to several categories:striking-based system, grappling or throwing systems, weapons bases-system, and health-based systems (15). Korean taekwondo is an asiatic fighting sport practised all over the world. Originally taekwondo was a discipline in the Korean army and originated about thirteen hundreds years ago (14). Taekwondo is a Korean martial art practiced in over 184 countries. The sport gained full medal status at the 2000 Olympics in Sydney, Australia,1 and draws participants of all ages due to its perceived fitness benefits and popularity (3). Zemper and Pieter (17) found injury rates for American elite male Taekwondo athletes to be 127.4/ 1,000 athlete-exposures and for females, 90.1/1,000 athlete- exposures. One athlete-exposure (A-E) refers to one athlete being exposed to the possibility of being injured. Since there are always two athletes competing during any one bout, there are two athlete-exposures per bout (4,5). In a later study, Pieter et al. (11) reported injury rates of 139.5/1,000 A-E and 96.5/1,000 A-E for European men and women, respectively (11). However, at a recreational tournament in the United Kingdom, the men (51.3/1,000 A-E) sustained statistically significantly more injuries than the women (47.6/1,000 A-E) (12). In this study it was aimed to determine the type of sports injuries occurring in Interuniversity Taekwondo Championship made in Marmaris, Muğla and to discuss sports injuries occurring in martial arts in the light of the literature.

## MATERIAL & METHOD

287 elitist sportsmen (178 males and 109 females) attending to Interuniversity Taekwondo Championship made in Ordu in April of 2011 were taken into this study. Injuries were grouped as injuries necessitating and not necessitating medical treatment. Injuries were recorded by two national team coaches and two national sportsmen and championship doctors. In addition, every sportsman was said to inform observers when any injury occurred. The data were recorded in the way the shape of injury, the belt grade of injured player, professional sportsmanship time, violence and mechanism of injury and if it necessitates any medical treatment. Physical examinations of sportsmen were not made before the contest. Injuries were recorded by determining with verbal statements of those treated by championship doctors and of injured sportsmen. Injuries were separated into sub-classes as those being and not being in the level to necessitate medical treatment and those being in the level to necessitate stopping the match, and were proportioned to the total injuries number. Injuries being in the level necessitating medical treatment were separated into two sub-groups as brain traumas and traumas except this. The number of injuries was recorded in two ways as total injuries number per match and in sportsman total injuries number per the match he held. Brain traumas were classified according to Colorado concussion classification (According to this, first grade injury confusion; no memory loss or blackout of consciousness; second grade injury confusion but there is memory loss and there is blackout of consciousness in the third grade).

The statistic program ''SPSS'' was used to analyse the data gathered. Descriptive statistics summarised body injuries factors such as sample size, number of males and females, age range, and mean age per competition period for all competitions. Means and proportions described the outcome measures (number of reported injuries, injury rates, and body part injured).

## RESULTS

The total 46 universities participated in championship and the contest continued for 3 days. Mean age of all sportsmen was 21,65± 0,88, that of female sportswomen was 21,9± 0,71, that of male sportsmen was 20,46 ± 0,94. All athletes of the year were over three years the average of professionalism.

All sportsmen had black belt. In the championship of 3 days, the total 271 matches were made. In the fist day in males matches of 58kg, 78 and 84kg, in females matches of 42 and 59kg; in the second day in males matches of 54, 62 and 72kg; in the third day in males matches of 67 and 84+ kg, in females matches of 55, 67 and 72+ were performed. The total injuries number was found out 539. 123 of these injuries were in the upper extremity, 1 of these was in the face region (nose break), and the remaining 415 were in the lower extremity.39 matchs had to be stoped because of the injuries. 16 of these injuries have caused sportsmen not to continue the match and 2 of these 16 injuries have become in the level necessitating medical treatment. In Table 1 and 2, injury frequencies and regions were given. The most common injury region was in the lower extremity (%77). In the lower extremity, the mostly injured parts were foot, ankle and tibia front part. The most common injury type was hematoma occurring in the foot dorsum and sprain in the foot metatarsal bones. There were 148 edemas (27%), 84 hematomas on dorsum of feet, 37 hematomas on hip (25 strikes, 12 ones after falling down), 9 sprains in ankle, 7 hematomas on toe, 20 hematoma on thigh, 6 edemas on knee-joint after striking down. In upper extremity, there were 90 hematomas, 6 contusions in forearm, 1 fracture in radius, 8 hematomas on metacarpus, 3 hematomas on wrist, 14 edemas on finger. Injury frequency was in heavier and treatment requiring level in males and especially in high weights. Total 38 injuries required the medical intervention. Of these injuries, 3 fractures (nose, metacarpus and radius), 6 finger sprain, 7 sprains in 20 hematomas of the thigh, 6 sprains in ankle, 9 sprains developing after hematomas on the front part of 104 tibias, 7 sprains developing after strike in forearm were analysed. Except for three medical situations developing after fractures, all other injuries were treated with bandaging, ice application and resting. It was determined that 1 of injuries necessitating advanced treatment was the nose break, 1 of those was the break in the hand metacarpal bone, two of them were the break in the radius. The technique causing the most widespread injury was the one made with the kick. The most often injury type had developed due to blocks made with the upper extremity 118(%21) or lower extremity against the kick technique 84 (%15). The nose break happened due to the kick hit on the face. The body injuries never occurred because the body part was being protected

with a special protective during the fighting. All of injuries being in the level necessitating treatment occurred due to the kick and all of injuries preventing the match from being continued occurred due to the foot or knee collisions. The great majority of the foot injuries occurred due to the collision of the foot with the rival's wrist 97(%18), hand 26(%4), knee (%1), the front outer part of the thigh and tibia while kicking 104(%19), foot and ancle 248 (%46). The injuries after falling down; were 9 (0,1%) sprains in ankle while falling down after kicking and 12 (2%) injuries in hip. Any brain trauma and shoulder and spine injury development was not detected during the matches.

Table 1. Upper Extremty İnjuries

| | Shoulder | Arm | Forearm | Wrist | Hand | Hand Finger | Neck | Nose |
|---|---|---|---|---|---|---|---|---|
| Sprain | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| Hematom | 0 | 0 | 90 | 3 | 8 | 0 | 0 | 0 |
| Broken | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| Scratch | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |
| Epistaxis | | | | | | | | 1 |

Table 2. Lower Extremty İnjuries

| | Hip | Thigh | Knee | Tibia | Ankle | Foot Dorsi | Foot Fingers |
|---|---|---|---|---|---|---|---|
| Sprain | 0 | 0 | 6 | 0 | 9 | 0 | 0 |
| Hematom | 37 | 20 | 0 | 104 | 84 | 148 | 7 |
| Broken | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scratch | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

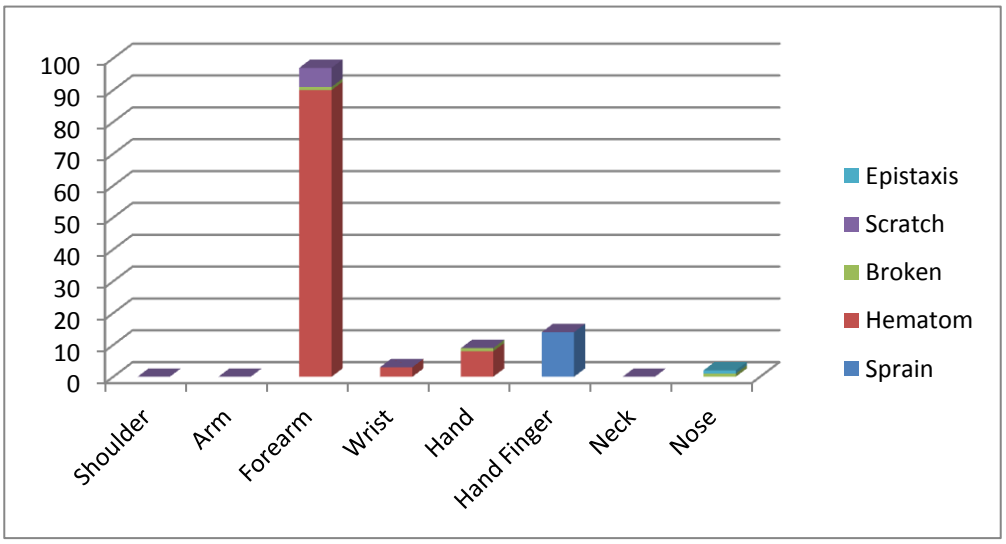


Figure 1. Upper Extremty İnjuries

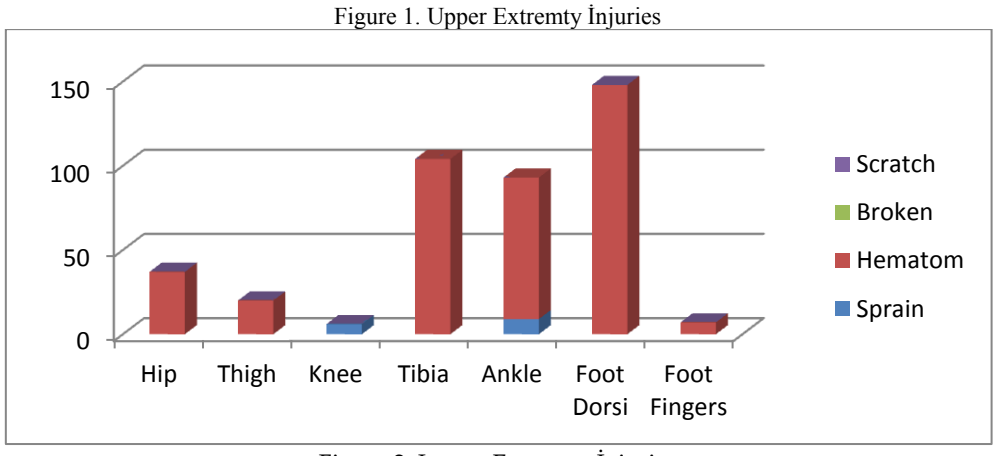


Figure 2. Lower Extremty İnjuries

## DISCUSSION

The Korean martial sport of full-contact taekwondo has become increasingly popular among adults and children alike (13). *Martial Arts* is a general term that describes the art of combat and self-defense. These arts involve the use of different body parts and various weapons. A large variety of martial arts exist, each with a distinct history, philosophy and set of techniques (6). Korean taekwondo is an Asiatic fighting sport practised all over the world. Originally taekwondo was a discipline in the Korean army and originated about thirteen hundred years ago. The word taekwondo can be translated as 'the art of foot and hand'. Tae means a kick or push with the foot, Kwon means clenched fist or the blow that crushes; Do means the spirit, way or method (14). Taekwondo, which originated in Korea more than 1000 years ago, is more sport than self defense oriented. In 2000, Taekwondo became recognized as an official sport at the Sydney Olympics. Taekwondo is a full contact free-sparring sport which awards points for head contact. As such, there has been increased interest in injury rates in the sport, especially relating to head injuries (4). A beginner starts at a rank of 'white belt' and when he or she has achieved sufficient proficiency of Taekwondo skills, they move through several higher ranks, respectively the colored belts (In increasing rank: Yellow, Orange, Green, Purple, Blue, Brown, Red), and black belts (with increasing rank based on Dan level, from 1st to 9th) (3). As expected in a collision sport, the contusion was the most frequently occurring injury type in both male and female Taekwondo athletes (5). At the elite level, more serious injuries such as fractures and cerebral concussions also occur (5). The incidence rate of injury for men attending in different taekwondo competitions was reported in a range of 20.5 to 168.4 injuries for each 1000 men (16). According to the existed evidence, the lower limbs is the most prevalent place of injury followed by the head, neck and vertebral column (16). Contusion and sprain were also have been found as the most prevalent types of injuries sustained (16). American elite athletes recorded injury rates of 127.4/1,000 A-E (men) and 90.1/1,000 A-E women) (5), while European colleagues had rates of 139.5/1,000 A-E (men) and 96.5/1,000 A-E (women) (5). Oler et al. reported that the combined injury ratios were 3.4 % when 300 young male and female taekwondo sportsmen were taken as basis (7**).** In our study, 539 injuries were observed in 271 competitions in total. The rate of injury per the competition was 1,98. The rate per the sportsman after injury was 1,87. However injury ratios occurring in the championship and injury ratios occurring in the matches necessarily will be different. So to present injuries occurring during the championship as injury frequency occurring in general martial arts will be hardly true. The great majority of injuries occurring is acute and starts suddenly. Only in two studies it was reported that they started late. Injuries in our study had sudden and acute starting. It was reported that in Pieter taekwondo all slow starting injuries were 14 in males and 35 in females. However any information concerning frequency, density and time of factors causing this was not given (8). The rate of injuries (69.5 per 1000 A-Es) in Iranian athletes is lower than the rates reported from most of European and American countries (16). Although Beis et al. found 20.5 injuries per 1000 A-Es (lowest reported rate of injury in the literature) and also Pieter et al. reported 51.3 injuries per 1000 A-Es for taekwondo athletes, it seems the rate was found in Iran could be considered lower than the mean of injury rates reported previously (16). The incidence rate of injury for men attending in different taekwondo competitions was reported in a range of 20.5 to 168.4 injuries for each 1000 men (16). According to the existed evidence, the lower limbs is the most prevalent place of injury followed by the head, neck and vertebral column (16). Contusion and sprain were also have been found as the most prevalent types of injuries sustained (16). The study was a summation of 9 years of data of competition injury reports, which included 904 injury reports spanning 58 individual competitions (3). The three most common locations of presenting injury were the head (19%), foot (16%), and thigh (9%). The most common mechanism of presenting injury was found to be a defensive kick (44%), followed by an offensive kick (35%). The most commonly diagnosed injuries were contusions (36%), sprains (19%), and strains (15%). Coloured belts had a higher incidence of contusions, while black belts sustained more joint irritation injuries. Black belts were more likely to suffer multiple injuries (3). In taekwondo, the lower extremities sustain most of the injuries (36.7–65.0%) (9).The great majority of the foot injuries occurred due to the collision of the foot with the rival's wirst 97( %18), hand 26(%4), knee (%1), the front outer part of the thigh and tibia while kicking 104(%19), foot and ankle was 248 (%46). On the other hand, the spine/trunk was found to be injured most often in

one judo study and not at all in karate and taekwondo (9). The spine injuries didn't dedecte in our sudy.The foot is the most often injured lower extremity (%46) part in taekwondo compared to judo and karate. In a study it was determined that the head and neck injuries were the most often injured region in taekwondo tournament (7). The head and neck injuries wasn't dedected in our study. Kazemi et al. made, 2% abrasion, 7% concussion, 12% contusion, 2% epistaxis, 11% laceration and 23% sprain were determined. In canadian national taekwondo championships (5). In our study these ratios %1 abrasion, %5 sprain %1 epistaksis, %94 hematomas were also determined. Epistaxis was reported in taekwondo as well as in other martial arts (9). In our study epistaxis was determined in 1 case, depending on the nose break. In our study, during blocks made against the kick, 1 radius break, 6 abrasion in the fore arm and 101 hematomas (%18) occurred. Breakfalls are common to the martial arts. The goal of practicing falls, or breakfalls, is to reduce the chance of injury in the event of a fall during training or when in a fight. Although each style may teach a different method of falling, the principles are quite similar (15). In our study any injury based on falls was not determined because in taekwondo the techniques towards beating down were not being permitted in the matches. Contusions and hematomas are so common in the martial arts that they are frequently unreported (2). The most widespread type of injury in our study was determined as contusions and hematomas as well (%94). As expected, the contusion was found to be the most frequently occurring injury type in other studies on Taekwondo injuries (11,17, 1). The sprain ranked in the top three of most frequently occurring injuries across several tournaments (5). The contusion was also the most oftenoccurring injury in karate, while the epistaxis ranked second in Dutch men and women (5). Although protective equipment is now being used as suggested by Siana et al., it also should be noted that after repeated impact the padding may no longer be adequate (14). In injuries occurring in the head and neck region, the most widespread type of injury is contusions and lacerations (10). Many contusions can be minimized by the use of appropriate headgear during sparring. Contusions, sprains, and strains are the most common neck injuries (15). In our study any injury due to hits on the neck was not determined. In our study any injury concerning the shoulder was not determined. As a result, the high velocities and momentum levels generated during taekwondo kicking in combination with a lack of proper blocking as found in this study should give rise to serious concern about the medical implications of full contact taekwondo (17).

As a result of the study, it was explained that most of the injuries such as hematoma, edema, contusion seen in the taekwondo competitions were not at the level of requiring intensive medical intervention and the lower extremities were mostly injured in these competitions. In the light of these findings, it could be said that these parts be protected during the competitions, the defense techniques be in different ways and the relevant practices be given importance.

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# Perceived value of national wrestlers

Mehtap YILDIZ[1]

[1]*Necmettin Erbakan Üniversitesi, Ahmet Keleşoğlu Eğitim Fakültesi, Beden Eğitimi ve Spor Bölümü*
*Address Correspondence to M. Yıldız, e-mail: yildizmehtap77@gmail.com*

**Abstract**

The aim of this research is the goals of the value detectors that we present to the sportsmen of the national wrestlers. In the research, interview method was used in qualitative research companies. The research group consisted of 7 national wrestlers (1 female, 6 male) from Hatay Mustafa Kemal University, Çukurova University and Mersin University in 2015-2016 Education Year. The data were reached through the Personal Information Form (4 questions) and the Semi-Structured Interview Form (5 questions). Content analysis method was used for evaluation of the data. As a result of the research, it has been determined that the most frequently stated values of national wrestlers' opinions about the values they have gained from sports are self-confidence, respect, obeying rules, cooperation, tolerance, responsibility, ambition, discipline and etc. It is thought that sports gain the human values that are accepted in society and tried to teach to individuals from a very early age.

**Keywords:** National, perception, value, wrestle.

## INTRODUCTION

In interpersonal relations, the concepts of right and wrong are increasingly confused. Individuals within the society are anticipated to show behaviors that are right, fair, respectful to the individual and loves the individual. These behaviors must be in accordance with generally accepted values adopted by society (22).

The value term is the principles that create the desired, undesirable, good and bad judgments about individuals, objects, behaviors, thoughts and beliefs (14). According to Schwartz (26), value is the criteria in which an individual evaluates himself / herself, other individuals and events, and chooses and defines his / her behaviors. Value is a very important part of an individual's character and experience (13). Values are internalized by individuals and constitute the philosophy of common life of societies. In addition, it plays a role not only in the formation of legal norms but also in the establishment of moral behaviors in the society (34). Values act as a bound that lets individuals to connect to each other and to put up with each other (5).

Sport is a crucial tool that allows individuals to develop their characters. Thanks to sports, individuals learn such values; work regularly and disciplined, obey rules, self-confidence, cooperation, tolerance, justice, sportsmanship, patience (19), being in unity and togetherness, assemble for a common purpose, striving for success, apologizing for wrong behaviors. Learning showing respect, appreciation, thanking, courage, friendship, cooperation, cleanliness (21), self-esteem, self-discipline, emotion control, non-discrimination, teamwork, entertainment, inclusion (9), health, renewal, social participation, employment, love of the country and nation, competition, win and loss (10).

Successful high-level athletes both in sporting periods and after ending their sporting lives; their lifestyles is being a model for future generations. Simon (29) stated that world famous athletes are considered to be watched by their fans with their style, courtesy, sacrifices, loyalty and courage as well as their excellent sportsmanship.

Sport is one of the most important social environments in which individuals can gain value

that is accepted by society. Therefore, it is important to determine what values are gained by sports in high-level athletes. It is thought that determining the perceptions of the athletes who have been engaged in sports for many years and reached the level of national athletes are also necessary in the field of sports science. The purpose of this research is to determine the perceptions of national wrestlers on the values they have gained from sports.

## MATERIAL & METHOD

In the research, phenomenological research approach is used in qualitative research models. Phenomenology research defines the common meaning of the experiences of a few people about a concept and tries to determine the common characteristics of all participants (6). In other words, it focuses on how people perceive the phenomenon, how they feel about it, how they judge it, and how they make sense of it. Thus, the data of the study was obtained by interview method. The interviews were applied to determine the meanings of emotions, thoughts, intentions and events in their lives that were not observed in the participants (23). Interview method is the basic data collection tool in qualitative research and has the flexibility to adapt to different research situations (25).

The research group consisted of 7 national wrestlers (1 female, 6 males) who study in the physical education and sports colleges of Hatay Mustafa Kemal University, Çukurova University and Mersin University in the 2015-2016 Academic Year and determined by the purposive sampling method (37), which are frequently used in qualitative researches. Nicknames were given to the wrestlers that participated into the interview (Table 1).

The data were acquired through the Personal Information Form and the Semi-Structured Interview Form prepared by the researcher. In the Personal Information Form, 4 questions including the age, the university and the department where he / she studied, the number of nationalities and the duration of the sports branch, and there are 5 questions that consist of semi-structured open-ended questions in the interview form, including the concepts of fair play-sportive virtue, trying every way to success and win in the sport, the athlete received the sample with the peculiarities of life, ideas about spiritual values that give strength to in sport competitions, and values gained by sport.

The focus is on internal validity in qualitative researches. In order to increase the internal validity of the interview form, the opinions of three members of the sports sciences field were consulted, and with the help of 2 national athletes selected from the target population, the questions were finalized by pilot research on the sample (33). Five open-ended questions that serve the purpose of the research were applied to national wrestlers by face-to-face interviews. The interviews were held between 14-20 April 2016 with the permission and appointment of the national wrestlers. The interviews lasted between 18-25 minutes.

For ensuring of the validity and reliability of the study, credibility, long-term interaction, depth-oriented data collection, expert review and participant confirmation strategies were used (18). Besides, the national wrestlers participated in the research voluntarily, the risks and the confidentiality of the meetings were kept confidential, the data were protected and the findings were reflected objectively and carefully. Berg and Lune (4) describe these processes as ethical dimensions.

As the qualitative data are based on verbal expressions, the main role of the researcher in the analysis process is the elimination of the unrelated sections of the relevant sections of the raw data (1). Content analysis method was used to evaluate the data. Content analysis encapsulates thinking about what data to include in the analysis and what to analyze, as well as how to effectively use the analysis steps and coding tables (4).

Qualitative data were read separately by the researcher and two experts and the process of creating themes was started. As a result of this process, the themes that were agreed and themes were determined. The reliability of the data was calculated by using Miles and Huberman's (1994) *Theme / Consensus + Disagreement provided theme X 100* formula (35).

The formula used to measure the harmony between researchers and experts which determines the themes should be 70% or more. The researchers and experts who tried to determine the harmony between the themes reached a consensus on the 42 / 46 x 100 = 91.3 ratio.

## RESULTS

Table 1 indicates the age of the national wrestlers participating in the research, number of being national, number of years they have done this sport branch and the findings of the interview date.

**Table 1.** Data related to the age, the university and the department, number of years for being national and date of interview

| Nicknames of Participants | Age | University and Department | Number of being National | Number of years for doing sports | Interview date |
|---|---|---|---|---|---|
| Mustafa | 18 | Hatay Mustafa Kemal Uni. PESC | 2 | 6 | 14.04.2016 |
| Fatma | 23 | Hatay Mustafa Kemal Uni. PESC | 3 | 10 | 15.04.2016 |
| Hüseyin | 27 | Hatay Mustafa Kemal Uni. PESC | 19 | 15 | 16.04.2016 |
| Burak | 22 | Mersin Uni. PESC | 3 | 12 | 19.04.2016 |
| Osman | 21 | Mersin Uni. PESC | 1 | 9 | 19.04.2016 |
| Haluk | 21 | Çukurova Uni. PESC | 4 | 12 | 20.04.2016 |
| Serdar | 19 | Çukurova Uni. PESC | 1 | 8 | 20.04.2016 |

Table 1, it has been determined that the age range of the research group is between 18 and 27, 3 national athletes according to the university and department status study at Hatay Mustafa Kemal University Physical Education and Sports College (PESC), 2 of them from Mersin University PESC, 2 of them from Çukurova University PESC, according to the number of national athletes with the least national athletes 1, the most national athletes 19 times been national, according to doing this sport branch it has been wrestling for at least 6 years and maximum 15 years.

Table 2 presents the findings of the national wrestlers' opinions on the concepts of fair play and sportive virtue.

**Table 2.** Findings of national wrestlers' perceptions of fair play and passive virtue concepts

| | Participants | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Themes** | Mustafa | Fatma | Hüseyin | Burak | Osman | Haluk | Serdar | **Frequency** |
| Gentlemanship | √ | √ | | | | √ | | **3** |
| Honesty | √ | | | | | | √ | **2** |
| Obeying Rules | √ | | | | | | | **1** |
| Love-Respect | | | √ | √ | | √ | | **3** |
| Focusing on only to Winning | | | | | √ | | | **1** |

In the Table 2 below themes were reached out:

*Gentlemanship*

For the theme of gentleman in the thinking of national wrestlers in terms of fair play and sport virtue Mustafa said *"Even if we beat our rival we behave like a gentleman towards them..."*, Fatma said *"The gentleman behaviour that comes to my mind first, when I notice my opponent's injury, I leave the match to the referee."*

*Love-Respect*

For the theme of love-respect in the national wrestlers' thinking about the concepts of play and sportive virtue Hüseyin said *"What comes to my mind are the competitions that have been done in the frame of love-respect."*, Burak said *"Being respectful and lovely towards rival, trainer, referee."*, Haluk said *"Showing respect and love towards everyone."*

*Honesty*

For the theme of honesty, national wrestlers think about the concepts of fair play and sportive virtue Serdar said *"Honesty, you have to be honest. My*

*opponent did not have a swimsuit before a competition. I was going to get the match, but I gave him my extra swimsuit and I got him back in the game."*

In addition to these themes, national wrestlers have to adhere to the rules and not to think about winning only in competitions, and that winning should not be the only goal.

Table 3 presents the findings of the national wrestlers participating in the research about their thoughts about the success of the sport and trying every way to win.

**Table 3.** Findings of national wrestlers' views on the success of sport in trying every way to achieve success

| | **Participants** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Themes** | Mustafa | Fatma | Hüseyin | Burak | Osman | Haluk | Serdar | **Frequency** |
| Struggle with the frame of rules | √ | √ | | √ | √ | | √ | **5** |
| There should not be unfair behaviors | | √ | | | | √ | | **2** |
| Trying to win deservedly | | | √ | √ | | √ | | **3** |

In the Table 3 below themes were reached out:

*Struggle with the frame of Rules*

In the views of national wrestlers in the struggle for success in sport and in every way to win Mustafa said *"We have to do the techniques in the framework of the rules and try every way of technical tactics. We want success in the framework of the rules."*, Burak *"Everything should be according to certain rules. Winning deservedly is different. Its desire is more than everything"*, Osman *"Every way should be tried by aiming to win without going out of sports rules."*

*Trying to Win Deservedly*

National wrestlers' success in the sport and trying to win every way to win by trying to win deservedly theme Hüseyin said *"This type of thinking athletes go to doping and it is unfair for other athletes. However, every athlete should try to win with his/her own right."*, Haluk *"Camps, training programs, eating and drinking, such as paying attention to the situation should be tried to win by deserving."*

*There Shouldn't be Unfair Behaviors*

In the views of national wrestlers about unsuccessful movements in sport and in their opinions about trying every way to win Fatma said*"Quenching, doping, sportsmen should not be resorted to any unsportsmanlike movements and the basis of the sport should not be destroyed."*

Table 4 presents the findings of the thoughts of the national wrestlers participating in the research and their thoughts about the characteristics of the athletes they took as idols.

**Table 4.** Findings about the thoughts of national wrestlers about the characteristics of the athletes that they take as idols

| | Participants | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Themes** | Mustafa | Fatma | Hüseyin | Burak | Osman | Haluk | Serdar | **Frekans** |
| Struggle under harsh conditions | √ | | | | | | | 1 |
| Discipline | √ | | | | √ | √ | | 3 |
| Success | √ | √ | | | √ | | | 3 |
| Respect | | √ | | | | | | 1 |
| Confidence | | √ | | | | | | 1 |
| Perseverance | | | √ | | | | | 1 |
| Technique | | | | √ | | | | 1 |
| Industriousness | | | | | | | √ | 1 |

In the Table 4 below themes were reached out:

*Discipline*

Discipline theme in the views of the national wrestlers about the characteristics of the athletes that they model with Mustafa said *"Being disciplined is one of the effective aspects that has impact on me."*, Osman *"Working with discipline throughout his/her life."*, Haluk *"He/She is disciplined, neat, not escaping from a training, careful with the diet program"*.

*Success*

The theme of success in the views of the national wrestlers about the characteristics of the athlete they took as an example Fatma said *"I was very impressed by his/her success of the matches.."*, Osman said *"The successes he/she achieved at an early age, his/her ratings were very different from my point of view."*

In addition to these themes, national wrestlers stated that they are struggling under difficult conditions and persevering in their opinions on the characteristics of the athletes who are taken as an idol by their lives, respecting everyone, having high self-confidence, hardworking and wrestling techniques are remarkable characteristics.

In Table 5, the findings of the national wrestlers' opinions about the spiritual values giving power to them were included in the research.

**Tablo 5.** Findings of national wrestlers' thoughts on spiritual values giving power to them in competitions

| | Participants | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Themes** | Mustafa | Fatma | Hüseyin | Burak | Osman | Haluk | Serdar | **Frequency** |
| Flag | √ | √ | √ | | | | | 3 |
| Independence March | √ | | √ | | | | | 2 |
| Family | | √ | | √ | √ | | √ | 4 |
| Friends | | √ | | | √ | | √ | 3 |
| Motherland | | | √ | | | √ | | 2 |
| Trainer | | | | | √ | | √ | 2 |
| Turkish Nation | | | | | √ | √ | | 2 |

In the Table 5 below themes were reached out:

National wrestlers' thoughts about the spiritual values that give them power, respectively; family, flag, friends, independence march, homeland, Turkish Nation, trainer themes are considered to be important spiritual values.

Table 6 indicates the findings of national wrestlers' opinions about the values they have gained from sports.

**Table 6.** Findings on the ideas of national wrestlers on the values they have gained from the sport

| | Participants | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Themes** | Mustafa | Fatma | Hüseyin | Burak | Osman | Haluk | Serdar | **Frequency** |
| Obeying the Rules | √ | √ | √ | | √ | √ | | 5 |
| Discipline | | | √ | √ | √ | | | 3 |
| Kindness | √ | √ | | | | √ | √ | 4 |
| Respect | √ | √ | √ | | √ | √ | √ | 6 |
| Sympathy | √ | | | | | | | 1 |
| Maturing | √ | | | | | | | 1 |
| Gentlemanship | √ | | | | | √ | √ | 1 |
| Confidence | √ | √ | √ | √ | | √ | √ | 6 |
| Collaboration | √ | √ | | | | | | 2 |
| Unity and Solidarity | √ | | √ | | | | | 2 |
| Helping | √ | √ | √ | | | √ | √ | 5 |
| Balanced Diet | √ | | | | | √ | | 2 |
| Responsibility | √ | | | | √ | √ | √ | 4 |
| Health | | √ | | | | | | 1 |
| Adapting to Society | | | √ | | | | √ | 2 |
| Learning the Losing Bliss | | | √ | | | | | 1 |
| Brotherhood | | | √ | | | √ | | 2 |
| Passion | | | | √ | √ | √ | √ | 4 |
| Moral | | | | | √ | | | 1 |
| Equality | | | | | √ | | | 1 |
| Order | | | | | | √ | | 1 |
| Love | | | | | | | √ | 1 |
| Patience | | | | | | | √ | 1 |

The following themes are reached in Table 6:

*Confidence*

In the thoughts of national wrestlers about the values that the sports given them Mustafa said *"Sports has given me a lot of self-confidence. If you don't trust before you go to the mat, I've already been defeated in my brain. Improves my feelings and thoughts."*, Fatma *"It definitely gives people confidence. A human cannot do anything without self-confidence."*, Hüseyin *"The self-confidence of the sportsman is very advanced."*

*Respect*

The theme of respect by national wrestlers regarding the values they have gained Hüseyin said *"Sports teaches me the respect for others' rights."*, Osman *"I learned to act respectfully in society through sports."*, Serdar *"Sports requires respect and respect among the friends."*

*Obeying the Rules*

National wrestlers think about the values that sport gives to them according to the obeying the rules theme Mustafa said *"Rules in sport are the most basic principles. No success without rules, the way to obey the rules opens the success' door."*

*Helping*

The theme of helping the national wrestlers in their thoughts about the values they have gained Mustafa said *"Sport taught me to help. We reach our goals by helping."*, Serdar *"You can't do anything alone in sports, it's important to help."*

*Kindness*

In the thoughts of national wrestlers about the values that the sport gives to them, the theme of tolerance Haluk said *"We learn to be tolerant of each other; towards the athletes, the referee, the coach."*

*Responsibility*

The theme of responsibility for national wrestlers' thoughts on the values they have gained Osman said *"Sports lets people to acquire the responsibility feeling."*

*Passion*

National wrestlers' opinions on the values they gain Burak said *"Sport needs to be passionate to achieve goals."*

In addition to these themes, national wrestlers, in their views on the values they have gained, have the following responsibilities: discipline,

cooperation, unity and togetherness, balanced nutrition, adaptation to society, brotherhood, empathy, maturation, gentlemen, health, learning of virtue of loss, morality, equality, order, love and patience themes

**DISCUSSION & CONCLUSION**

Gentlemanship and love-respect themes came to the forefront in the national wrestlers' thinking about the concepts of fair play and sportive virtue. National wrestlers stated that the concept of fair play in them evokes the notions of gentlemanly and love-respect. Besides, national wrestlers stated that they should be honest in the competitions, to be obeyed to the rules and not to focus only on winning. This result can be interpreted that national wrestlers perceive the concept of sportive virtue as a friendly, friendly and honest fight in competitions, to respect their rival, coach, referee, and to respect the rules in any circumstances. Stornes and Ommundsen (30) determined that the sporting levels of the hand-ball players who are in the team sports are high. Kromerova and Šukys (20) have found that young athletes with less experience attach more importance to the value of obeying the rules than athletes with more experience. Kaya (17) emphasizes on the concept of fair play in school sports programs. The contest stated that they had thoughts such as accepting to lose. Freeman et al. (11) found that physical education teachers give importance to sportsmanship and honesty values during teaching.

Contrary to the findings of the research, Kaya (17) found that the students acted with an understanding of winning in the competitions. Sezen (27) determined that professional football players see rule violations as normal behaviors according to amateur players and non-sporting behaviors as smart tactics. Şahin (32) determined that in the competition only to win the value of playing; human values are not considered in sports.

It has been concluded that national wrestlers should have competitions in their opinions on the road to success in sport and to try every way in order to win, to fight to win by winning competitions and not to take part in sports. This can be explained by the fact that national wrestlers believe that it is important to compete in accordance with the rules and that every way should be tried in order to win in sports. It can also be interpreted that national wrestlers act as individuals with the values required by sport. Topan (36) found that female athletes exhibited more respect for rules and management than men. Sezen Balçıkanlı (28) found a significant relationship between empathic tendency and respect for rules and sport in professional football players.

Contrary to the findings of the study, Şahin (32) found that the phenomenon of success in unscientific ways emerged as lost ethical values. Cruz et al. (7) determined that male football players have an attitude of winning against the rules in order to gain advantage of their team.

It is determined that the importance of the struggle, respect, self-confidence, perseverance, diligence, technical skills are considered important in the thoughts of the national wrestlers. This result can be explained as the role of national wrestlers as a role model, to be disciplined, to have a successful sports life, to be respectful to everyone and every situation, to be confident, to be diligent and determined despite all kinds of negative conditions and to be used as a model for wrestling techniques. Jones and Lavallee (16) found that young athletes consider discipline, respect and self-confidence values important in sports. Freeman et al. (11) found that students prioritize the value of success when doing sports. İyem (15) determined that to be a good footballer, it is necessary to spend regular work and labor from a very early age and work discipline is important.

National wrestlers' thoughts about the spiritual values that give them strength in the family, flag, friends, independence march, homeland, trainer and Turkish Nation themes have been seen as important. This situation, especially in national athlete homeland, nation, flag and the National Anthem can be interpreted as the important elements that motivate them. In addition, it can be said that there are important factors in the success of national athletes in their family, friends and coaches who make a sense of belonging. Perenyi (24) determined that sportsmen consider national identity and tradition values vital.

The most frequently stated values of national wrestlers' opinions about the values they have gained by the sport are determined as self-esteem, respect, obeying rules, cooperation, tolerance, responsibility, ambition, discipline. It can be said that national wrestlers think that sport develops the values that should be in every person in themselves and these values are universal values that should be found in every society. Jones and Lavallee (16)

found that discipline, self-confidence and goal-setting values were important for young athletes. Çiftçi et al. (8) found that scouting improved the values of love, respect, friendship and tolerance. Stran and Curtner-Smith (31) found that the discipline value affects sport education. Cruz et al. (7) determined that equality and justice values are important for male football players. İyem (15) found that professional football players are important for regular and continuous work from a very early age in order to become a good footballer. Sezen Balçıkanlı (28) concludes that in professional football players, the role of play is a positive influence on moral behavior. Gau and James (12) found that moral values are important in demonstration sports. Behets (3) stated that physical education teachers care about the value of social responsibility. Bahadır et al. (2) found that the values of honesty and courage are crucial for physical education teachers.

Contrary to the findings of the research, Şahin (32) is thought to be gained in sports, being honest, being regular and successful. It was determined that the values did not stand out sufficiently.

Consequently, it is thought that sports gain the human values that are accepted in society and tried to teach to individuals from a young age. It should not be ignored that sport is a field that can pioneer to social values which are decreasing day by day in society. Therefore, it should be kept in mind that sport is an important thing for the values which are tried to be gained through the education of individuals in the society. After that, it is recommended to conduct mixed research to compare individual and team spor

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# Relationship between physical activity levels and body compositions of university students

Şükran ARIKAN[1], Serkan REVAN[1]

[1]*Selçuk University, Faculty of Sport Sciences, Konya, Turkey*
*Address Correspondence to Ş, Arıkan, e-mail: sarikan@selcuk.edu.tr*

**Abstract**

The aim of this study is to determine the relationship between physical activity levels and body composition of university students. A total of 155 students (56 women, 99 men) attending Selcuk University Faculty of Sports Sciences voluntarily participated in the research. Body composition was determined by bioelectrical impedance analysis while the International Physical Activity Questionnaire (IPAQ)- short form was used to determine students' physical activity levels. According to the research findings, there was no correlation between body composition variables and physical activity level variables in men ($p > 0,05$), but there was only a weak but significant negative correlation between total physical activity score and height in women ($p < 0,05$, $r = -0.28$). There was a significant relationship between the total score of high intensity physical activity and body weight ($r = 0.21$), body fat percentage ($r = -0.21$), lean body mass ($r = 0.24$), basal metabolic rate ($r = 0.23$), body mass index ($r = 0.17$) and waist / hip ratio ($r = 0.24$). Besides it was also determined that there was a significant relationship between total physical activity score and waist / hip ratio ($r = 0.18$). As a result, it can be said that there is no significant relationship between body composition variables and physical activity level variables of men and women participating in the research.

**Key words:** Physical Activity Level, Body Composition, Bioelectrical Impedance Analysis, International Physical Activity Questionnaire

## INTRODUCTION

Physical activity is defined as any physical movement produced by skeletal muscles and causing exertion of energy (7). There are indisputable evidences regarding the fact that regular physical activity contributes to primary and secondary safeguarding from numerous chronic diseases and reduces the risk of early demise. A linear relation is available between physical activity intensity and health condition and physically more active people have the lowest risk level (29). Today, excessive sedentary behaviors have become the dominant and widespread property of modern life. As the ratios of chronic illnesses and premature deaths increase, the negative impacts of the gradually increasing sedentary life on the public health have become clearer and clearer (2). Sedentary life contains the activities like sleeping, sitting, lying, and watching TV that do not prioritize energy consumption over resting level. Functionally, a sedentary behavior covers the activities containing the 1.0-1.5 metabolic equivalent (MET) energy consumptions (1 MET is the amount of oxygen consumed during a rest and 3,5 ml/kg/min). Light physical activity includes the activities like walking slowly, sitting, writing, cooking, and dishwashing and requires consumption of energy at the level of about 1.6-2.9 MET (19).

Physical activity levels are frequently monitored in order to assess the attitudes of the population toward health and their relation with the health condition that contains fatality and disease ratios. It is necessary to evaluate the physical activity in an accurate manner to determine the effectiveness of the interventions prepared to identify the current levels and alterations in the population and increase the activity levels (21). It was specified that there are many methods used in the determination of physical activity and sedentary behaviors (8, 10, 17) but there is no golden standard for assessing the validity of the physical activity measurements (9). The short form of the International Physical Activity

Questionnaire (IPAQ) is a method used frequently in the assessment of physical activity in the large-scale epidemiologic studies (4, 20, 25).

In the studies scrutinizing the relation between physical activity and body composition, it was demonstrated that physical activity maintains or increases the lean tissue mass and affects the body composition positively by supporting the loss of fat (11, 28). Identification of the body composition is important in terms of assessing the feedingstate and estimating the potential health risks. The bioelectric impedance analysis (BIA), which is an alternative to the more invasive and expensive methods like Dual energy X-ray absorptiometry, computed tomography, and magnetic resonance imaging, is a valid method used in evaluating body composition (24). The objective of this study is to determine the relation between the physical activity levels and body compositions of university students.

## MATERIAL & METHODS

**Subjects:** Total 155 students (56 women, 99 men) between the ages of 18 and 24 studying at the Faculty of Sports Sciences at Selçuk University took part voluntarily in the study. The subjects were informed and their consent forms were caused to be signed by them prior to the study.

**Body Weight and Height Measurement:** The heights (cm) and body weights (kg) of the subjects were measured using a mechanical weigh (Seca brand) with a meter measuring heights, as bare feet, feet pressing smoothly on the floor, heels adjoined, knees stretched, and body in upright position, with light clothes as much as possible.

**Bioelectrical Impedance Analysis:** The body compositions of the participants were determined by means of the method of bioelectrical impedance analysis (Bodystat Quadscan 4000). Measurements were taken between 8:00 and 10:00 a.m. in the morning, without the intake of liquids and nutritions following the hunger from the night, in a lying flat position, by placing two electrodes on the proximaland distal of the right hand and foot. The participants were asked not to have consumed the food and beverages containing alcohol and caffeine in the 24 hours prior to the test and performed sportive activities. Measurements were postponed in women in line with their menstrual cycle situations.

**Physical Activity Assessment Questionnaire:** In order to determine the physical activity level of the subjects, the short form of the International Physical Activity Questionnaire (IPAQ) was used. This questionnaire developed to find the physical activity types conducted by individuals during their everyday lives covers the questions in relation with the time spent physically in the last seven days. It questions the frequency of the activities of sports, exercise, and entertainment performed by individuals at home, at work, or when travelling from one place to another. The validity and reliability studies of the questionnaire for Turkey were conducted by Öztürk (18) for university students. Information regarding the time spent in sitting, walking, moderate-intensity physical activity (MIPA), and high-intensity physical activity (HIPA) is obtained. In the evaluation of all the activities, benchmark is the fact that an activity is conducted for at least 10 minutes at once. The minute, day, and MET value (multiples of the oxygen consumption at rest) are multiplied anda score like "MET-minute/week'' is obtained. The physical activity levels are classified a low (<600 MET-minute/week), medium (600-3000 MET-minute/week), and high (>3000 MET-minute/week) (13).

**Statistical Analysis**: The data were summarized by providing the percentages, averages, and standard deviations. As the data were distributed normally, the independent group t test was used for the pairwise cluster comparisons. In the determination of the relations between the body composition and variables of physical activity level, Pearson Correlation analysis was used. In the study, the level of significance was accepted as 0.0

## RESULTS

It was determined that there is a significant difference between the points of body weight, height, body fat percentage, fat mass, fat-free body mass, basal metabolic rate, body mass index, waist-to-hip ratio, high-intensity physical activity level, total sitting period, and total physical activity level of the young adult women and men taking part in the study ($p<0.01$). In view of the medium intensity physical activity and walking points of the women and men participants, no significant difference was identified ($p>0.05$; Table 1).

**Table 1.** Mean, standard deviation and t test results of female and male participants

| | Women | | Men | | |
|---|---|---|---|---|---|
| | **Mean** | **SD** | **Mean** | **SD** | **t** |
| Weight (kg) | 55,2 | 7,7 | 71,8 | 9,5 | 11,18** |
| Height (cm) | 163,5 | 5,1 | 177,4 | 6,3 | 14,07** |
| Body fat percentage (%) | 22,3 | 4,0 | 11,9 | 3,3 | -17,34** |
| Fat mass (kg) | 12,5 | 3,6 | 8,8 | 3,5 | -6,28** |
| Lean body mass (kg) | 42,7 | 5,1 | 63,1 | 7,1 | 18,85** |
| Basal metabolic rate (Kcal/gün) | 1460,4 | 122,3 | 1936,8 | 196,4 | 16,43** |
| Body mass index (kg/m$^2$) | 20,6 | 2,5 | 22,8 | 2,8 | 4,95** |
| Waist / Hip ratio | 0,7 | 0,04 | 0,8 | 0,03 | 12,61** |
| Vigorous PA (MET-dk/hafta) | 725,7 | 1104,2 | 1781,8 | 1969 | 3,70** |
| Moderate PA (MET-dk/hafta) | 836,4 | 696,9 | 731,3 | 612,4 | -0,98 |
| Walking time (MET-dk/hafta) | 1022,1 | 796,3 | 1047,8 | 838,6 | 0,19 |
| Sitting time (dk) | 409,6 | 185 | 353,3 | 143,1 | -2,06* |
| Total PA (MET-dk/hafta) | 2584,3 | 1675,3 | 3561 | 2218,4 | 2,86** |

*p value of <0.05 was considered statistically significant. **p value of <0.01 was considered statistically significant. PA: Physical activity

It was determined that 46.45% of the participants were high, 48.39% were moderate, and 5.16% were active at low levels. In terms of the gender, it was determined that majority of the men participants (53,54%) were at high activity level, while the majority of the women participants (58,93%) were at medium activity level (Table 2).

**Table 2.** Physical activity levels of participants

| **Activity Levels** | **Women** | | **Men** | | **Total** | |
|---|---|---|---|---|---|---|
| | F | % | F | % | F | % |
| Low | 4,00 | 7,14 | 4,00 | 4,04 | 8 | 5,16 |
| Medium | 33,00 | 58,93 | 42,00 | 42,42 | 75 | 48,39 |
| High | 19,00 | 33,93 | 53,00 | 53,54 | 72 | 46,45 |
| Total | 56,00 | 100,00 | 99,00 | 100,00 | 155 | 100 |

A weak but significant level of positive relation between high-intensity physical activity points and the variables of body weight (r=0.21), fat-free body mass (r=0.24), basal metabolic rate (r=0.23), body mass index (r=0.17), and waist-to-hip ratio (r=0.24) of the young adults taking part in the study, was determined. Nevertheless, also a weak but statistically significant level of negative relation between the high-intensity physical activity points and body fat percentage (r=-0.21). As long as the participants' body fat percentages increase, their high-intensity physical activity points decline. In addition, a positive relation between the total physical activity points and waist-to-hip ratio was determined (r=0.18). When the body composition and physical activity points are scrutinized in terms of gender, no significant relation was found between the body composition variable and physical activity levels, save for the weak significant level of negative relation between height and the total scores of physical activity in women (r=-0.28) (Table 3).

**Table 3.** The correlation between body composition and physical activity level variables

| | Weight | Height | Body fat percentage | Fat mass | Lean body mass | Basal metabolic rate | Body mass index | Waist / Hip ratio |
|---|---|---|---|---|---|---|---|---|
| **Women (n=56)** | | | | | | | | |
| Vigorous PA | -0,08 | -0,19 | 0,08 | -0,01 | -0,11 | -0,11 | 0,02 | 0,00 |
| Moderate PA | -0,20 | -0,18 | 0,07 | -0,08 | -0,25 | -0,25 | -0,14 | 0,16 |
| Walking time | -0,03 | -0,17 | 0,21 | 0,10 | -0,12 | -0,12 | 0,05 | -0,14 |
| Sitting time | -0,06 | -0,07 | -0,06 | -0,04 | -0,06 | -0,06 | -0,03 | 0,26 |
| Total PA | -0,15 | -0,28* | 0,18 | 0,01 | -0,24 | -0,24 | -0,02 | 0,00 |
| **Men (n=99)** | | | | | | | | |
| Vigorous PA | 0,04 | -0,09 | 0,02 | 0,03 | 0,04 | 0,03 | 0,10 | 0,09 |
| Moderate PA | -0,08 | 0,02 | 0,00 | -0,04 | -0,08 | -0,09 | -0,10 | -0,09 |
| Walking time | -0,05 | -0,10 | 0,08 | 0,05 | -0,10 | -0,10 | -0,02 | -0,01 |
| Sitting time | -0,05 | 0,19 | -0,17 | -0,15 | 0,00 | 0,00 | -0,15 | -0,15 |
| Total PA | 0,00 | -0,12 | 0,05 | 0,04 | -0,03 | -0,03 | 0,05 | 0,05 |
| **Total (n=155)** | | | | | | | | |
| Vigorous PA | 0,21** | 0,14 | -0,21** | -0,11 | 0,24** | 0,23* | 0,17* | 0,24** |
| Moderate PA | -0,14 | -0,09 | 0,08 | -0,02 | -0,14 | -0,14 | -0,14 | -0,04 |
| Walking time | -0,02 | -0,07 | 0,06 | 0,05 | -0,04 | -0,05 | 0,01 | -0,03 |
| Sitting time | -0,15 | -0,06 | 0,06 | -0,02 | -0,15 | -0,14 | -0,16 | -0,09 |
| Total PA | 0,12 | 0,07 | -0,13 | -0,08 | 0,15 | 0,14 | 0,11 | 0,18* |

*p value of <0.05 was considered statistically significant. **p value of <0.01 was considered statistically significant.
PA: Physical activity

## DISCUSSION & CONCLUSION

This study was conducted to determine the relation between the physical activity levels and body compositions of university students. Of the individuals participating in our study, 46,5% were determined to be active at high level, 48,4% at moderate level, and 5,2% at low level. When it comes to gender, it was determined that the majority of the men participants (53,5%) are active at high level and the majority of the women participants (58,9%) were active at moderate level. In the study conducted by Akova (1), it was reported that 87,4% of the women and 80% of the men, and totally 84% of the individuals, were doing low and moderate-level physical activity. In a different study performed on university students, the result was that 14,8% of the students were inactive, 67,5% were minimally active, and 17,7% were active (18). In a research carried out in Brazil, 41,1% of the individuals above the age of 20 were found to be inactive (12). The inactivity levels of the Australian adults were determined as 67,7% and it was specified that these ratios were 71,2% in women and 64,8% in men (6). In a study conducted on the adults living in the US, the inactivity level was reported as 68% (16). In another study performed in the member states of the European Union, it was stated that both the ratio of the active adults and the level of sedentary lifestyle were 31% and determined that the frequency of encountering the men who are active at a sufficient level is higher in the women in all the countries (27). In addition, in our study, no significant difference was found between men and women in the medium-intensity physical activity and walking points, while a significant difference was determined between total physical activity, high-intensity physical activity, and sitting points. Total physical activity and high-intensity physical activity points were found higher in men than women and the sitting points of women are higher than those of the men. Savcı et al. (23) reported that men' total physical activity, moderate and intense level activity points were higher than those of women to a significant extent and no statistically significant difference was determined between the sitting activity points of the men and women university students. In a different study in which healthy young adult university students participated, it was stated that the total points of the men for physical activity, moderate-intensity activity, intense activity, and walking activity were

higher than those of women significantly (18). When the studies conducted in the world and in our country are examined, it appears that men have higher physical activity level than women. Differently from those studies, the high physical activity levels apparent in both genders in our study make us think that it may be because of the fact that the students participating in our study are the students of the school of sports sciences.

Of the individuals taking part in the study, a significant level of positive relation in terms of high-intensity physical activity points and body weight, fat-free body mass, basal metabolic rate, body mass index, and waist-to-hip ratio variables and a significant level of negative relation with the body fat percentage were determined. In addition, a positive relation was found between the total physical activity points and waist-to-hip ratio. When the body composition and physical activity level variables were examined in terms of gender, no significant relation was found between the variables of body composition and physical activity levels, save for the significant level of negative relation between the height and total physical activity points in women. In a study conducted on university students, the fact that the participation of the 51% of the students in weekly physical activity is at very low level, that their daily sedentary living times are averagely 12 hours, and a significant relation between overweight and sedentary lifestyle is present was determined (22). In a different study, the correlation between some anthropometric measurements and international physical activity questionnaire scores were examined. Accordingly, as the physical activity level increased, the mean values of waist circumference and waist circumference / height of the women and body mass index, neck circumference, waist circumference and waist circumference ratio of the men decreased (1). Kim et al. (15) determined that in the abdominal obesity prevalances and low body weight of the medium and high activity groups had a lower ratio and no significant difference was observed in the groups whose body mass index is above 25 kg/m$^2$. In consideration of such data, the researchers stated that regular physical activity not only reduces the body weight but also is in relation with a balanced body composition and physical fitness.

Evaluation of sitting period in addition to physical activity and sedentary behaviors is a new and significant field for preventive medicine (4) because sitting period is in an independent relation with fatality ratios. Besides, it suggests that high amounts of sitting cannot be compensated for with occasional leisure time physical activity even if the amount exceeds the current minimum physical activity recommendations (14). In our study, it was determined that there is a significant difference in terms of sitting periods between women (409,6 min) and men (353,3 min) and that sitting periods are not related with the variables of body composition. Differently from our findings from our study, Barlow et al. (3) observed that the high periods of sitting reported in both men and women are significantly related with the prevalence of the high cardiometabolic risk factors including high waist circumference, body fat percentage, as well as obesity. Suliga et al (26) reported that the sitting period of two hours or more a day increases the abdominal obesity risk significantly in the normal, overweight, and obese groups. In a research attended by 9079 individuals from different countries, it was stated that the possibility of being obese by the adults with the sitting periods of eight hours or more a day is 62% higher than the ones whose period of sitting is less than four hours (5). Such differences in the results of the studies may stem from the difference in the variables of the individuals taking part in the studies, such as age, physical activity level, and body mass index.

There are several limitations of this study. First, the sample size was relatively small, and therefore is likely not representative of university students. Second, study participants were composed of a convenience sample of university students enrolled in faculty of sports science. This may limit the generalizability of the findings to diverse populations. Another limitation of this study is the use of the IPAQ-Sort Form instead of the Long Form version, which is reported to provide more in depth and detailed activity data.

As a result, it can be said that there is no significant relationship between body composition variables and physical activity level of men and women with normal body mass index.

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# Effect of L-Carnıtıne used ın regular exercıse in elderly obesıs rats

İbrahim Kubilay TÜRKAY[1], Aynur BAŞALP[1]

[1]*Mehmet Akif Ersoy University , Burdur, Turkey*
*Address Correspondence to İ.K. TÜRKAY, Turkay, e-mail:* kubilay.turk.ay@/hotmail.com

**Abstract**

The aim of this study was to investigate the effect of L-Caritine supplemented elderly rats on weight loss during 12 weeks. This experimental study was carried out on experimental animals in a scientific laboratory environment, under defined conditions and according to the method of application. Therefore, the model of the research is an experimental research model. In this study, 8 obese aged rats were used for 20 months. Approximately 70 years of human life is equivalent. The rats were given special cholesterol food for obesity. In the study, L-Carnitine was administered to the experimental group 3 times a week just before the exercise, with the daily dose of the sublingual fluid administered to the rats in a suitable dose (1 gr./kg). Before the exercise + L-Carnitine application, weight measurements of the rats were recorded at the beginning of the study (day 1), in the middle of the study (day 45) and finally at the end of the study (day 90). The "IBM SPSS Statistics 22 analiz package program was used to evaluate the statistical analysis of the study. Normal distribution assumptions were evaluated with Kolmogorov-Smirnov and Shapiro-Wilk tests. In the rare cases where the two tests are contradictory, the Kolmogorov-Smirnov test result, which is more preferred in small data sets, was used. Type 1 error margin for normality tests is taken as 0.05. At the end of the study, it was determined that the weight of the old obese rats who used L-Carnitine together with the regular exercise for 12 weeks, both on the 45th and 90th days, was found.

**Key words:** Elderly obese, Rat, Regular exercise, L-carnitine, Effect

## INTRODUCTION

Exercise is a structured, systematic, activity aimed at improving physical fitness, which is organized in order to improve the physical state of the individual. The effect of regular exercise on biochemical values has become a working area. At the same time, the method, severity and duration of the exercise are scientifically proven to differ in biochemical sense (2). There are two kinds of organism response to the effect of exercise. First; the one-off exercise is the acute exercise. The other type of response is systematic, regular exercise, which is a repetitive type of exercise that represents stability (4).

Obesity is derived from the word dolayı obesiteus 'and is due to eating. Obesity as a result of unbalanced nutrition in children and adolescents; When the amount of energy taken with nutrients exceeds the amount of energy consumed by basal metabolism and bodily movement, it is a disease caused by accumulation of excess fat in the body (3). Obesity; diabetes, arteriosclerotic heart disease, hypertension, such as causing health problems, triglycerides are stored in excess of a disease (13). Because of the extra weight in the physical activities of obese patients, cardiovascular and respiratory loading is larger than normal and their physical performance is seriously affected (12). In today's society, the level of knowledge about physical activity is insufficient, the importance of physical activity for health is not understood and the adoption of an increasingly sedentary lifestyle, increasing the prevalence of chronic diseases such as obesity, cardiovascular diseases, hypertension, diabetes, osteoporosis One of the reasons was (11). Obesity; diabetes, arteriosclerotic heart disease, hypertension, such as causing health problems, triglycerides are stored in excess of a disease (13). Obesity is a serious health problem that shortens life span and reduces the quality of life. Because of the extra weight in the physical activities of obese patients, cardiovascular and respiratory loading is larger than normal and their physical performance is seriously affected (12).

Carnitine palmitoyltransferase-1 is a transmembrane protein located on the outer mitochondrial membrane, where it catalyzes the conversion of acyl-coenzyme A esters to acyl-carnitine esters (7). Carnitine increases non-

oxidative glucose excretion under euglycemic hyperinsulinemic conditions in both healthy individuals and type 2 diabetes, suggesting that l-carnitine enhances insulin action on glycogen storage (9). Carnitine administration improves insulin-induced glucose excretion, indicating that the metabolite is functioning in the interface between fatty acid metabolism and glucose metabolism (10).Human skeletal muscle oxidizes glucose and fatty acids to form ATP during physical exercise. These metabolites are derived from plasma, glycogen and triacylglycerol stores. The workload of working muscles determines the fuel that is partly consumed. During high-intensity short-term exercise (more than 75% of peak oxygen consumption), carbohydrates are the preferred fuel, while fatty acids are preferred as low-energy (less than 50% of maximum oxygen consumption) physical energy as a source of energy (8). . The increase in acetyl carnitine production during high-intensity exercise was not constantly changed by carnitine supplementation before exercise (1). The aim of this study was to investigate the effect of L-Carnitine on exercise on weight of young obese rats using L-Carnitine for 12 weeks.

## MATERİAL AND METHOD

This study was carried out on experimental animals according to experimental research model in laboratory environment, under determined conditions and application method. This study was approved by the Local Ethics Committee of Mehmet Akif Ersoy University with the decision dated 02.08.2017 and numbered 312 (Date and number of documents: 08.08.2017-E.37983- Issue: 93773921-020).

In this study, 8 obese aged rat rats were used for 20 months. Approximately 70 years of human life is equivalent.

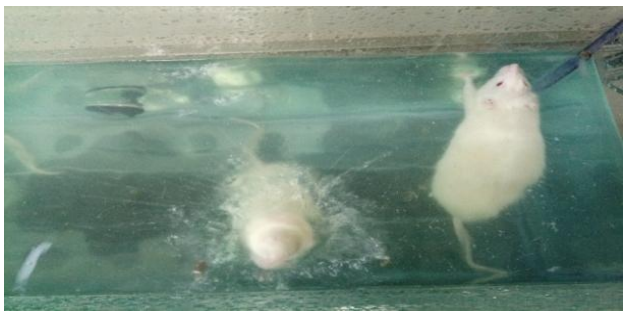

**Figure 1-2. Working Group Photos**

In the study, L-Carnitine (1 gr./kg) was given to the rats in the form of liquid sublingually with the gavage method 3 times a week before starting the exercise. In the beginning of the study (1. day) before the exercise + L-Carnitine application, in the middle of the study (45th day) and finally at the end of the study (day 90), the weight measurements of the rats were recorded with precision weighing.

**Figure 3-4. Photos for Data Collection Tools**

The "IBM SPSS Statistics 22 analiz package program was used to evaluate the statistical analysis of the study. Normal distribution assumptions were evaluated with Kolmogorov-Smirnov and Shapiro-Wilk tests. In the rare cases where the two tests are contradictory, the Kolmogorov-Smirnov test result, which is more preferred in small data sets, was used. Type 1 error margin for normality tests is taken as 0.05. In examining the time-dependent changes of the group; paired sample t test was used.

**INTERPRETATION OF ANALYSIS AND FINDINGS**

Table 1. Weight Measures and Standard Deviations of Old Obese Rats Using Regular Exercise + L-Carnitine

| Day | Egzersiz+ L-Carn. G. (gr) | (Std.) (gr) |
|---|---|---|
| 0. | 403.8571 | 4.75809 |
| 45. | 400.1429 | 3.11241 |
| 90. | 391.7143 | 3.98039 |

Table 2. Paired Samples Test Results Applied To Determine The Effect Of Time İn Terms Of Weight Variable İn Exercise + L-Carnitine Application Of Elderly Obese Rats.

| Egzersiz+L-Carnitine | Day | Mean | Std. Dev. | Std. Err. Mean | Lower | Upper | t | df | Sig.(2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| Pair 1 | 45.-0. | -3.71 | 5.25 | 1.98 | -8.57 | 1.14 | -1.87 | 6 | 0.110 |
| Pair 2 | 90.45. | -8.42 | 6.39 | 2.41 | -14.34 | -2.51 | -3.48 | 6 | 0.013 |
| Pair 3 | 90.-0. | -12.14 | 5.52 | 2.08 | -17.24 | -7.03 | -5.82 | 6 | 0.001 |

**CONCLUSION AND EVALUATION**

In Table 1, the average of the weight of the exercise + L-carnitine group of aged obese rats was determined as 0, 403,8571gr. According to this, the exercise of aged obese rats + L-carnitine group was found to lose weight regularly in every measurement in 3 months period.

In Table 2, in the ıpaired samples, test results applied to determine the effect of time in exercise + L-carnitine group of elderly obese rats, no significant weight difference was found between day 0 and day 45. (t6 = -1,872, p value) = 0.110). According to this result; In the transition from day 0 to day 45, the mean weight of rats was -3,71429 (± 1,98463) g, but there was no statistical significance. A statistically significant difference in weight was found between days 45 and day 90 (t6 = -3,485 (± 2,41875) g, p value = 0,01). In line with this result; In the transition from day 0 to day 45, the mean weight of rats was -8,42857 (± 2,41875) g. A significant weight difference was determined between day 0 and day 90 (t6 = -5,820, p value = 0,001). According to this result; In the transition from day 0 to day 90, the mean weight of rats was -12,14286 (± 2,08656) gr.

According to these results, L-Carnitine, which is an amino acid derivative which activates fatty acids, has been found to provide support in every measurement in weight reduction of elderly obese rats when combined with regular exercise. In other words, elderly obese rats are approximately 3.5% of their weight in the first three months. have experienced a decline. If we adapt this result to people, a 65-year-old elderly and obese person will lose weight by 14% every one to three months if he / she gives a 3.5% weight to his / her own weight with regular exercise and L-Carnitine support every three months. In this way, it will be possible to get rid of obesity in a few years. Azuma T. et al. (2011) examined the effects of exercise training on the immune system, oxidative stress and weight in obese rats fed 42 high-fat diets and found that regular exercise resulted in favorable changes in oxidative stress and weight loss. This study is similar to our study. Moruguchi S. et al., A genetically obese Zucker, found significant changes in their sugar content and weight reduction, although they could not achieve a complete change in their immune system during 40-day exercise in mice. This study is similar to our study.

As a result, L-Carnitine was found to lose weight in obese rats with regular exercise applied to elderly obese rats.

**Suggestions**

- Based on these results, elderly obese individuals may also be recommended to use L-Carnitine in addition to regular exercise in order to lose weight.
- The incentives for regular exercise may be increased by the state to increase the quality of life of elderly obese individuals and to ensure a healthier and longer life.
- The only thing that will best support L-carnitine supplementation to be used with regular exercise is careful nutrition. Therefore, in order to prevent weight gain in terms of quality of life in elderly obese individuals, necessary information support should be provided by doctors, specialists or physical education teachers.

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# Fitness profiling in women soccer: performance characteristics of elite Turkish women soccer players

*İbrahim CAN[1], Aras Beka YASAR[1], Serdar BAYRAKDAROGLU[1], Beyza YILDIZ[1]*

*Gumushane University, School of Physical Education and Sport, Gumushane, TURKEY*

*Address Correspondence to İ. Can, e-mail: ibrahimcan@gumushane.edu.tr*

**Abstract**

The aim of this investigation was to evaluate an overall performance of the elite women football players. In accordance with this purpose, 11 women football players (age: 21,5 ± 2,58 years; height: 160,8 ± 5,17 cm; weight: 55,8 ± 7,23 kg) who plays in Turkish Women's 1st Football League participated voluntarily. In order to measure athlete's aerobic capacity, Yo-Yo intermittent recovery test (Yo-Yo IR1) was applied and maximal oxygen uptake ($VO_{2max}$) values were estimated by using running distances obtained from the test results. The Wingate anaerobic power test (WanT) to measure the athlete's anaerobic properties, the vertical jump (VJ) and standing long jump (SLJ) tests to determine explosive power, the Illinois agility test to measure agility skills, 10 and 30 meters sprint runs to measure sprint performances, hand grip and back-leg strength tests to measure strength characteristics were used. In order to obtain power and velocity parameters, loaded-squat jump ($SJ_{Loaded}$) was applied with an resistance that equaled to 40% of body weight and bench throw (BT) was applied with an resistance that equaled to 30% of body weight of the participants by applying an isoinertial device and results of peak power (PP), peak velocity (PV), mean propulsive power (MPP), and mean propulsive velocity (MPV) during both movements were recorded. Statistical analysis was used in the assessment of the data. According to analysis results, it was achieved that Yo-Yo IR1 running distances was as 676,3 ± 156,4 meters, while $VO_{2max}$ values of athletes were estimated as 42,2 ± 1,20 $ml/kg^{-1}/min^{-1}$. Relative and absolute anaerobic power values for elite women football players were obtained as 439,7 (± 61,18 W) and 8,04 (± 1,09 W/kg) for maximal anaerobic power, 316,1 (± 34,46 W) and 5,78 (± 0,56 W/kg) for maximal anaerobic capacity, 193,6 (±22,30 W) and 3,55 (± 0,61 W/kg) for minimal anaerobic power, respectively. In addition, fatigue index values measured as 55,7 (± 3,75 %). Participant's right and left hand grip strength values were obtained as 30,6 (± 4,62 kg) and 29,6 (± 4,5 kg), back and leg strength values measured as 90,2 (± 18,7 kg) and 101,8 (± 29,5 kg), respectively. Participant's 10 and 30 meters sprint duration were obtained as 1,85 (± 0,12 sec) and 4,96 (± 0,34 sec). SLJ, VJ and agility values were obtained as 178,4 (± 21,1 cm), 35,7 (± 4,60 cm) and 17,6 (±0,67 sec), respectively. Velocity and power values for athletes during BT movement were obtained as 1,21 (± 0,10 m/sec) for MPV, 2,04 (± 0,18 m/sec) for PV, 353,6 (± 83,2 W) for MPP and 666,3 (± 152,1 W) for PP. In response to this, velocity and power values for athletes during $SJ_{Loaded}$ movement were obtained as 1,21 (±,10 m/sec) for MPV, 2,04 (± ,18 m/sec) for PV, 353,6 (± 83,2 W) for MPP and 666,3 (± 152,1 W) for PP. As a result, although there are many studies on physical or physiological characteristics of elite male footballers, the literature on the overall performance characteristics of women football players are limited. It is thought that the results obtained are important to fill this lack in the literature and will be the reference source for future research.

**Key Words:** Football, Fitness, Performance, Women

## INTRODUCTION

In a football match, 80-90% of the performance is reported to be spent with moderate and low intensity walking and running while the remaining part is spent with high intensity activities (7, 15, 79, 82). Various acceleration and decelerations, frequent change of activity, directional change, unusual movement patterns and application of various technical abilities make a significant contribution to energy expenditure (79). Today, about 20 million women play football and this number equals to almost 10 % of the sum of women and male football players all over the world. It is stated that the number of registered women football players increased by more than 50% in 2006 (young and senior level). The number of recreactional and professional leagues and international events for women footballers in different age categories has grown substantially in late years. This allows a wide range of women football players to practise and contend in professional environment. There is also an increased need for specific studies that can assist improving the women football players' performance expectations and performance levels (61).

It has argued that a very good anaerobic capacity and a well-enhanced aerobic fitness are prerequisites for succeeded performance in women's football (65).In a study, it was shown that elite women footballers do an mean of 1459 (1336-1529) activities at a varying intensity of changing every 4 seconds per match and the number of running at high intensity is 125 (72-159) on average with a time changing per 2-3 seconds (51). In studies conducted by different authors and using different measurement techniques, it was found that women football players had a distance of 8.5-10.3 km in a football match (1, 2, 28, 33, 40, 65).

Due to the duration of a football game, aerobic capacity is extremely important for footballers (93). One of the most fundamental component determining success in an aerobic endurance sport is maximal oxygen uptake ($VO_{2max}$) (39). $VO_{2max}$, expressed as the highest amount of oxygen the organism can use during one minute of exhausting exercise (43), indicates the individual's cardiovascular fitness (13). That is, it reflects the capacity of the oxygen delivery system for muscle work and shows the oxygen used by the muscles during exercise (41). $VO_{2max}$ values of women football players were obtained to be 42-57 $ml.kg^{-1}.min^{-1}$ (25, 28, 30, 33, 38, 47, 51, 57, 64, 65, 71, 75, 81, 88, 90, 95, 97, 98). A player having a high $VO_{2max}$ value has the high energy storage required for energy release and a better recovery rate (43).

Most of the movements in one match are executed without the ball and mostly cover the aerobic exercises while intense anaerobic exercises are made during the movements that bring the game to its conclusion (80). According to the volume of the match, the athletes have to make sprint throws, get into the ball-fighting struggle, changing directions fast, jogging and shuttle runs. In those cases where the density increases, anaerobic metabolism is effective while aerobic metabolism is active in cases where concentration is regular and under the submaximal level (93). Anaerobic performance is the ability of the individual to maximally performing anaerobic exercise. The ability to produce the highest mechanical power (anaerobic power - peak power) in a few seconds and to sustain high power efficiency (anaerobic capacity - mean power) in short time is considered to be the main indicators of anaerobic performance (46). Anaerobic power and capacity is often used according to the consumption of two different anaerobic energy systems (48).

Today's football matches are played faster and at higher intensity. Capacity to perform different high intensity activities is important in match performance (53). Although high intensity movements contribute to the distance covered only for ~11%, they constitute the most important movements of the match and scoring a goal or possession of the ball make a direct contribution (80). Sprint is a high-intensity activity which takes place about each 90 seconds, every ending at an average of 2-4 seconds in a football match. This corresponds to 0.5-3.0% of the efficient playing duration, i.e. the duration of playing with the ball. It has also been found that virtually all of sprints (~ %96) in the games are shorter than 30 meters and a large generality is shorter than 10 meters (6, 78).

Jumping performance assesses the leg strength and is closely associated with sprint performance (74, 102). It is fundamental to arrive maximal speed at the moment of sprint and maximal speed depends on explosive strength (19). Explosive power and sprint rapidness are two interrelated physiological traits at high-intensity that contribute to football performance (66, 83, 93). Explosive power is essential for the skills that are very important in the football such as jumping, sprinting and turning (9, 77, 93, 101).

Most of the football moves require fast turns. In other words, it denotes the player's fast turns in the opposite direction or to the ball. These fast turns are often called agility (103). Agility composed of the combination of equilibrium, speed, condition and strength is described as the skill to change direction in a fast and accurate way at the moment of a movement series (34, 73, 99).

Kinetic and kinematics associated with resistance workout are thought to be an fundamental stimulant in the formation of neuro-muscular adaptations (27). The maximal strength, described as the maximal strength produced by a muscle or muscle groups in the neuromuscular system at the moment of maximal contraction without any time constraint, is expressed as a repetitive maximal or 100% of maximal and denotes the heaviest weight that the athlete can lift at one time (16). Although the terms of strength and power are sometimes used interchangeably, this is not the right approach. Because power, which is one of the fundamental elements of sporting performance, has a time component and is the mechanical amount described as the temporary ratio of the work done

(power= work/time), and it usually depends on the ability to create the highest possible strength (maximal strength) (67, 94). It is important to calculate the power for three different reasons. These are as follows; (1) to designate the optimal loading for resistance workout, (2) to evaluate the influence of strength workout and (3) to predict the exercise performance (49).

It is very important to apply the strength in a very short time in the athletic performance. Thus, it is necessary to display the highest possible strength in a very short time in many movements taking place in less than a second (84). The velocity, which is a vector amount, is expressed as the time-related ratio of change in the any position (104). The concentric contraction velocity of a muscle is inversely proportional to the external force or the load applied. When the executed strength is zero, the contraction rate of the muscle is the greatest. When the strength raises to a level equal to the maximal strength which strains the muscle, the rate of contraction becomes zero (12). In other words, the strength that the muscle produces increases but the speed of movement decreases as the weight increases.

There are many studies on the physiological and physical features of elite male footballers and the desires for games in the Turkish population. However, despite the increasing professionalization and popularity of women football worldwide, the studies on women's football are limited and we predict that this study will be valuable for the sports science literature. Therefore, the aim of this research is to make a general evaluation on the athletic performance characteristics of elite women football player.

## METHODOLOGY

### Participants

In this study, 11 women footballers (age: 21.5 ± 2.58 years; height: 160.8 ± 5.17 cm; weight: 55.8±7.23 kg) from Turkish Women's 1st football league voluntarily participated. The health condition of the participants is good and they don't use any drugs that may negatively affect the variables analysed. At the beginning of the study, players signed an approval document stating that they voluntarily attend in the investigation.

### Procedures

### Height and Weight Measurement

The height and weight measurements of players were obtained by using a Seca 769 (Seca Corporation, Hamburg, Germany) electronic measuring instrument with an accuracy of the 0.001 meter and 0.01 kg respectively.

### Yo-Yo Intermittent Recovery (Level 1) Test

Athletes' running distances were obtained by using the Yo-Yo intermittent recovery level 1 (Yo-Yo IR1) test designed by Bangsbo (8) to determine the aerobic features of the athletes competing in team or individual sports. In this test, the athletes were made a 2x20 meter shuttle run at a gradually increasing speed within the running area determined by the cones. Each running area has another cone which is put 5 meters behind the starting point and demonstrates the recovery region. At the end of each 40-meter run, the athletes were told that they had 10 seconds to recover and they had to walk slowly or jog in the recovery zone. Afterwards, the athletes were told to stand on the starting point and wait for the signal for the next run. Running speeds were determined with audible signal sounds coming from a CD. The test was terminated when a subject was exhausted or when s/he failed to reach the finish line twice (10).

### Maximal Oxygen Uptake

The maximal oxygen uptake ($VO_{2max}$) values of the participants were estimated by using the following formula according to the Yo-Yo AT1 test result.

$VO_{2max}$ ($ml.kg^{-1}.min^{-1}$)= IR1 running distance (m) X 0.0084 + 36.4 (10).

### Maximal Heart Rate

The maximal heart rate ($HR_{max}$) values of the athletes in the IR1 test were obtained by using the heart rate monitor (Polar M400, Finlandiya) when the test was completed.

### Vertical Jump Test

After a general 10-minute warm up, athletes were subjected to a vertical jump (VJ) test. First, standard arm lengths were determined in front of the test platform and then they were asked to jump as high as possible. At the end of the test, the distance between the jump distances and standard arm lengths of the subjects was calculated and the jump distances were recorded in centimetres (56). The VJ test was performed twice by allowing adequate resting time and the best score was recorded for analysis.

**Standing Long Jump Test**

After a 10-minute warm-up, the athletes performed a standing long jump (SLJ) test to determine their explosive leg strength. In this test, participants were asked to open their feet at shoulder width and to jump forward by bending their knees as their toes were behind the specified line. The distance between the toes of the participants at starting line and the place of heels where they landed was calculated and recorded in centimetres (56). The SLJ was performed twice by allowing adequate resting time and the best test value was recorded for analysis.

**Sprint Performance**

After a 10 minute warm-up, the athletes performed 10 and 30 m sprint run three times in the a static position (after 0 m back of the first photocell) with a 3-minute recovery period between each test period. Sprint times were determined by using an electronic photocell (Newtest Powertimer System, Newtest Oy, Oulu, Finlandiya)

**Agility Test**

The Illinois agility test designed by Getchell (32) was utilized to determine athletes' acceleration, directional change and agility characteristics. In this test, the 10 meter-long and 5 meter-wide test area was marked with 4 cones (start, finish and two turning points). There are 4 more cones in the middle of the test area, each with a 3.3 meter gap between them. An electronic photocell (Newtest Powertimer System, Newtest Oy, Oulu, Finlandiya) was placed at the start and finish points. The test consists of 40 m straight run and 20 m slalom (zigzag) runs between cones with 180 ° turns every 10 meters. When the participants felt ready, the test was initiated while the participants were in a supine position and the hands were in contact with the ground at the shoulder-length and it was tried to be finished as soon as possible. Before the test started, the participants were allowed to make trials in order to be used to test area. To obtain the best performance, the test was applied twice with a 3-4 minute recovery period between each repetition and the best test time was recorded in seconds (56).

**Hand Grip Strength Measurement**

Athletes' hand grip strength values were obtained from both the right hand and the left hand by using a digital strain gauge dynamometer (Takei TKK5401 Takei Scientific Instruments, Tokyo). During the measurements, the participants were allowed to extend their elbows provided that they did not touch their arms or bodies to the dynamometer. According to the standard arm position proposed by the American Society of Hand Therapists (ASHT) for the hand grip test, it is especially necessary for the participants to get their shoulders closer and rotate them independently, with their elbows bent 90º and sitting with their forearms and wrists in a neutral position (31). It was stated that the subjects had to be in a standing position, grasp the dynamometer with their dominant hand and apply maximal pressure gradually for at least two seconds until the grade was recorded. After recording the result, non-dominant hand was measured. The movable part of the dynamometer handle was adjusted in a way to reach the first phalange of ring finger. Athletes were permitted two trials with both hands and the best results for both hands were recorded with an accuracy of 0.1 kg.

**Back and Leg Strength Measurement**

Back and leg strength values of the athletes were obtained by using back and leg dynamometer (Takei TKK5402 Takei Scientific Instruments, Tokyo).The legs were twisted in the leg strength measurement and the knees in a tensioned position in the back strength measurement. After the participants placed their legs on the dynamometer with their knees bent in leg strength measurement and the knees stretched in back strength measurement, they pulled up the dynamometer bar vertically with their arms stretched, their backs straight and their bodies leaning forward slightly (41). For each movement, the measurements were repeated twice and the best results were recorded with an accuracy of 0.1 kg.

**Anaerobik Performans**

The Wingate Anaerobic Power Test (WanT) was utilized to obtain the anaerobic capacity and power values of participants. First, the subjects were informed with regard to test procedure in detail and then the test was conducted by using a computer ergometer (Monark 839E Sweden) with a compatible software and connected to a computer modified for leg. WanT is the most popular cycle ergometer test used to achieve anaerobic performance (23, 44) where the subject pedals against a resistance designated by the subject's body mass as fast as possible (5, 17). Developed at the Wingate Institute Research and Sports Department

in Israel (96), this test is considered to be a laboratory test (11) that provides information on both lactacid (anaerobic capacity) and alactacid (anaerobic power) composition of anaerobic performance (14, 70). Before the test, a 5-minute warm-up protocol was applied to the participants to help hem familiarize with the test protocol. At the beginning of the test, the subject pedalled for a few seconds without a load to reach the pedal speed established. When the subject reached the predetermined pedal speed without load, a load corresponding to 7.5% of the body weight of each subject was applied as resistance and the subject tried to pedal at high speed for 30 seconds against this resistance created by this load. Pedal counts were recorded for every 5 seconds and all power parameters were calculated absolute and relative values with a computer software (11, 23, 24, 45, 46, 76, 96). The parameters obtained during the Wingate anaerobic power test are given below (72).

Peak Power (Maximal Anaerobic Power): It is the highest mechanical strength achieved during any 5-second time period during the test.

Mean Power (Maximal Anaerobic Capacity): It is the average strength produced during the test.

Minimal Power: It is the lowest mechanical strength achieved during any 5-second time period during the test.

Fatigue Index: It is the percentage expression of power reduction during the test. It is found by dividing the difference between the highest power value and the lowest value obtained in any 5 second time period during the test by the highest power obtained.

**Bench Throw and Loaded-Squat Jump Movements**

The bench throw (BT) movement was applied to the participants on a Smith machine (Esjim IT7001, Eskisehir, Turkey). The reason for BT movement is applied by using a smith machine instead of free weights is that this machine can provide accurate and reliable measurements by limiting the movement in the vertical direction (49). Before BT movement, the participants were applied a 20-min warm-up protocol comprised of 15 min of general (5 min of upper and lower-body stretching following a moderate running) and 5 min of particular exercises (bench press and bench throw trials at sub-maximal degree). After warm-up, subjects were stated to apply BT movement 3 times at maximal velocities with an resistance equaled to 30% of their weight. It was stated that participants had to lower the barbell in a restrained form until they touched the chest slightly during the BT movement and then throw it as fast and as high as possible together with the start command (54).

Before loaded-squat jump ($JS_{Loaded}$) movement, the subjects were applied a 20-min warm-up protocol comprised of 15 min of general (10 min of running following 5 min of upper and lower-body stretching) and 5 min of particular exercises (squat attempts at sub-maximal degree). After the warm-up, participants were subjected to a $JS_{Loaded}$ test with an resistance that equaled to 40% of their weights by using free weights. During this trial, participants were requested to bring their knees to the flexion from the static position until their thighs were parallel to the ground and after the start command, they had to jump as fast as possible without allowing their shoulders to lose touch with the barbell and repeat this movement 3 times (55). If these requirements were not met, the motion was repeated. Because, addictively the external load during the $JS_{Loaded}$ test, the body weight must be moved and the speed and power parameters must be determined via the ability of the participants to accelerate total mass (body mass and external load) (26).

A linear converter (T-Force Dynamic Measurement System; Ergotech Consulting S.L., Murcia, Spain) was connected to the last part of the barbell in order to obtain the power (MPP: mean propulsive power; PV: peak power) and velocity (MPV: mean propulsive velocity; PV: peak velocity) parameters during the bench throw and loaded-squat jump movements. The use of this system is especially proper for any weights lifting workouts or any resistance training exercise in which it is necessary to overcome a load (a constant mass) moving along the vertical axis against gravity. The system includes an electromechanical equipment (interface and velocity sensor), a special computer program (T-force system software) that manages this equipment and a hook connected to the barbell. The velocity sensor is usually placed on the ground and measures the speed of the loads lifted by measuring how quickly the 2-meter cable is pulled and dropped through a tachogenerator with a high sensitivity within the aluminium body. In other words, the sensor provides the current proportional to the movement of the cable and allows the velocity to be directly determined in the loads where the movement is made. The cable is made of

nylon-coated stainless steel and has a diameter of 0.50 mm. The tension of wire (5N) can withstand large accelerations, so using this system for sudden sports activities such as jumping, pulling and lifting will not be a problem. Computer transmission interface includes an electronic data acquisition board equipped with 14-bit resolution. It is connected to the computer via a USB port which allows very fast and reliable data transfer. The sampling frequency of the data obtained is fixed at 1000 Hz. This means that instantaneous speed data in each Ms is obtained. A specifically designed hook is used to connect the power converter cable to the weight training barbell (85, 86).

**Statistical Analysis**

SPSS version 16.0 (SPSS Inc, Chicago, IL) was used for all data analyses. Descriptive statistics analysis method was used in data assessment.

**RESULTS**

Descriptive statistical results for some performance parameters of participants are indicated in table 1, the statistical results for the power and velocity values in $SJ_{Loaded}$ and BT exercises are shown in table 2 and the statistical results for absolute and relative anaerobic power values are indicated in table 3.

Table 1. Results of the elite women football players according to some performance variables

| Variables | n | Minimal | Maximal | Mean (sd) |
|---|---|---|---|---|
| Right hand grip strength (kg) | 11 | 24.9 | 41.6 | 30.6 (± 4.62) |
| Left hand grip strength (kg) | 11 | 23.5 | 39.3 | 29.6 (± 4.50) |
| Leg strength(kg) | 11 | 62.5 | 151.0 | 101.8 (± 29.5) |
| Back strength (kg) | 11 | 66.1 | 124.5 | 90.2 (± 18.7) |
| Standing long jump (cm) | 11 | 130 | 210 | 178.4 (± 21.1) |
| Vertical jump (cm) | 11 | 30 | 44 | 35.7 (± 4.60) |
| Agility (sec) | 11 | 16.73 | 19.01 | 17.6 (± .67) |
| 10 meters sprint (sec) | 11 | 1.70 | 2.07 | 1.85 (± .12) |
| 30 meters sprint (sec) | 11 | 4.57 | 5.56 | 4.96 (± .34) |
| Yo-Yo IR1 test (m) | 11 | 480 | 960 | 676.3 (± 156.4) |
| $HR_{max}$ (beat/$sec^{-1}$) | 11 | 185 | 194 | 187.9 (± 2.50) |
| $VO_{2max}$ (ml/$kg^{-1}$/$sec^{-1}$) | 11 | 40.7 | 44.4 | 42.2 (± 1.20) |

Table 2. Results of the some kinetic and kinematic parameters during loaded-squat jump and bench throw movements of the elite women football players

| Variables | Bench Throw | | | | Loaded-Squat Jump | | | |
|---|---|---|---|---|---|---|---|---|
| | n | Minimal | Maximal | Mean (sd) | n | Minimal | Maximal | Mean (sd) |
| Load (kg) | 11 | 13.5 | 20 | 16.7 (± 2.31) | 11 | 17 | 25 | 21.8 (± 2.56) |
| Displacement (cm) | 11 | 57.9 | 89.6 | 77.2 (± 9.81) | 11 | 44.4 | 76.4 | 62.5 (± 8.61) |
| MPV (m/$sec^{-1}$) | 11 | 0.74 | 0.95 | .85(± .07) | 11 | 1.03 | 1.35 | 1.21 (± .10) |
| PV (m/$sec^{-1}$) | 11 | 1.32 | 1.66 | 1.44 (± .10) | 11 | 1.81 | 2.32 | 2.04 (± .18) |
| MPP (W) | 11 | 102.7 | 181 | 140.1 (± 26.8) | 11 | 237.7 | 467.1 | 353.6 (± 83.2) |
| PP (W) | 11 | 196.7 | 325.8 | 273.6 (± 43.6) | 11 | 472.8 | 882.3 | 666.3 (± 152.1) |

MPV: Mean Propulsive Velocity; PV: Peak Velocity; MPP: Mean Propulsive Power; PP: Peak Power

Table 3. Results of the elite women football players according to absolut and relative anaerobic power values

| Variables | n | Minimal | Maximal | Mean (± sd) |
|---|---|---|---|---|
| MAP (W) | 11 | 317.2 | 512.0 | 439.7 (± 61.1) |
| MAP (W/kg) | 11 | 5.97 | 9.41 | 8.04 (± 1.09) |
| MAC (W) | 11 | 251.3 | 357.0 | 316.1 (± 34.4) |
| MAC (W/kg) | 11 | 4.46 | 6.38 | 5.78 (± .56) |
| MinP (W) | 11 | 147.8 | 227.2 | 193.6 (± 22.3) |
| MinP (W/kg) | 11 | 2.48 | 4.04 | 3.55 (± .48) |
| FI (%) | 11 | 50.8 | 59.8 | 55.7 (± 3.75) |

MAP: Maximal Anaerobic Power; MAC: Maximal Anaerobic Capacity; MinP: Minimal Anaerobic Power; FI: Fatigue Index

## DISCUSSION

Athletic performance in football depends on many factors such as aerobic-anaerobic capacity, agility, speed, muscle power and strength (9, 93). A high degree of physical fitness provides the physiological basis for the players to compete with the physical requirements of matches and allows them to perform their tactical and technical skills effectually particularly towards end of the game in which fatigue starts to be felt (8). The evaluation of the physical capacities of players may indicate the demonstration of physical requirements at a certain period of the game. Since athletes must be able to adapt to the game's requirements to be succeed at the levels of competition. It is also stated that the physical requirements of the football occur more apparent as the levels of struggle increases (80).

There are many ways to determine the physiological features of athletes and the physical requirements of the match being done. Most of the field and laboratory tests such as shuttle run tests on the field or treadmill tests to determine $VO_{2max}$ values have been designed to determine physical performance (50). Although the values obtained on the treadmill test are considered to be the "gold standard" for measuring aerobic power, there is a need for training staff, expensive equipment and a long time (4, 22, 36). So, simple and inexpensive field tests applied to a large group of subjects were designed as alternative tests (92). Yo-Yo IR tests are one of the recently used tests. The IR1 test is a nice indicator of the ability of elite women footballers to run at high intensities during the competition-based games and can also be utilized as a demonstration of physically game effort (51).

Looking at the studies conducted on the Yo-Yo AT1 performance of women football players, it is stated that according to Sezgin *et al.,* (88) the average running distance of the elite Turkish women football players is 676 m and the running distance of elite and lower-level women football players of Hong Kong is 673.3 m and 630.0 m respectively as stated by Man (57). These finding are similar to those reported in the current research. In this study, the average IR1 running distance of elite women football players has been found to be 676.3 (± 156,4 m). As different from the finding of this research, Milanovic *et al.,* (63) have reported that the test results for women athletes from the Serbian national team playing in different positions range from 880 to 930 m. Mujika *et al.,* (66) have stated that average running distances of young (17.3 ± 1.6 years) and older (23.1 ± 2.9 years) elite women football players are 826 (± 160 m) and 1224 (± 255 m), respectively. In the study conducted, the running distances of the elderly football players in the IR1 test are 48% higher than the young elite women. Krustrup *et al.,* (51) have stated that average running distance of women football players competing in the 1st League of Denmark is 1379 m on the IR1 test. In addition, while the IR1 distance of NCAA women football players has been found to be 1097 (± 100 m) (90); the test distance of women footballers in American üniversities have been obtained as 1120 (± 297 m) (58). Martinez-Lagunas *et al.,* (59) have established that Yo-Yo IR1 running distance of German women football players at different levels is 1102 (±316 m) for the women football players in the 2nd league and 886 (±399 m) for women players in the 4th league. The findings obtained in the current research show parallelism with the findings obtained in the studies of Sezgin *et al.,* (88) and Man (57); however, they are significantly lower than the results obtained in other studies. It can be argued that this difference is due to the fact that elite Turkish women football players have a worse condition level.

There are many researches in literature conducted to determine maximal oxygen uptake ($VO_{2max}$) values of women football players indirectly by using field tests and directly by using laboratory tests. In previous studies, $VO2_{max}$ values of Turkish women football players were obtained to be 42.08 $ml.kg^{-1}.min^{-1}$ (88) and 43.1 $ml.kg^{-1}.min^{-1}$ (95). $VO2_{max}$ values are 43.3 $ml.kg^{-1}.min^{-1}$ for Hong Konger women footballers (57), 57.6 $ml.kg^{-1}.min^{-1}$ for Danish elite women football players (47), 49,4 $ml.kg^{-1}.min^{-1}$ (51) and 52.3 $ml.kg^{-1}.min^{-1}$ (52) for women football players in the 1st league of Denmark, 49,8 $ml.kg^{-1}.min^{-1}$ for women football players in the 1st league of Italy (30), 51.4 $ml.kg^{-1}.min^{-1}$ for Australian national women football team (33), 53.5 $ml.kg^{-1}.min^{-1}$ for Serbian elite women football players (71), 53.9 $ml.kg^{-1}.min^{-1}$ for NCAA 1st league women football players (90), 54.0 $ml.kg^{-1}.min^{-1}$ for elite Norwegian women football players (38), 45.1 $ml.kg^{-1}.min^{-1}$ for Spanish 1st league women football players (3), 53.9 $ml.kg^{-1}.min^{-1}$ for women footballers in Czech Republic premier league (18), 47.9 $ml.kg^{-1}.min^{-1}$ for Australian international women football players (25), 48.4 $ml.kg^{-1}.min^{-1}$ for British international women football players (28), 54.8 $ml.kg^{-1}.min^{-1}$ (40) and 48.5 $ml.kg^{-1}.min^{-1}$ (98) for Australian women players of national football team

and 51.4 ml.kg$^{-1}$.min$^{-1}$ for Australian 1st league women football players (33). Todd *et al.,* (97) have found that average $VO_{2max}$ values of British professional, international and regional women football players are 45.0 ml.kg$^{-1}$.min$^{-1}$, 46.8 ml.kg$^{-1}$.min$^{-1}$ and 43.9 ml.kg$^{-1}$.min$^{-1}$ respectively. Martinez-Lagunas and Hartmann (60) have obtained the estimated $VO_{2max}$ values of the elite German women football players as 49.9 (± 4.9 ml.kg$^{-1}$.min$^{-1}$) in IR1 test. In the present study, the estimated average $VO_{2max}$ values of women footballers in the elite level according to the IR1 test results were found as 42.2 ml.kg$^{-1}$.min$^{-1}$. Compared with the finding obtained for the elite women football players in the literature, it is seen that the results of our study are lower. This difference is due to the fact that elite Turkish women football players have lower aerobic capacity. Actually, when looking at the IR1 distances in the current research, elite Turkish women football players seem to cover a lower distance. Given that the $VO_{2max}$ values are also obtained from the Yo-Yo AT1 running distance inferentially, it is an expected result to obtain a low average $VO_{2max}$ value.

Since the amount and volume of blood in women is low, the heart needs to work faster to send the oxygen needed to the required tissues. This makes the heart to be tired quickly. Therefore, it is stated that women have low heart rate volume and high heart rate counts (87). In this study, average $HR_{max}$ values of elite Turkish women football players has been found to be 187.9 beats/min$^{-1}$. Ostojic (71) found the $HR_{max}$ values of Serbian women football players as 183.1 beats/min$^{-1}$ and average $HR_{max}$ values of Danish elite women players in the match were found to be 186 beats/min$^{-1}$ by Krustrup *et al.,* (51). Sezgin *et al.,* (88) and Sjökvist *et al.,* (90) have found the $HR_{max}$ values of women footballers in IR1 test as 184 and 194.9 beats/min$^{-1}$ respectively. The maximal heart rate counts were determined as 184 beats/min$^{-1}$ for Spanish 1st League women football players (3), 193 beats/min$^{-1}$ for Czech Republic Premier League women football players (18), 202 beats/min$^{-1}$ for Australian international women football players (25). In this study, it is seen that the $HR_{max}$ values of elite Turkish women football players are lower than $HR_{max}$ numbers reported in other researches conducted on elite women footballers. Considering the Yo-Yo IR1 distances of the subjects, it can be argued that this difference is due to the fact that subjects did not push themselves too hard and they finished running test without allowing $HR_{max}$ values rise further. Since motivation and willingness are important factors for realistic performance of the participants in field tests. Furthermore, the test is terminated when the athlete fail in order to arrive the finish point twice in the specified duration in the Yo-Yo IR1 test according to test rules. For this reason, even if the subjects have enough energy to continue running, they may complete the running test without reaching the maximal heart rate when the test is terminated as per the rules, which may result in lower running distances and heart rate counts.

Explosive power is essential for very important abilities (e.g. jumping, sprinting, turning) in football (9, 77, 83, 93, 101).In this study, the VJ and SLJ tests were applied to identify the explosive power features of the women footballers and the jump distances were obtained as 35.7 cm for the vertical jump test and 178.4 cm for the standing long jump test. Looking at literature, average vertical jump height is 35.6 cm (42) and 40.5 cm (98) for Australian women footballers, 35.3 cm for elite Turkish football players (95), 35.4 cm for women football players in Turkish 1st League (21), 37.8 cm for Danish elite women players (47), 35.0 cm for women football players of Danish 1st League (52), 39.3 cm for British elite women football players (75), 47.6 cm for Serbian elite women football players (71), 30.7 cm for football players of Norwegian national team and 28.1 cm for the 1st League women football players (37). Smith *et al.,* (91) reported an average vertical jump height of 42.8 cm and 38.3 cm respectively for the 1st and 3rd league college women football players. Todd *et al.,* (97) reported that vertical jump height for the British professional, international and regional women football players were as 49.0, 47.8 cm and 46.6 cm, respectively. Göral ve Göral (35) obtained the vertical jump height of Turkish women footballers as 31.3 (± 2.61 cm).

Sprint is a very important characteristic of achievement in football and short sprint tests as 10 and 30 meters are widely used for determining sprint ability (42). In this study, times in the sprint tests applied to determine the sprint performances of elite Turkish women football players have been found as 1.85 (±.12 sec) for 10 meters and 4.96 (±.34 sec) for 30 meters. McCurdy *et al.* (62) have obtained that the 10 and 25 meters test scores of women football players are 2.31 and 4.52 sec, respectively. In studies conducted on Australian women footballers, Hoare & Warr (42) obtained 5, 10 and 20 meters sprint times as 1.23 sec, 2.08 sec and 3.63 sec,

respectively while Tumilty & Darby (98) achieved 20 meters sprint times of players as 3.31 sec. In addition, according to Todd *et al.,* (97) have stated that the 5 and 30 meters sprint times of British professional, regional and international women football players are 1.04 sec & 4.64 sec, 1.07 sec & 4.70 sec and 1.02 sec & 4.62 sec., respectively. Krustrup *et al*., (52) have found 30 meters sprint running values of Denmark 1st league women football players as 4.86 sec while Haugen *et al,* (37) have found 4.35 sec for the players of Norwegian national women football team and 4.43 sec for the 1st league women football players and 4.58 sec for the 2nd league women football players. In a study conducted by Göral and Göral (35) on Turkish women football players, the sprint speed of 30 meters was obtained as 5.67 sec.

The agility, which is expressed as a quick change of direction, is stated to be affected from balance, flexibility, muscular coordination and explosive power (89). In addition, agility is a physiological precondition in football due to the fact that players often make sudden changes of direction to be efficient in the match (66, 80). In this study, agility values of elite Turkish women football players have been found to be 17.6 (±.67 sec). Concerning the literature, it is observed that various tests have been used for measuring the agility skills of women football players. Vescovi and McGuigan (100) have reported that the pro-agility and modified Illinois agility test values of college women football players are 4.88 sec and 10.24 sec., respectively. Hoare and Warr (42) have used the 505 agility test to assess the agility characteristic of Australian women footballers and achieved a mean value of 2.75 sec.

Wingate anaerobic power test (WanT) usually measures peak power (PP), mean power (MP) and fatigue index (FI) values. PP is the highest mechanical power achieved throughout any 5-second time period in the test and the power in this duration predominantly reflects the ATP-PC (alactic) system. MP is the average power obtained throughout 30 second test period and predominantly reflects the anaerobic glycolysis energy system in the muscle. FI is the percentage expression of the reduction in power produced at the time of testing which shows the total capacity of emergency and short-time energy systems and ATP generating systems. In other words, it is obtained by dividing the PP value the difference between the minimal power and PP attained in any 5-second time period during the test (11, 20, 23, 24, 76).

In this study, the absolute and relative anaerobic power values of elite Turkish women football players have been found to be 439.7 (±61.18 W) and 8.04 (±1.09 W/kg) respectively for maximal anaerobic power, 316.1 (±34.4 W) and 5.78 (±.56 W/kg) for maximal anaerobic capacity, 193.6 (±22.3 W) and 3.55 (±.61 W/kg) respectively for minimal anaerobic power and fatigue index values have been found as 55.7 (±3.75 %). There is a limited information on the anaerobic power values of women footballers in the literature. In a study comparing the anaerobic values of Greek 1st league women football players according to game positions, the absolute and relative power values in terms of peak power parameter are 570 (±63 W) and 9.50 (±.79 W/kg) respectively for defensive players, 658 (±29 W) and 9.41 (±.24 W/kg) for goalkeepers, 571 (±85 W) and 9.44 (±.70 W/kg) for forwards, 578 (±78 W) and 9.57 (±.78 W/kg) for midfielders while these values are 423 (±48 W) and 7.07 (±.83 W/kg) for defensive players, 489 (±14 W) and 7.00 (±.06 W/kg) for goalkeepers, 426 (±59 W) and 7.07 (±.87 W/kg) for forwards and 432 (±50 W) and 7.21 (±.70 W/kg) for midfielders in terms of mean power values. Fatigue index values have been obtained as 47.8 (±10.2%) for defensive players, 47.5 (±6.4 %) for goalkeepers, 44.1 (±4.9 %) for forwards and 44.2 (±7.1 %) for midfield players (68). These findings are different from the findings of our study. Tamer *et al*., (95) obtained the anaerobic power values of elite Turkish women football players as 96.13 kgm/s$^{-1}$ by using the vertical jump test and the Lewis Nomogram, indicating that this value is moderate relative to the elite women football players in different countries.

In this study, the right and left hand grip values of elite Turkish women football players have been obtained as 30.6 (±4.62 kg) and 29.6 (±4.50 kg) respectively while back and leg strength values are 90,2 (±18,7 kg) and 101,8 (±29,5 kg). Nikolaidis (68) reported that the righy and left hand grip strength values of the Greek 1st league women football players were 31.7 (±4.6 kg) and 29.2 (±3.5 kg) for defensive players, 33.9 (±8.6 kg) and 33.0 (±4.4 kg) for goalkeepers, 30.5 (±4.3 kg) and 26.9 (±3.6 kg) for forwards, 30.5 (±4.6 kg) and 29.4 (±4.6 kg) for midfield players respectively. In another study by Nikolaidis (69), the right and left hand grip strength values of women football players were obtained as 31.2 (±4.5 kg) and 29.3 (±4.2 kg) respectively. According to Dey *et al.,* (29) the left and right hand

grip strength values of the players in the women national football team of India were obtained as 31.1 (±2.78 kg) and 29.6 (±3.59 kg) respectively. The findings of this research and the findings obtained in the researches of Nikolaidis (68, 69) and Dey *et al.*, (29) are similar. Unlike the results of our study, in the study by Göral and Göral (35) completed on Turkish women football players, the right and left hand grip strength values of the athletes were found to be 25.2 (±1.96 kg) and 24.6 (±1.83 kg) respectively while the back and leg values were 77.9 (±4.78 kg) and 90.7 (±2.36 kg). The results obtained in the relevant study are observed to be quite low. This difference is thought to arise from the differences in the struggle level (elite - amateur level) of women football players.

Velocity and power parameters of elite Turkish women football players during BT (% 30 of body weight) and $SJ_{Loaded}$ (% 40 of body weight) movements applied by using external loads were analysed with an isoinertial velocity transducer and the velocity and power values of women football players during bench throw movement were 0.85 (±.07 m/sec) for MPV, 1.44 (±.10 m/sec) for PV, 140.1 (±26.8 W) for MPP and 273.6 (±43.6 W) for PP while the velocity and power values in the $SJ_{Loaded}$ movement were 1.21 (±.10 m/sec) for MPV, 2.04 (±.18 m/sec) for PV, 353.6 (±83.2 W) for MPP and 666.3 (±152.1 W) for PP. This is the first study in which velocity and power values of women athletes are obtained by using an isoinertial velocity transducer.

## CONCLUSION

In conclusion, there are many studies on the physiological and physical features of elite level male footballers in the Turkish population and the desire for games. However, the studies conducted on elite Turkish women football players are limited despite the increasing professionalization and popularity of women football worldwide and the current study is thought to be an important source of reference for the literature of sports sciences. This study is the most comprehensive study performed on the performance qualities of Turkish women footballers at the elite level. When the finding attained from this research are compared with the finding of the researches on elite women football players performed in other countries, it is observed that the elite Turkish women football players have lower performance values and their conditions are in a worse level. Thus, it is necessary for the elite Turkish women footballers to improve their conditional characteristics, which are considered as prerequisites for successful athletic performance in order to increase their competing level and to reach a level for international competition.

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# Diurnal variation in anaerobic performance: Effect of core body temperature

Mehmet PENSE[1], Erbil HARBİLİ[1], Sultan HARBİLİ[1]

[1]*Selçuk University, Faculty of Sport Sciences, Konya, TURKEY.*
*Address Correspondence to M, Pense, e-mail: mpense@selcuk.edu.tr*

**Abstract**

The purpose of this study was to investigate the effects of circadian rhythm on anaerobic performance and body temperature determined through three different methods. Ten elite male taekwondo athletes (average age: 23.9±2.7 years, height: 178.7±4.9 cm, body mass: 72.1±7.8 kg, training experience: 12.5±4.9 years) participated in the study. The body temperatures of the participants were measured in the morning of the first day, (between 09:00-10:00 a.m.), and in the early evening (between 16:00-17:00 p.m.) through three different methods (Core body temperature, tympanic temperature, and skin surface temperature). The participants performed Wingate test (WT) both in the morning and in the early evening. Core body temperature was significantly higher in early evening than it was in the morning ($p<0.05$), while tympanic and skin surface temperatures remained unchanged ($p>0.05$). However, there was no significant difference between morning and early evening for peak power, mean power, and fatigue index values ($p>0.05$). As a result, a significant increase was observed in core body temperature in early evening compared to morning, but this increase did not show a positive effect on anaerobic performance.

**Keywords:** Anaerobic Power, Circadian Rhythm, Wingate Test

## INTRODUCTION

It is known that numerous biological and physiological variables are circadian (24 h) rhythm, and that the changes in this rhythm are influential on performance (22). It has been well documented that maximal short-term performances fluctuate in different periods of a day (7, 18, 21, 24, 25, 27, 28, 30). These daily variations have been found to be ranging from 3 to 21,2 %, depending on the population tested, the muscle groups, and the experimental design (16). Although the underlying mechanisms are not clear, some researchers suggest that daily variations in anaerobic power may depend on changes in body temperature (3, 15). Some studies have suggested that simultaneous increases in central body temperature and muscular power are causally related because the diurnal increase in central temperature may have a beneficial passive warm-up effect (3, 18). This passive warm-up may enhance metabolic reactions, increase the extensibility of connective tissue, reduce muscle viscosity, and increase conduction velocity of action potentials (25). In previous studies, it was demonstrated that the Peak and Mean Power values obtained from the Wingate test conducted in different periods of a day are higher in the afternoon compared to those obtained in the morning (4, 11, 13, 15, 18, 27). However, in studies conducted on the relation between the body temperature and anaerobic performance, it was reported that the body temperature values increased in the afternoon reaching the peak levels at 18:00 p.m., and the anaerobic power values also increased in line with the body temperature values in the afternoon (26, 27). It was reported that the body temperatures were measured in oral, rectal or intra-aural ways in most of these studies, (20, 27, 28, 30), and in another study, it was reported that muscle temperature was estimated from skin temperature using skin probe (18). On the other hand, no study was encountered demonstrating the impact of Core Temperature, which is measured from the intestinal region and shows the body temperature more accurately, on the performance. The purpose of the present study was to investigate the effects of circadian rhythm on anaerobic performance and body temperature determined through three different methods.

## MATERIALS AND METHODS

The subjects visited the laboratory for 2 times for the tests. In their first visit, their body weights and heights were measured, which are among the physiological features. Subsequently, core, body, skin surface, and tympanic temperatures were measured. The core temperature measurements were taken in 9 different times; before the 5-minute warm-up period, after the warm-up period, during the Wingate test with 5-second intervals, and after the test. As per the skin surface and tympanic measurements, they were taken in 4 different times, before the warm-up period, after the warm-up period, just after the Wingate test, and 5 minutes after the test. In order to determine the anaerobic performance values of the subjects, peak power, mean power, and fatigue index values were measured in cycle ergometer using the Wingate test. The Wingate test and all of the parameters measured were repeated when the subjects visited the laboratory for the second time. The measurements were conducted with a 30-hour interval in 09:00 in the morning and 16:00 in the afternoon. The random cross experiment design was used in the formation of the groups. All of the measurements were conducted under 30±1.8°C temperature and 25-35% moisture conditions of the laboratory.

### Subjects

Ten elite taekwondo athletes (average age: 23.9±2.7 years, height: 178.7±4.9 cm, body mass: 72.1±7.8 kg, training experience: 12.5±4.9 years) voluntarily participated in this study. The subjects followed an exercise program, in which they performed exercises 2.1 ± 0.9 hours in average in each day. They did not perform any exercise on the days of measurements. After receiving a thorough explanation of the protocol, they gave written consent to participate in this study. The study was approved from the Selçuk University Ethics Committee (#2013/01). They were categorized as "moderately evening type" (n = 1), "intermediate type" (n = 7), and "moderately morning type" (n = 2), on the basis of their answers to Horne and Ostberg's self-assessment version of morningness-eveningness questionnaire (12).

### Procedures

### Pre-experimental Protocol

The subjects suspended exercises for 55 hours between the tests conducted in the laboratories at 09:00 a.m., in the first day until the end of the last test, and they conducted no physical activities. They did not use alcohol, caffeine, or did not smoke between 09:00 a.m. and 16:00 p.m. The subjects had a light breakfast at 07:00 a.m., and had their normal diets at the lunch.

### Body Temperature Measurements

**Body Core Temperature:** The core temperature was measured through the Body Temperature Monitoring System (CorTemp, Wireless sensing systems & design, HQ Inc, Palmetto, USA) with a 0,1 °C precision. This device collected and recorded the data wirelessly from the batteries, which were swallowed by the subjects in the shape of a pill. It was demonstrated in various research studies that the Cortemp telemetric measurement device was a reliable and valid system (9, 10, 17).

**Skin Surface Temperature:** In the measurement of skin surface temperature, thermistors with a 0,1°C precision were used that were placed in four regions (chest, thigh, leg, forearm) of the body. The temperature data coming from these thermistors were recorded through a recorder device (Tumer, TR), which can display in 4 different digital screens. Skin surface temperature was calculated by formula 1 using the temperature values of four regions (19).

Mean skin temperature (MST) = $(0.34*t_{chest}) + (0.33*t_{thigh}) + (0.18*t_{leg}) + (0.15*t_{forearm})$ *Formula 1;*

$t_{chest}$= Chest Temp, $t_{thigh}$= Thigh Temp, $t_{leg}$= Calf Temp, $t_{forearm}$= Forearm Temp.

**Tympanic Temperature:** Tympanic (in-ear/endaural) temperature was measured by touching the (Braun, Germany) device with a 0,1 °C precision to the tympanic area in the ear. The temperature value seen on the digital screen of the device was recorded.

### Wingate Anaerobic Test

The seat height and handle bars were adjusted in the cycle ergometer appropriately for each subject. Before the Wingate test, each of the subjects warmed up for 5 minutes on 50 watt workload pedaling in the cycle ergometer. Then, the Wingate Anaerobic Test (WT) was conducted on a friction-loaded cycle ergometer (Monark model 864 Crescent AB, Varberg, Sweden) interfaced with a microcomputer. The Wingate test is consisted of a 30 s maximal sprint against a constant resistance related to body mass (0.075 $kg \cdot kg^{-1}$ body mass) as proposed by Bar-Or (1). The Wingate test began from a rolling start, at 60 rpm against minimal

resistance (weight basket supported). When a constant pedal rate of 60 rpm was achieved, a countdown of "3-2-1-go!" was given, and the test resistance was applied. Subjects were verbally encouraged throughout the test to avoid pacing and to sustain a maximal effort throughout the test. Every second, power output was calculated by the computer and stored. The highest power output over 1 s ($P_{peak}$) and the mean power ($P_{mean}$), corresponding to the ratio between total work done and time to do it (i.e, 30 s), were recorded at the end of the test. The fatigue index (i.e., the percentage decrease in power output) was equal to the difference between the highest ($P_{peak}$) and the lowest power ($P_{low}$) divided by the highest power (30):

*Formula 2;*

Fatigue Index (FI) = $(P_{peak} - P_{low})/P_{peak}$

**Statistical Analysis**

Descriptive statistics (Mean±SD) were calculated for all variables, and the normality of their distributions was checked using the Kolmogorov-Smirnov test. The *t-test* was used for dependent samples to analyze differences between the morning and the early evening in anaerobic power outputs and body temperature. The alpha level was set at $p<0.05$.

## RESULTS

**Body Temperature**

The body temperatures of the athletes measured through three different methods (body core, skin surface and tympanic) in the morning and in the early evening were presented in Table 1. While no significant difference was found between the morning and early evening concerning the skin surface and tympanic temperature values ($p>0.05$), it was found that body core temperature was significantly higher in the early evening than in the morning ($p<0.05$).

**Table 1.** Changes in body temperature of athletes

| | Morning (09:00) | Early evening (16:00) | *t*-value |
|---|---|---|---|
| Core Temp (°C) | 37.09 ± 0.24 | 37.37 ± 0.28 | 3.06* |
| Skin Temp (°C) | 32.90 ± 0.86 | 32.84 ± 0.91 | 0.19 |
| Tympanic Temp (°C) | 36.01 ± 0.54 | 35.98 ± 0.49 | 0.40 |

*p< 0.05

**Wingate Test**

Power outputs obtained from the Wingate test performed by athletes in the morning and in the early evening were presented in Table 2.

**Table 2**. Anaerobic performance values (mean± SD) in the morning and in the early evening

| | Morning (09:00) | Early evening (16:00) | *t*-value |
|---|---|---|---|
| Peak Power (W) | 802.4±97.9 | 811.1±107.7 | 0.51 |
| Peak Power ($W \cdot kg^{-1}$) | 11.12±0.78 | 11.25±0.89 | 0.54 |
| Mean Power (W) | 601.5±67.8 | 594.7±66.1 | 1.28 |
| Mean Power ($W \cdot kg^{-1}$) | 8.35±0.45 | 8.26 ±0.32 | 1.20 |
| Fatigue Index (%) | 51.3±3.9 | 52.1±4.9 | 0.53 |

It was revealed that there was statistically no significant difference between anaerobic power outputs tested in the morning and in the early evening ($p>0.05$).

## DISCUSSION

In this study, daily change of the core temperature and the impact of this change on the anaerobic performance were tested. In this purpose, body temperature was measured in the morning and in the early evening through three different methods (body core, skin surface, and tympanic) and the WT was applied. Among the measured body temperatures, it was determined that only the core temperature values fluctuated and it was detected to be higher in the early evening compared to those in the morning (Table 1). However, it was determined that there was no significant difference in the morning or in the early evening hours concerning the values of the peak power, mean power, and fatigue index, which are the indicators of anaerobic performance (Table 2). There are numerous studies demonstrating that the anaerobic performance ($P_{peak}$, $P_{mean}$) increases in parallel to the increase of the body temperature within a day (3, 5, 11, 13, 15, 18, 23, 26-29). As mentioned before, core temperature is used as the initial indicator for circadian rhythm (31) in physical performance and biological processes, and numerous performance indicators follow the circadian changes in the body temperature. Chtourou (4) reported that the times of the day of the 2 test sessions (07:00 and 17:00 hours) approximate, respectively, the bathyphase

(trough time) and the acrophase (peak time) of the circadian rhythm of the oral temperature. Berg and Ekblom (2) and Souissi (27) demonstrated that, in the experimental studies conducted in warm and cold environments, a %5 decrease occurs in the maximal anaerobic power value per 1-degree decrease in the muscle temperature. In these studies, it was reported that the body temperature increases and partial cellular changes in the muscles might be effective on the daily muscular contraction characteristics (14, 18). It is considered that the increase in the body temperature causes increases in metabolic reactions, connective tissue elasticity, and muscle conduction velocity, and at the same time, a decrease in the muscle viscosity; as a result of all these changes, it is evaluated that the ability of muscular contraction increases (25, 27).

In this study, although the morning core temperature values were determined to be significantly higher than those measured in the early evening, it was observed that the anaerobic performance values were not in parallel with the body temperature. There are studies with similar findings in the literature demonstrating that the anaerobic performance values measured in the morning and in the afternoon were similar and no circadian fluctuation was determined (6, 8, 22). However, it was demonstrated that the low level of anaerobic performance observed in the mornings disappeared after the exercise program (4). Souissi et al, (30), bringing a different view to the issue, demonstrated that daily fluctuations in the anaerobic performance can be prevented through regulated warm-up protocols. In previous studies, it was reported that the $P_{peak}$, $P_{mean}$ values, which are generally detected to be low in the morning hours, significantly increased after a 15-minute warm-up; contrary to this, it was reported that 5-minute and 15-minute warm-ups performed in the afternoon did not change the $P_{peak}$, $P_{mean}$ values. Researchers reported that daily fluctuations in the anaerobic performance can be regulated through long warm-up protocols. However, it was demonstrated that applying an artificial 5 °C increase in the adductor pollicis muscles in the mornings did not influence the daily fluctuations in the muscle strength (14). Having no increase in the anaerobic performance despite the increase in the core temperature within a day demonstrates that the daily changes in the anaerobic performance cannot be explained by only the daily fluctuations of the body temperature. Moreover, it is reported that hormonal changes possible to appear within a day influence the circadian fluctuations in the muscle performance (14). In this case, in order to better apprehend the reasons behind the circadian changes in the anaerobic performance, it is suggested that the hormonal changes should also be observed in future research studies.

## CONCLUSION

As the conclusion, it was determined that the body temperature changed in different hours of a day, increasing in the evening hours, but it did not influence the anaerobic performance.

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# The role of exercıse ın reducıng the sıde effects of antıpsıcotıcs used ın the treatment of bıpolar dısorders

Hatice TOY[1], Erkut TUTKUN[1] , Itır TARI CÖMERT[2]

[1]*Bursa Uludag University, Faculty of Sport Science, Turkey*
[2] *Fatih Sultan Mehmet Vakıf University, Faculty Of Education, İstanbul, Turkey*
*Address Correspondence to E, Tutkun, e-mail: erkuttutkun@uludag.edu.tr*

**Abstract**

The study is a systematic evaluation of quantitative studies showing the relationship between drug use and physical activity in investigating the side effects of antipsychotics used in patients who have bipolar disorder.

Bipolar disorder is usually treated with medicine and the side effects of the drugs which are used to increase the body mass index of patients and this causes obesity. This study mainly aims to examine the role of exercise in reducing the side effects of antipsychotics which are used by individuals who have bipolar disorder with using the high-level evidence which was acquired from published systematic reviews and meta-analyzes.

Most antipsychotics cause weight gain; olanzapine and clozapine are seen as the antipsychotics which have highest risk. In the first period after taking antipsychotics, the weight is increasing rapidly, and patients continue to gain weight in the long term. One of the best strategies to prevent this situation is to adapt antipsychotics according to individual needs and to check over weight and other metabolic parameters closely.

The researches which were done and current information in the last 10 years were included in the study. Recent studies have shown that in the patients who have bipolar disorder, physical activity programs can play a significant role in supporting of mental and physical health. We hope that adding exercise to treatment plans for individuals with bipolar disorder may provide side benefits and be guidance for clinical practice, policy and future research.

**Keywords:** Bipolar disorder, Antipsychotics, Obesity, Exercise

## INTRODUCTION

Bipolar disorder is a mental health status that can cause low depressive and high manic disorder. While most people experience a slight mood wave, fluctuations in individuals with bipolar disorder may be excessive and unpredictable. Bipolar disorder which is formerly named as a "manic depression" is a mental disorder characterized by serious and significant mood changes.

A person who has this condition experiences "rises or overflow" (mania) and "self-abasement or collapse" (depression). Both manic and depressive episodes are only shorter than a few hours to a few days or longer, and can last for several weeks and months. Although the periods of mania and depression vary from person to person, most people can experience very short periods of these intense moods and do not even realize that they have this disorder (5). As reported by another definition, bipolar disorder is a "fatal disorder" with high comorbidity rates and early recognition of bipolar disorder is reported to be beneficial in reducing disease-related comorbidities and mortality in an effective treatment process (29).

The diagnosis of bipolar disorder is also associated with an increased risk of cardiovascular disease which leads to premature death (38,17,11). On that occasion, obesity and sedentary lifestyle diabetes are risk factors for metabolic syndrome and cardiovascular diseases and often affect individuals who have bipolar disorder (3,7,25). Therefore, individuals who have bipolar disorder are confronted with the need to focus their treatment not only on their mental health, but also on their physical health.

At this point, exercise is a magnificent way to meet this need and also shows that it is an effective treatment in reducing depression and anxiety by contributing to the improvement of conditions that negatively affect physical health (obesity,

cardiorespiratory compliance, hypertansion, cholesterol) (33, Rethorst & Trivedi, 2013). When some data are taken into consideration to reduce depression and anxiety, exercise may also be useful in the treatment of bipolar disorder. These data have provided to the adoption of mild to moderate exercise as the first treatment method to reduce depression (8). Specifically, exercise shows that it is partly associated with increased brain-derived neurotrophic factor (43).

According to the European Psychiatric Association, there are four main categories of bipolar disorder. These are bipolar I disorder, bipolar II disorder, cyclothymic disorder and bipolar disorder due to improper use of substance (Stubbs et al., 2018). All types of bipolar disorder usually respond to treatment, for this reason, it requires many years for drug use and treatments such as psychotherapy.

**Symptoms of bipolar disorder**

For the diagnosis of bipolar disorder, a person must have had at least one manic and one depressive period during his or her life.

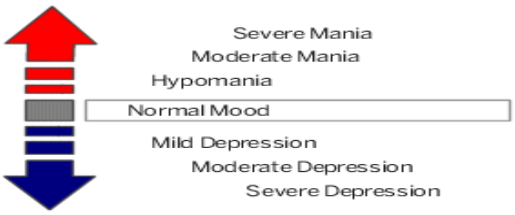


**Figure I.** Symptoms of bipolar disorder (Bressert, 2019)

Manic episode (bipolar I disorder) is characterized by excessive speech, extreme uneasiness, hyperactivity, low sleep need and / or intense thoughts. In a manic period, individuals believe that they are able to do everything, do plan and do all these things, and they feel as if nothing can stop them. For the diagnosis of bipolar I, this period lasts at least one week and shows an alteration from a person's usual behavior.

Hypomanic episode (bipolar II disorder) is characterized by the same symptoms as a manic period, but it is a condition where symptoms proceed for at least four days.

In the depressive episode, excessive sadness, lack of energy, or lack of interest in certain things, is often characterized by feelings of lack of pleasure in activities, helplessness and hopelessness. Anyone with this condition may experience normal mood up to three years between mania and depression. When not treated, the severity of the periods change and the severity of the symptoms increase.

The prevalence of bipolar disorder (BD) is 0.6% for lifetime BD-I and 0.4% for BD-II among cultures and ethnic groups. BD ranks sixth among mental disorders and 20th among all diseases in the world. According to the general population, life expectancy of BD individuals is less than 10 years (49).

The obesity is common in patients who have bipolar disorder and it is associated with increased medical morbidity and poor psychiatric outcomes. Genetic factors, neurotransmitter abnormalities, atypical depression, eating behaviors, pharmacotherapy, age, gender, socioeconomic status and physical inactivity are effective variables that can interact to prevent onset and prevention of obesity in bipolar disorder. Although the causes of obesity in bipolar disorder vary among patients, they directly or indirectly include pharmacological, biological, psychological, and socio-demographic variables, and the sedentary lifestyle, which leads to obesity in this population, affects the disturbances in eating behavior and the drugs used (52). Therefore, there is a need for behavioral studies that increase physical activity and reduce over-eating in patients who have bipolar disorder.

**Antipsychotic Use in Bipolar Disorder;**

Antipsychotic drugs in bipolar disorder are used in addition to treatment to control psychotic symptoms such as hallucinations, delusions or mania. These symptoms may occur during acute mania or severe depression. Antipsychotics help in the prevention of future mania or depression attacks while treating bipolar depression. In people with bipolar disorder, antipsychotics are also often used in combination with mood stabilizers to prevent and balance drug use, insomnia, anxiety and/or agitation and may reduce manic symptoms until mood stabilizers are fully effective (22). It is observed that some antipsychotics help to stabilize their moods on their own. Consequently, it is used alone as a long-term treatment in individuals who do not tolerate or respond to lithium and anticonvulsants (20).

Antipsychotic drugs help to regulate the functioning of cognitive functions by controlling thought, mood and perception. Although it is not known exactly how these drugs work, it is usually seen that they quickly heal manic attacks. Aripirazole (abilify), asenapine (sapphire), kariprazin (vraylar), clozapine (clozaril), lurasidone

(latuda), olanzapine (zyprexa), quetiapine (seroquel), risperidone (risperdal), ziprasidone (geodon) are the antipsychotics which are used to treat bipolar disorder. Some of these drugs cause significant weight gain, high cholesterol levels and increase the risk of diabetes. As metabolic side effects of these drugs cause serious health problems in bipolar patients, exercise and healthy nourishment are important in these individuals.

The fastest weight gain takes place in the first 6 months after starting an antipsychotic treatment and then continues slowly. Table I shows the risk of weight gain with different antipsychotics.

**Table 1.** Weight gain with different Antipsychotics (Cooper et al., 2016).

| Antipsychotics | Risk Of Weight Gain |
|---|---|
| • Olanzapine → | High |
| • Clozapine → | High |
| • Chlorpromazine → | High / Moderate |
| • Quetiapine → | Moderate |
| • Risperidone → | Moderate |
| • Paliperidone → | Moderate |
| • Asenapine → | Low |
| • Amisulpride → | Low |
| • Aripiprazole → | Low |
| • Lurasidone → | Low |
| • Ziprasidone → | Low |
| • Haloperidol → | Low |

Weight gain due to antipsychotics is a important management problem for clinicians. Weight gain and obesity have been shown that it leads to increased cardiovascular and cerebrovascular morbidity and mortality and reduced quality of life (9).

In addition to weight gain, antipsychotics are also known that they impair glucose metabolism, increase cholesterol and triglyceride levels, cause arterial hypertension and lead to metabolic syndrome (13). It has been reported that metabolic syndrome will increase the risk of diabetes mellitus by five times and the risk of cardiovascular disease twice in the next 5-10 years (9). The increased metabolic syndrome and obesity prevalence lead to a decrease in lifespan and an increase in mortality rates in psychiatric patients (34).

Allison and colleagues (2) evaluated that weight gain associated with both first- and second-generation antipsychotics (FGAs and SGAs) at standard doses for 10 weeks. While most of the antipsychotics caused weight gain, patients who took placebo lost weight. An average loss of 0.39 kg of weight loss was reported for Molindone, whereas clozapine, olanzapine, thioridazine, sertindole, chlorpromazine and risperidone were all reported that they cause in a significant weight gain ranging from 4.45 to 2.10 kg.

Leucht and colleagues (27), 6-week multidisciplinary treatment data using the meta-analysis, indicated that haloperidol, lurasidone and all other antipsychotics except ziprasidone cause weight gain, and olanzapine and zotepine induce more weight gain than other antipsychotics.

In another study, it was observed that while olanzapine and clozapine caused the highest weight gain, quetiapine, risperidone and sertindole caused a small amount of weight gain and aripiprazole and amilsulpride users had low-moderate weight whereas ziprasidone caused the lowest weight gain (40). De Hert and colleagues (14) reported that asenapine, iloperidone, paliperidone and lurasidone were effective in weight gain from new generation antipsychotics.

Bak and colleagues (4) found that most antipsychotics except aripiprazole, amilsulpride and ziprasidone, including FGAs, provided significant weight gain. Significant weight gain was observed in the first 6 weeks in the groups which took antipsychotics. Interestingly, a significant proportion of patients showed a clinically significant weight loss in amilsulpride, aripiprazole, asenapine, olanzapine, paliperidone and ziprasidone in more than 7% of the basal weight.

**The mechanisms underlying weight gain and other metabolic abnormalities caused by antipsychotics;**

Many mechanisms have been proposed to explain the weight gain caused by antipsychotics. The amount of weight gain depends on the antipsychotic type and the individual characteristics of the patients. Most research focuses on clozapine

and olanzapine, the two drugs which are found to cause the highest weight gain. The possibility of high weight gain with these drugs has been associated with the effects on serotonin 5-HT2A and 5-HT2C, dopamine D2 and D3, histamine H1 and muscarinic M3 receptor (19). Differential effects on body weight are explained by the different affinity of drugs at these receptors (23).

Antipsychotics affect neuropeptides which are associated with appetite control and energy metabolism. Leptin and adiponectin are adipokinine which are produced in white adipose tissue in AIWG. Adiponectin levels which were decreased and increasing leptin levels with short and long term olanzapine treatment were denoted (1). An increase in food intake and accumulation of adipose tissue is affected by the use of antipsychotics by the hormone Ghrelin, which acts on the curved nucleus of the hypothalamus. Changes in leptin, adiponectin and ghrelin levels were determined to be due to direct effects of drugs on weight gain (28). On the other hand, the effects of antipsychotics on lipid and glucose metabolism which are associated with their effects caused on weight gain and adipocyte tissue, resulting in insulin resistance and consequently increasing the release of very low density lipoproteins from triglycerides and adiposities. There is also evidence that antipsychotics increase the expression of sterol regulatory element binding protein (SREBP) and very low density lipoprotein (VLDL) genes (21).

Genetic polymorphisms can explain the physical change in AIWG. In the meta-analysis of Zhang et al. (54), 13 single nucleotide polymorphisms from the nine genes that were significantly associated with AIWG were identified. The single nucleotide polymorphisms which are associated with ADRA2A, DRD2, 5-HTR2C and MC4R genes have shown the greatest effect by showing that candidate genes are also associated with receptors in which weight loss is demonstrated by the therapeutic effects of antipsychotics.

The results of the study which was published in 2014 and in the post-2014 study are presented in Table II.

Table 2. The Relationship between Weight Increase and Interaction Due to Antipsychotics which are used by Patients who have Bipolar Disorder

| Researchers | Year | Population | Medication which is used | Results |
|---|---|---|---|---|
| Rubio-Terrres et al. | 2014 | Bipolar Disorder | Aripiprazole (ARI) and Olanzapine (OLA) | Patients who were treated with aripiprazole had lower side effects than olanzapine. |
| Creta et al. | 2015 | Bipolar Disorder (n=486) | Olanzapine and Clozapine | HTR2C, LEP, FTO and TBC1D1 represented genes related to weight gain during treatment with a SGA. Obesity-related genome-wide (FTO rs9930506) has been associated with psychotropic weight gain. |
| Rado & Cavanaugh | 2016 | Schizophrenia Schizoaffective Disorder Bipolar Disorder, (t:24 weeks-n:25) | Olanzapine+ Metformin<br><br>Olanzapine+ Placebo | The average change in body weight for the olanzapine + metformin (O/M) group was found to be 5.5 kg and 12.8 kg for olanzapine + placebo (O/P) group. Patients in the O/M group had a %3 increase a weight compared with the O/P group who gained %7 of their body weight ($p<0.037$). Body mass index change in O/M group was 0.85 versus 2.02 in O/P group ($p<0.045$). In O/P group, insulin resistance and waist circumference were increased compared with O/M group. Metformin is an effective way to prevent Olanzapine-derived weight gain. |
| Talaeı et al. | 2016 | Schizophrenia Bipolar Disorder (n:68 | Olanzapine Placebo Topiramate | All doses of 50,100 and 200 mg (placebo and topiramate) have been shown that they are effective in the prevention of Olanzapine-derived obesity in |

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| | | t:12 weeks) | | schizophrenia and/or patients who have bipolar disorder. |
| Detke et al. | 2016 | Schizophrenia<br>Bipolar Disorder<br>n=102<br>t=52 weeks | Olanzapine | In both groups, the increase in BMI due to olanzapine was high. Intensive behavioral controlled studies are needed to assess the tolerability of oral olanzapine and to reduce the risk of weight gain for adolescents who have schizophrenia and bipolar mania. |
| Fang et al. | 2017 | Bipolar Disorder | SGAs (olanzapine, asenapine, quetiapine, risperidone, aripiprazole, paliperidone, ziprasidone) | The weight gain and metabolic side effects of second generation antipsychotics in bipolar disorder were investigated. Antipsychotics which were used in short and long-term studies were found that they caused weight gain compared to placebo. |
| Meyer et al. | 2017 | Bipolar Disorder<br>Schizophrenia | Lurasidone | Lurasidone was associated with weight loss in 1 year after the patients who have schizophrenia and bipolar disorder. Analyzes showed that weight loss was more apparent in patients who are using second-generation antipsychotics which are associated with the risk of more weight gain before lurasidone treatment. |
| Ostacher et al. | 2018 | Bipolar Disorder | Lurasidone<br>Quetiapine<br>Aripiprazole<br>Olanzapine<br>Ziprasidone | They aimed to evaluate the efficacy and tolerability of lurasidone against other atypical antipsychotic mono therapy agent in bipolar patients. Tolerability results included weight gain, state of sleep, extrapyramidal symptoms (EPS). Results: lurasidone was found that it was more effective than aripiprazole and ziprasidone and had less weight gain than quetiapine and olanzapine and was associated with less sleepiness than quetiapine and ferazidone. |
| Vieta & Montes | 2018 | Bipolar Disorder | Asenapine | Asenapine has been shown that it is effective reducing clinically significant depressive symptoms in patients who have bipolar I disorder. Drowsiness, dizziness, extrapyramidal symptoms, increased body weight and oral hypoesthesia are the most common side effects which are associated with asenapine. In addition to this, the frequency of these events, especially weight gain, was generally lower than olanzapine. Besides, it has been shown that asenapine improves health-related quality of life. |
| Butler et al. | 2018 | Bipolar Disorder | Asenapine, kariprazin, quetiapine and olanzapine<br>Risperidone, ziprasidone<br>divalproex/valproat | The results showed that risperidone and ziprasidone had a generally beneficial effect on acute mania symptoms compared to placebo. Participants who are using atypical antipsychotics, except quetiapine, reported more extrapyramidal symptoms than placebo, clinically significant weight gain was observed in olanzapine users. There were no differences between olanzapine and divaproex / valproate for acute mania. |

Butler and colleagues (6) evaluated the effect of drug and non-drug treatments in the treatment of acute symptoms related to bipolar disorder and prevention of recurrence. His studies included prospective cohorts and comparative randomized controlled trials which registered adults who have

bipolar disorder (BD), 3 weeks for acute mania and every week for 3 to 6 months for depression. Asenapine, kariprazine, quetiapine and olanzapine improved acute mania symptoms compared to placebo. Risperidone and ziprasidone have generally shown a beneficial effect on acute mania symptoms compared to placebo. Participants who are using atypical antipsychotics, except quetiapine, reported more extrapyramidal symptoms than placebo, and clinically significant weight gain was observed in olanzapine users. There were no differences between olanzapine and divalproex / valproate for acute mania.

Meyer and colleagues (32) in their studies, serious psychiatric disorders such as schizophrenia and bipolar disorder are associated with increased risk of obesity compared to the general population. The relationship between lurasidone and low weight gain risk has been established in short and long-term clinical trial settings, while the information about the association of lurasidone with weight gain in normal clinical care remains limited. The body weight data of the participants based on drug use were analyzed in depth to estimate the effect of lurasidone on the body weight of the patient. The body weight data (kg) of the patients with schizophrenia or bipolar disorder were followed up for 12 months after the initiation of lurasidone and were associated with weight loss at the end of 1 year. Second-generation antipsychotics with intermediate-high risk (clozapine, olanzapine, quetiapine or risperidone) were analyzed based on first-generation antipsychotic use because of low weight gain (aripiprazole, ziprasidone). Analyzes have shown that weight loss is more significant in patients who are using second-generation antipsychotics associated with the risk of more weight gain before lurasidone treatment. These findings are consistent with the results of previous prospective studies and suggest that lurasidone is associated with a lower risk of weight gain in patients who have schizophrenia or bipolar disorder.

According to In Vieta and Montes (51) studies, asenapine treatment in adult and patients who have pediatric has been found that it is effective in the short and long-term treatment of mania associated with bipolar I disorder. Asenapine is a second generation antipsychotic which is approved in the US (brand Saphris®) for manic treatment in Europe (brand Sycrest®) for the treatment of moderate to severe manic attacks associated with bipolar I disorder in adults.

Asenapine is an antagonistic activity at the D2 receptor, which is probably responsible for its antimanic features.

In addition, asenapine has been found that it is effective in reducing clinically significant depressive symptoms in patients who have bipolar I disorder. Drowsiness, dizziness, extrapyramidal symptoms, increased body weight and oral hypoesthesia are the most common side effects which are associated with asenapine. In addition to this, the frequency of these events, especially weight gain, was generally lower than olanzapine.

Ostacher and colleagues (35) aim to evaluate the efficacy and tolerability of lurasidone against other atypical antipsychotic mono therapy agents in patients who have bipolar disorder in their studies. They incorporated into 14 randomized clinical trials (n=6221 patients), lurasidone, quetiapine (extended release and immediate release), aripiprazole, olanzapine, and ziprasidone in their studies. While results included weight gain, drowsiness, extrapyramidal symptoms (EPS); lurasidone is more effective than aripiprazole and ziprasidone and also it was found that it is associated with less weight gain and less drowsiness than quetiapine and olanzapine.

**Bipolar Disorder: A Deadly Disease with Dangerous Comorbidities;**

Physical activity has an inverse relationship with sleep duration in the individuals who have bipolar disease. While more activity usually continues with less sleep at night, more sleep tends to lead to less activity the next day. Merikangas and colleagues (31) determined that changes in internal psychological conditions among the participants with bipolar I disorder were strongly influenced by sleep and physical activities. Nonetheless, researchers have indicated that many studies on mood, sleep, and activity tend to focus on a particular system rather than taking into account the collective impact of the systems. The findings of the study included studies to balance depressive periods in patients who have bipolar disorder. They stated that studies which are focusing on motor activity and energy have more efficiency than existing approaches, and that both active and passive monitoring of multiple regulatory systems are significant in designing therapeutic objects.

The study included 12 studies which are examining the physical activity levels of individuals who have bipolar disorder.

Table 3. The relationship between physical activity level and outcome of individuals with bipolar disorder

| Researchers | Year | Pattern | Population/ Examination | Context | Results |
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| Van Citters et al. | 2010 | Randomized Controlled Study | BMW, n=30<br>HC, n=19<br>SG, n=18<br>(n =76) | Moderate walking exercise and the acquisition of healthy nutritional habits accompanied by a health consultant<br>Study duration =9 months | It was found that the participants had a significant increase in exercise and mental and physical health, and a significant decrease in waist circumference. |
| Sylvia et al. | 2011 | Prospective | BD<br>Group I, n=4<br>Group II, n=6 | It consists of 3 Treatment modules (Nutrition, exercise and healthy life) with 12 sessions of 12 minutes for 14 weeks. | Both groups exercised more than 100 minutes per week. While there was no Momentous difference in group 1, the depressive and manic symptoms and body weight decreased and quality of life advanced in group 2. |
| Wright et al. | 2012 | Cross sectional | BD<br>n=25 | Semi-structured interview on the views of the relati-onship between exercise and BD. Data were subject-ted to qualitative analysis using the Interpretive Pheno-menology Analysis approach. | Exercise has been found to have a tranquillizer effect on hypomania in some participants while the others have an increase in manic levels after exercise. |
| Sylvia et al. | 2013a | Prospective | BD<br>DSM IV<br>n=482,<br>18-68 age | In BD patients, the frequency of exercise was compared with quetiapine which is a second generation antipsychotic against lithium which is a classic mood conditioner. | About 40% of the participants reported that they did not exercise regularly.<br>Less frequent exercise was associated with higher BMI, more depressive symptoms and lower quality of life, while more frequent exercise resulted in increased manic symptoms. |
| Sylvia et al. | 2013b | Prospective | BD<br>n=5,<br>age between 23 to 64 | Participants participated in a 20-week Cognitive Behavioral Therapy which consisted of a therapy of Nutrition, Exercise and Healthy Living module. | The weight, cholesterol and triglycerides of the participants decreased as well as daily calorie and sugar intake during the study period. Weekly exercise duration increased threefold and depressive symptoms decreased. |
| Daumit et al. | 2013 | Retrospective Study | BD<br>n=64<br>Schizophrenia<br>Schizo- affective,<br>MDD,<br>n=291 | The study includes group exercise sessions and individual weight management sessions.<br>Operating time= 18 months | It was stated that the experimental group lost more weight than the control group and 37.8% of the participants in the experimental group lost at least 5% of the initial body weight compared to 22.7% of the participants in the control group. |
| Vancampfort et al. | 2013 | Systematic review Meta-analysis | Related publications<br>n=11 article | A study of physical activity in patients who have bipolar disorder | The increase in body mass indexes of individuals who have bipolar disorder originated the sedentary lifestyle, some demographic factors and the inadequacy of their participation in physical activities. |

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| Jenney et al. | 2014 | Prospective | BD<br>N=60 | It includes the weekly 150-minute walking exercise recommended by the EPA. Adult patients treated for BD (>18 years) were measured for seven days. | It was determined that the participants could not complete the weekly 150-minutes medium/severe exercise recommended by EPA. In bipolar disorder, excessive weight, smoking habits, sedentary lifestyle, night eating syndrome and side effects of the drugs used had a negative effect on physical activity. |
| Melo et al. | 2016 | Systematic review | Related publications | 31 randomized control-ed studies which is examining 15,587 patients who have bipolar disorder | The depressive symptoms of bipolar patients who are attending physical activities decreased and their quality of life and functionality increased. |
| Merikangas et al. | 2018 | Case Study | BD I =25<br>BD II=29<br>MDD=91<br>Control group=97 (healthy)<br>n=242 | Motor activity and sleep time data were obtained to the very minute with a non-combined wrist insertion device for 2 weeks.<br>Mood and energy levels (using a personal digital clock) were evaluated with analog scoring 4 times a day for 2 weeks. | It was observed that motor activity in bipolar disorder had a greater reactivity among all results, including sleep, mood, and energy. |
| Stubbs et al. | 2018 | Meta analysis | BD I,II<br>schizophrenia<br>MDD | EPA guidance on physical activity for the treatment of severe mental disorders: The European Psychiatric Association (EPA) Guide supported by the International Organi-zation for Mental Health Physical Therapists (IOPTMH) | Researchers reported that exercise effectively decreased symptoms of mental disorder, improved cognitive functions, and enhanced cardiovascular health among schizophrenic patients. Results of the study shows that aerobic exercise which was performed at moderate intensity for at least 150 minutes twice a week improves cognitive and cardiorespiratory health in mental spectrum disorders and decreases depressive symptoms. |

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| Vancampfort & Goldstein | 2018 | Book Chapter-3 | BD | Bipolar disorder and physical activity | In cases where physical activity studies are included in routine management in the treatment of BD patients, it is important to increase the quality of life of this population in relation to mental and physical health in reducing the different morbidity and mortality rates. |

Van Citters and colleagues (50) with in the period of 9 months, in the study which consists of participants who have schizophrenia, bipolar disorder and major depressive disorder, an individual health consultant was assigned to determine the objects which are related to other healthy living modules as well as healthy and regular nutrition program. The program was controlled with moderate walking exercise. They found a significant increase in the mental health of the participants and a significant decrease in the waist circumference.

Sylvia and colleagues (44) has developed Nutrition, Exercise and Healthy Life Therapy in addition to psychotherapy to help individuals who have bipolar disorder while they acquire healthier lifestyle habits. This therapy consists of three modules that aim to change food intake with more nutritious and portion control, increasing weekly exercise as well as improving other health areas (i.e. sleeping, smoking / substance use). In the pilot study of treatment, five participants completed a 20-week individual cognitive-behavioral therapy-based treatment and there was a moderate decrease in depression levels. Participants reported that they were satisfied with the treatment by participating in most of these integrated therapy sessions. In addition to this, it has been determined that they increased the intake of vegetables and decreased the daily sweetness in their nutritional habits. Body weight, cholesterol (high density lipoprotein cholesterol and low density lipoprotein) triglycerides and plasma glucose levels of participants decreased until to 20th week. Participants did not only triple the amount of exercise, but also improved their depressive symptoms. This is one of the first studies which establish the practicality and tolerability of an intensive lifestyle study of bipolar disorder and its effectiveness offers promising data. These studies show some promises that participants who have serious mental illnesses will be successful in the general population and they can be successful in health programs. In order to examine the effectiveness of these programs better, it is crucial to carry out further studies on this quality in controlled studies.

Wright and colleagues (53) conducted a semi-structured study in which 25 people who have bipolar disorder were interviewed about their experiences in exercise and disease. Specifically, they stated that exercise may be beneficial in this population, but that excessive and severe exercise is adverse because it may increase manic symptoms and potentially increase their manic and hypo manic symptoms. While the aggravation of manic symptoms affects the mood directly or indirectly, they draw attention to the reduction of violent exercises that are presumed to be a psychological risk in the disease. Interestingly, patients stated that rhythmic exercise forms may provide a calming effect and may facilitate mood regulation thanks to the gradual structure of activities such as walking, running or swimming.

Correspondingly, Sylvia and colleagues (45) conducted a comparative study with quetiapine which is a second-generation antipsychotic against lithium a classical mood stabilizer in 482 patients with bipolar disorder. At the beginning of the study, individuals who have a manic or hypo manic condition were found that they are tending to exercise more frequently than individuals with depression. Data from the study support that there may be a complex relationship between bipolar disorder and exercise, however it is unclear whether moods can maintain exercise behavior or have a bidirectional relationship. The authors suggest that there is a special relationship between exercise frequency and mood and people who have bipolar disorder reported that they have less exercise in

their depressive periods. While the relationship of increased energy and activity to mania and depression may be an example of the basic symptomatology of the disease, another explanation of this relationship is related to the behavioral activation system (36; 53).

Wright and colleagues (53) stated that although some participants have an increase of manic symptoms, some have a calming effect on hypomania, Suto and colleagues (42) for patients who have bipolar disorder, it is necessary to establish a special health strategy for finding the right type of exercise. As well as this is a controversial discussion, it shows that there is a need for current studies which are examining the effects of exercise during mania and hypomania in this population. The researchers also argue that among the most useful factors in treating bipolar disorder are a specific theme for finding the right type of exercise that can be useful individually (exercise and rest intervals). Although they are qualitative, these studies emphasize that the components such as type, intensity, frequency and duration of exercise can be particularly important when examining the relationship between exercise program and bipolar disorder. Although it has been suggested that exercise may have a significant impact on individuals with bipolar disorder, empirical evidence is needed to support this claim. Daumit and colleagues (12), 18-month group exercise sessions and individual weight management sessions studies included patients who have bipolar disorder (n=64, 22%), severe mental illness such as schizophrenia, and schizoaffective disorder, including individuals with major depression (n= 291). According to the results of the study, it was found that the experimental group lost more weight than the control group and 37.8% of the participants who are in the experimental group lost at least 5% of the initial weight compared with 22.7% of the participants who are in the control group. These findings suggest that overweight or obese individuals who have severe mental illness can apply lifestyle changes which is taught by a study although daily difficulties caused by their illness.

Vancampfort and colleagues (48) according to the results of their study, individuals who have bipolar disorder were insufficient in their participation in physical activities and they had low correlations related to self-efficacy, Comorbidities, education and social isolation. The individuals who have bipolar disorder had a low participation in physical activities and difficulties in directing these individuals to activities cause an increase in BMI, but they are idle due to low income levels and lack of health insurance.

Janney and colleagues (24), in their study with 60 outpatients who have bipolar disorder, they found that 78% of the participants were classified as sedentary (13.5 hours per day), and no participants could complete the 150-minute moderate / severe exercise recommended by the EPA. These findings are consistent with a number of other studies which have a high rate of physical inactivity in people who have bipolar disorder (25). In general, levels of physical activity in bipolar disorder appear to be lower than in the general population, but the data are uncertain (24). For instance, a national study in Canada found no significant difference in physical activity between individuals who have and have not bipolar disorder (7). After all, individuals who have bipolar disorder are limited to reporting on their own, and only to assess their physical activity during leisure time. Moreover, methodological changes which related to the method of evaluation of physical activity make comparison difficult among studies. When taken into consideration the many factors that negatively affect physical activity, such as excessive weight, smoking habits, and side effects of drugs used in bipolar disorder, it is not surprising that data show a higher probability of having sedentary lifestyles (16, 48). In the study which is conducted by Melo and colleagues (30), it was stated that the depressive symptoms of bipolar patients attending physical activities decreased, and their quality of life and functionality increased. In addition to this, the sedentary lifestyle ranged from 40% to 64.9%.

Merikangas and colleagues (31), they deliberated the control group which included totally 242 men and women with 25 Bipolar I disorder, 29 with bipolar II disorder, 91 with depressive disorder and 97 with no history of mood disorder in their studies. For 2 weeks, the researchers used electronic scales (actigraphy device) to evaluate their daily energy levels, emotions, and physical activity levels. Participants scored their moods and energy levels 4 times a day (morning, lunch, evening, and bedtime) using scales consisting of seven items. These are “very happy, “very sad” and “very tired”. It was found that a higher activity level, increased mood and increased energy at the next times (such as lunch time) were associated in the morning.

Similarly, an increased energy level at a certain time was associated with increased activity at the next times. The results of the study show that the increase in physical activity decreases mental disorders and improves general health in adults (especially those who have bipolar I disorder). The biological systems which involved in regulating motor activity are complexly linked to other homeostatic systems such as sleep, feeding behavior, energy, and mood. Mobile monitoring technology allows real-time evaluation of these multiple systems.

Stubbs and colleagues (41) reported that physical activity plays a significant role in reducing the burden of mental health symptoms in patients who have bipolar and schizophrenia. It also provides evidence that patients who have mental disorders may exhibit cardiovascular disease symptoms between the ages of 30 and 40, and the exercise plays a crucial role in reducing these symptoms and improving physical health. According to experts who suggest doing exercise in addition to standard medication and psychotherapy to better treat mental diseases, exercising two to three times a week with a structured physical activity program can reduce the symptoms of depression and schizophrenia. In addition to the treatment of mental disorders, the European Psychiatric Association (EPA) has advocated exercise and published a new guideline to encourage it. Scientists gathered together on the EPA guidelines published in the European Psychiatry Association and they suggested that a structural exercise program should be added to standard drug therapy and psychotherapy. Researchers reported that exercise effectively reduced symptoms of mental disorder, improved cognitive functions, and enhanced cardiovascular health among patients who have schizophrenia. Results of the study shows that aerobic exercise which performed at moderate intensity for at least 150 minutes per week improves cognitive and cardiorespiratory health in schizophrenia spectrum disorders and decreases depression and schizophrenia symptoms. Also the results support combining aerobic and resistance exercise in the treatment of schizophrenia spectrum disorder and patients who have major depression. The EPA guideline was also supported by the International Organization of Mental Health Physical Therapists (IOPTMH) (41). Vancampfort and Goldstein (49) examined the physical health conditions of people who have BD. The authors hope that the rapidly increasing evidence for the importance of exercise in the treatment of BD patients will provide a sustainable health policy change over time, where physical activity studies are included in routine management. Such kind of change is essential for improving the quality of life of this population related to mental and physical health in reducing different morbidity and mortality rates.

## CONCLUSION AND SUGGESTIONS

Most of the drugs which used to treat bipolar disorder cause an increase in appetite and weight gain and they lead decrease self-confidence and reduced quality of life. Most studies focus on strategies to reduce weight gain instead of anti-disease strategies. Preventive and early intervention strategies are more important than weight loss strategies in patient management. The effectiveness of pharmacological therapies in chronic psychiatric disorders such as bipolar disorder is important, but the side effects of the drugs used should be considered. Experts recommend different strategies in addition to medication. Non-pharmacological strategies include cognitive and behavioral studies, nutritional counseling and exercise programs. Studies which are evaluating these strategies have a significant heterogeneity in terms of duration of study, duration of follow-up and intensity of studies. The cognitive and behavioral strategies include eating behaviors and nutritional habits, physical exercise programs, problem solving training, goal setting and social support. Nutrition counseling involves a daily reduction of 500-1,000 kcal / day and a reduction in calories which are taken from fats to 30%. Exercise programs consist of 150 minutes of moderate intensity (55-69% of maximum heart rate) exercise per week. These studies are generally named as “behavioral lifestyle programs” (26).

Some evidence suggests that there is a strong relationship between exercise and mania. Generally, exercise which applies in bipolar patients has been associated with improved health practices, including functionality and quality of life by reducing depressive symptoms (30). Almost all antipsychotics cause weight gain, increase the risk of metabolic complications and physical health and reduce adaptation with medication and daily life. Various strategies have been tried to reduce antipsychotic-induced weight gain (AIWG), and clinicians choose antipsychotics according to the diagnosis, efficacy

and side-effect profile of the patient. Haloperidol, lurasidone, ziprasidone, aripiprazole and amilsulpride have the less risk of weight gain compared to other antipsychotics. However, the risk of weight gain due to antipsychotics is not the only factor that regulates antipsychotic choices. Clozapine, which is the drug with the highest risk of gaining weight, is the only antipsychotic that has received a license in psychiatric treatment. Similarly, olanzapine, which is rich the aspect of efficiency, has a higher risk of gaining more weight than most other antipsychotics.

Although the risk of weight gain is highest in the first year of treatment, monitoring carefully and early intervention are the first steps in AIWG treatment. Non-pharmacological interventions are important in the treatment of AIWG and it is seen that diet counseling, exercise studies, cognitive and behavioral strategies are equally as effective as individual and group therapies.

As in other treatment areas, decisions about drug selection and weight management should be taken by patients and doctors. Main approaches for weight management with antipsychotics:

- Making sure that the risk of weight gain and other side effects are considered when choosing antipsychotics,
- Performing regular Body Mass Index (BMI) measurements during the antipsychotic treatment, especially in the first few months of treatment, where the risk of weight gain is highest,
- Use of lifestyle approaches (increased physical activity and exercise, changes nutritional habits) to manage weight gain; for instance eating well- balanced and regularly, feeding smaller portions, restricting foods and beverages which are rich in sugar and fat and making exercise a habit can prevent weight gain in patients.

There is evidence that exercise may be an appropriate and effective strategy for dealing with the depressive stage of bipolar disorder, but more researches are necessary to determine the recommended intensity, duration and frequency of exercise programs. We believe that in bipolar disorder, more research is needed to get better results in this area because of excessive fluctuations in mood symptoms and high Comorbidity rate.

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# Identification of decision-making skills of the high school students participating in school sports activities

Ayla KARAKULLUKÇU [1], Mehmet ÖÇALAN [1], Pelin AVCI [2]

[1]*Kırıkkale University, Faculty of Sport Science, Kırıkkale, Turkey.*
[2]*Selçuk University, Faculty of Sport Science, Konya, Turkey.*
*Address correspondence to A. Karakullukçu, ayla.karakullukcu@gmail.com*

**Abstract**

The aim of this study is to identify the decision-making skills of the high school students participating in school sports activities. The sample of the study consisted of 221 (n=96 girls and n=125 boys) volunteer students studying in 4 different high schools affiliated to Kırıkkale Provincial Directorate of National Education in 2017-2018 academic year. The students participating in the study were divided into 3 different age groups. 49.3% (n=109) of the students are in the 14-15 age group, 35.7% (n=79) are in the 16-17 age group and 14.9% (n= 33) are in the 18-19 age group. "Melbourne Decision-Making Questionnaire" which was developed by Mann, Burnett, Radford and Ford (16) and whose validity and reliability in Turkish were carried out by Deniz (9) was used in the identification of decision-making skills of the students. The data obtained from the questionnaire were evaluated in SPSS 22.0 package program at 95% confidence interval and 0.05 significance level. In this study, the effect of two or more independent variables on more than one dependent variable was determined by two-way MANOVA analysis. In the statistical analyses, it was found that there was no interaction between the dependent variables ($F_{(15, 577,36)}$=.86, p>0.05) and there was a statistically significant difference between the self-confidence, which is one of the sub-dimensions of the decision-making, and grade variable ($F_{(3,213)}$=2.85, p<.05). In addition, it was determined that there was a statistically significant difference between the self confidence and team or individual sport variable ($F_{(1,213)}$=7.18, p<.05). According to the findings obtained from the study, it was concluded that the highest mean value obtained from the decision-making styles of the students who participated in the school sports activities belonged to Part I "self-confidence", and also the self-confidence of the 12th grade students was higher than the 9th grade students. Another result obtained from the study is that the students who are interested in team sports have higher self-confidence than the students who are interested in individual sports. As a result of the evaluation, the fact that the students participating in the study adopted the style "Self-Esteem (Self-Confidence) in Decision-Making" at the most supports the hypothesis of this study.

**Keywords:** decision-making, high school student, school sports activities

## INTRODUCTION

It takes a certain period for individuals coming into the world to become independent in terms of sustaining their lives and fulfilling the tasks required in human life. This process is important for individuals to acquire different behaviors (21). The best thing that individuals can do for themselves is to make a decision based on the most appropriate options for the possible problems in their lives provided that they renew their knowledge and experience (1).

After the social structure is shaped by the democratic life, the necessity to make a choice for the individuals arises (17). The individuals who have to choose the option that they believe to be the most accurate have uncertainty in most issues throughout their lives and they seek solutions to their problems in this uncertainty (13). There are many definitions in the literature about this choice process called decision-making. Kalaycı (11) defines the decision-making as the process of choosing inevitably the most ideal alternative among the existing alternatives according to the course of the events happening to the individuals. The reaction style that the individuals show in the process of decision-making and that becomes a habit is called as decision-making style (24).

The role of individual factors in the decision-making abilities of the individuals is high. As the options increase, the difficulty in making decisions increases proportionally (9). The level of education, the profession and the preferred work affect our lives to a great extent (6). Individuals solve their problems effectively thanks to the knowledge, skills and experiences they have (4). Decision-making ability, as in many areas of life, has an important place in sports (18). The decision-making abilities of sportspeople in sports competitions may affect the process positively or negatively. The wrong decisions of the sportspeople at the wrong time may change the outcome of the competition. Professional sportspeople can easily overcome the problems thanks to their experience and quick decision-making abilities (15).

In the literature review, it is seen that there are some studies related to decision-making abilities and styles on different people who are present in sports community or not (12). A significant difference was found between self-esteem and careful decision-making styles (vigilance) in the study conducted by Akpınar et al. (2) to determine the decision-making levels of hockey sportspeople studying at the university. In a study conducted by Halim et al. (10) to determine the self-esteem and decision-making styles of the pre-service teachers in the process of decision-making, it was found that pre-service teachers had a higher score in the self-confidence sub-dimension of decision-making.

As a result, the ability of decision-making is an important factor for the personal development of the individuals. Therefore, the high self-esteem and decision-making styles of the sportspeople in decision-making will positively affect their careers and personalities (23).

## MATERIAL & METHOD

### *Participants*

The sample of the study consisted of 221 (n=96 girls and n=125 boys) volunteer students who studied in 4 different high schools affiliated to Kırıkkale Provincial Directorate of National Education in 2017-2018 academic year, and who participated in school sports activities in the branches such as football, volleyball, basketball, handball, swimming, badminton, and whose ages ranged between 14-19.

### *Data Collection Tools*

Melbourne Decision Making Questionnaire I-II was used to determine the decision-making abilities of the students participating in the study. Melbourne Decision Making Questionnaire (MDMQ) whose original was developed by Mann et al. (16) was adapted into Turkish and its validity and reliability was carried out by Deniz (9). MDMQ is divided into two parts.

**Part I:** This part aims to determine the self-esteem (self-confidence) in decision-making. It consists of six items and three items are scored in positive direction and three items are scored in reverse direction. Scoring is done by the answers given to the items. It is 2 points for "True", 1 point for "Sometimes True", and 0 point for " Not True". The maximum score that can be obtained from the Questionnaire is 12. High scores indicate high self-esteem in decision-making (14).

**Part II:** It consists of 22 items and measures decision-making styles. It has four sub-factors (9).

**Factor 1: Vigilance:** It is the state in which individuals search for the necessary information meticulously before making a decision and make a choice after evaluating the alternatives carefully. This factor was expressed in six items (2, 4, 6, 8, 12, 16).

**Factor 2: Buck-passing:** It is the state in which individuals refrain from making a decision and tend to leave the decision to others and thus try to avoid making a decision by giving this responsibility to somebody else. This factor was expressed in six items (3, 9, 11, 14, 17, 19).

**Factor 3: Procrastination:** It is the state in which individuals permanently sidestep, postpone and delay making a decision without a valid reason. This factor was expressed in five items (5, 7, 10, 18, 21).

**Factor 4: Hyper vigilance:** It is the state in which individuals feel under pressure of time and thus exhibit hasty behaviors and try to reach quick solutions when they have to make a decision. This factor was expressed in five items (1, 13, 15, 20, 22) (3).

In the scoring of MDMQ II, vigilance is evaluated with the score range 0-12, buck-passing is evaluated with the score range 0-12, procrastination is evaluated with the score range 0-10 and hyper vigilance is evaluated with the score range 0-10. This questionnaire is also answered as MDMQ I. The

high scores indicate that the decision-making style is used (9).

It was found in the questionnaire that internal consistency reliability coefficient (cronbach alpha) of self-esteem in decision-making of Physical Education and Sports Teachers was 0.74, and 0.76 for decision-making styles (cronbach alpha).

### *Statistical Analysis of Data*

Two-way MANOVA analysis was used in the study. This statistical method was preferred because of the existence of two independent variables and more than one dependent variable (19).

## RESULTS

**Table 1.** Frequency Distribution of Participants According to Gender and Age

| Age group | Gender | | | | Total | |
|---|---|---|---|---|---|---|
| | Female | | Male | | | |
| | N | % | N | % | N | % |
| **14-15 age** | 44 | 45.8 | 65 | 52.0 | 109 | 49.3 |
| **16-17 age** | 33 | 34.4 | 46 | 36.8 | 79 | 35.7 |
| **18-19 age** | 19 | 19.8 | 14 | 11.2 | 33 | 14.9 |
| **Total** | **96** | **100** | **125** | **100** | **221** | **100** |

In Table 1, 49.3% (n=109) of the students who participated in the study are in the 14-15 age group, 35.7% (n=79) in the 16-17 age group and 14.9% (n=33) in the 18-19 age group. 45.8% (n=44) of the female students are in the 14-15 age group, 34.4% (n=33) in the 16-17 age group and 19.8% (n=19) in the 18-19 age group. 52.0% (n=65) of the male students are in the 14-15 age group, 36.8% (n=46) in the 16-17 age group and 11.2% (n=14) in the 18-19 age group.

**Table 2.** Mean Values Concerning the Decision Abilities of the Participants

| Sub-dimensions | Class | Team &Individual | Mean | Sd | N |
|---|---|---|---|---|---|
| **Confidence** | 9 | Team | 5.36 | 1.38 | 25 |
| | | Individual | 5.05 | 1.32 | 20 |
| | | **Total** | **5.22** | **1.35** | **45** |
| | 10 | Team | 5.76 | 1.16 | 37 |
| | | Individual | 5.00 | 1.11 | 30 |
| | | **Total** | **5.42** | **1.20** | **67** |
| | 11 | Team | 5.85 | 1.48 | 41 |
| | | Individual | 5.47 | 1.66 | 30 |
| | | **Total** | **5.69** | **1.55** | **71** |
| | 12 | Team | 6.33 | 1.85 | 21 |
| | | Individual | 5.71 | .77 | 17 |
| | | **Total** | 6.05 | 1.49 | 38 |
| | **Total** | Team | 5.81 | 1.46 | 124 |
| | | Individual | 5.28 | 1.31 | 97 |
| | | **Total** | **5.57** | **1.42** | **221** |
| **Careful decision-making** | 9 | Team | 9.36 | 2.27 | 25 |
| | | Individual | 8.95 | 2.46 | 20 |
| | | **Total** | **9.18** | **2.34** | **45** |
| | 10 | Team | 9.49 | 2.63 | 37 |
| | | Individual | 9.10 | 2.20 | 30 |

| | | | | | |
|---|---|---|---|---|---|
| | | **Total** | **9.31** | **2.44** | **67** |
| | 11 | Team | 10.02 | 1.98 | 41 |
| | | Individual | 9.10 | 1.81 | 30 |
| | | **Total** | **9.63** | **1.95** | **71** |
| | 12 | Team | 9.48 | 2.14 | 21 |
| | | Individual | 10.06 | 1.39 | 17 |
| | | **Total** | **9.74** | **1.84** | **38** |
| | **Total** | Team | 9.64 | 2.26 | 124 |
| | | Individual | 9.24 | 2.03 | 97 |
| | | **Total** | **9.46** | **2.17** | **221** |
| **Avoiding decision-making** | 9 | Team | 4.32 | 2.27 | 25 |
| | | Individual | 3.30 | 1.81 | 20 |
| | | **Total** | **3.87** | **2.12** | **45** |
| | 10 | Team | 3.24 | 2.43 | 37 |
| | | Individual | 3.93 | 2.69 | 30 |
| | | **Total** | **3.55** | **2.55** | **67** |
| | 11 | Team | 4.07 | 2.38 | 41 |
| | | Individual | 3.33 | 1.88 | 30 |
| | | **Total** | **3.76** | **2.20** | **71** |
| | 12 | Team | 3.48 | 3.17 | 21 |
| | | Individual | 2.59 | 2.12 | 17 |
| | | **Total** | **3.08** | **2.75** | **38** |
| | **Total** | Team | 3.77 | 2.53 | 124 |
| | | Individual | 3.38 | 2.21 | 97 |
| | | **Total** | **3.60** | **2.40** | **221** |
| **Delaying decision-making** | 9 | Team | 3.68 | 2.23 | 25 |
| | | Individual | 2.85 | 2.18 | 20 |
| | | **Total** | **3.31** | **2.22** | **45** |
| | 10 | Team | 3.19 | 2.72 | 37 |
| | | Individual | 3.60 | 2.85 | 30 |
| | | **Total** | **3.37** | **2.76** | **67** |
| | 11 | Team | 3.59 | 2.11 | 41 |
| | | Individual | 3.30 | 2.25 | 30 |
| | | **Total** | **3.46** | **2.16** | **71** |
| | 12 | Team | 3.29 | 2.80 | 21 |
| | | Individual | 2.18 | 2.04 | 17 |
| | | **Total** | **2.79** | **2.52** | **38** |
| | **Total** | Team | 3.44 | 2.43 | 124 |
| | | Individual | 3.10 | 2.42 | 97 |
| | | **Total** | **3.29** | **2.42** | **221** |
| **Panic decision-making** | 9 | Team | 4.68 | 2.61 | 25 |
| | | Individual | 3.95 | 2.26 | 20 |
| | | **Total** | **4.36** | **2.46** | **45** |
| | 10 | Team | 3.49 | 2.43 | 37 |
| | | Individual | 4.23 | 2.05 | 30 |
| | | **Total** | **3.82** | **2.28** | **67** |
| | 11 | Team | 4.29 | 2.28 | 41 |
| | | Individual | 3.80 | 1.95 | 30 |
| | | **Total** | **4.08** | **2.15** | **71** |
| | 12 | Team | 4.05 | 2.77 | 21 |

| | | | | |
|---|---|---|---|---|
| | Individual | 3.06 | 2.16 | 17 |
| | **Total** | **3.61** | **2.53** | **38** |
| **Total** | Team | 4.09 | 2.49 | 124 |
| | Individual | 3.84 | 2.09 | 97 |
| | **Total** | **3.98** | **2.32** | **221** |

It was controlled multidimensional statistics whether or not the dependent variables were interacting in itself, and it was determined that there was no interaction ($F_{(15, 577,36)}$= .86, p>.05). The main effects were examined due to the lack of multipleinteractions.

**Table 3. Main Effects**

| | Dependent variable | Df | Mean Square | F | p |
|---|---|---|---|---|---|
| **Class** | **Confidence** | **3** | **5.45** | **2.85** | **.04** |
| | Careful decision-making | 3 | 3.36 | .72 | .54 |
| | Avoiding decision-making | 3 | 4.89 | .86 | .46 |
| | Delaying decision-making | 3 | 4.67 | .79 | .50 |
| | Panic decision-making | 3 | 4.33 | .81 | .49 |
| **Team &Individual** | **Confidence** | **1** | **13.77** | **7.18** | **.01** |
| | Careful decision-making | 1 | 4.12 | .88 | .35 |
| | Avoiding decision-making | 1 | 12.19 | 2.14 | .15 |
| | Delaying decision-making | 1 | 10.46 | 1.77 | .19 |
| | Panic decision-making | 1 | 6.82 | 1.27 | .26 |
| **Error** | **Confidence** | **213** | **1.92** | | |
| | Careful decision-making | 213 | 4.71 | | |
| | Avoiding decision-making | 213 | 5.69 | | |
| | Delaying decision-making | 213 | 5.91 | | |
| | Panic decision-making | 213 | 5.36 | | |
| **Total** | **Confidence** | **221** | | | |
| | Careful decision-making | 221 | | | |
| | Avoiding decision-making | 221 | | | |
| | Delaying decision-making | 221 | | | |
| | Panic decision-making | 221 | | | |

According to Table 3, it was found that there was a statistically significant difference between self-confidence, which is one of the sub-dimensions of decision-making, and grade variable ($F_{(3, 213)}$= 2.85, p<.05). The Bonferonni follow-up test was used to determine where the significant difference was derived from. According to the findings, the self-confidence of the 12th grade students was found to be significantly higher than the 9th grade students. In addition, it was found that there was a statistically significant difference between self-confidence, which is one of the sub-dimensions of decision-making, and team or individual sport variable ($F_{(1, 213)}$= 7.18, p<.05). According to the Bonferroni follow-up test, the self-confidence of the sportspeople interested in team sports was found to be significantly higher than the sports people interested in individual sports.

## DISCUSSION AND CONCLUSION

The findings of the study support the hypothesis of this study. As a result of the study, a statistically significant difference was found between the self-confidence, which is one of the sub-dimensions of decision-making, and the grade variable. The highest mean value obtained from decision-making styles was obtained from the sub-dimension "self-confidence". In accordance with the findings, the self-confidence of the 12th grade students was found to be significantly higher than the 9th grade students. This situation can be considered as individuals are self-confident as a

result of the experience and knowledge they gained. It can concluded that 12th grade students become aware of their abilities as a result of their experience and therefore, their self-esteem is high. Besides, it was found that there was a statistically significant difference between the self-confidence, which is one of the sub-dimensions of decision-making, and team or individual sport variable. The self-confidence of the sportspeople interested in team sports was found to be significantly higher than the sportspeople interested in individual sports. Collaboration in team sports is more than individual sports. Therefore, it can be deduced that it is inevitable that individuals who are interested in team sports will show more success in their self-confidence level because their communication skills and socialization will be more intense.

When the literature is examined, we have seen different studies supporting this study. It was deduced from the study of Avşaroğlu (5) conducted on university students that self-confidence "self-esteem" mean scores differed significantly depending on the grade variable, and there was no significant difference in the mean scores of decision making styles. The studies of Taşgit (20), Akpınar et al. (2) and Uğur (23) support our study.

The individuals who strive to reach new information continuously in order to improve themselves in self-recognition stage are the individuals with high self-confidence while making a decision. The self-confidence of the individual positively affects the level of self-esteem in every decision-making moment (8).

In the study of Birol and İnce (7), it was concluded that 4th grade students were more self-confident than other grade students in the "self

confidence" dimension of decision-making depending on the grade variable. This result has parallels with our study. According to the result drawn between the relationships of the other grades, while the 1st grade students delay making a decision, 4th grade students feel panic while making a decision, and this situation has no parallel with our study.

In a study conducted by Temel et al. (22), no significant difference was found depending on the age variable.

In accordance with the findings obtained from other studies, similar results were achieved as well as different results. The reason for the difference in the findings of the study can be interpreted as the sample varies depending on the sample is limited to a broader or narrower population. This study is important as an example for future studies.

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# A study on effect of melatonin in dyslipidemia caused by experimentally diabetes

Deniz ULUIŞIK[1], Ercan KESKIN[1], Durmuş HATIPOĞLU[1]

[1] *Department of Physiology, Faculty of Veterinary Medicine, University of Selcuk, Konya, Turkey*
*Address Correspondence to D. ULUIŞIK, e-mail: aytekin.alpullu@marmara.edu.tr*

**Abstract**

In this study, it was aimed to determine the effects of melatonin application on lipid profile in streptozotocin-induced diabetic rats. Animals in control group were not any treatment. Melatonin group animals received 50 mg/kg melatonin intraperitoneally in daily for eight weeks. Diabetes was induced by subcutaneous injections of streptozotocin at dose of 40 mg/kg for two days as a single dose per day in diabetes group animals. Animals in Diabetes+Melatonin group were made diabetic by streptozotocin in the same way and then these animals received 50 mg/kg melatonin intraperitoneally in daily for eight weeks. In blood samples taken from all animals, TNF-$\alpha$, triglyceride, total cholesterol, LDL and HDL were determined. In diabetes group, TNF-$\alpha$ level were high ($p<0.05$). The changes in TNF-$\alpha$ level with melatonin application to diabetic rats were important ($p<0.05$). In diabetic rats, triglyceride and LDL levels were found to be enhanced compared to control group ($p<0.05$), HDL level was significantly low ($p<0.05$), while the change in total cholesterol level was not important. With the melatonin application to diabetic rats, HDL level was found to be higher ($p<0.05$) and LDL level was lower than diabetes group ($p<0.05$). It was concluded that the administration of melatonin to streptozotocin-induced diabetic rats may have positive effects on lipid profile.

**Key words:** Diabetes, melatonin, TNF-$\alpha$, lipid profile, rats.

## INTRODUCTION

Diabetes has serious complications in worldwide and its incidence is an increasing in recent years. Cardiovascular disorders are one of the most important complications of diabetes. The incidence of cardiovascular disorders in diabetic patients is 3-4 times higher than those without diabetes. Several risk factors such as dyslipidemia, hypertension and smoking are thought to be associated with the prevalence of micro and macrovascular disorders in diabetes. It is accepted that diabetes itself is an independent risk factor for development of atherosclerosis cases. Oxidative stress is one of the potential mechanisms that mediate vascular disorders in diabetes. Free radicals and oxidative stress play an important role in atherogenesis as well as cause oxidation of low density lipoproteins. Oxidized LDL (Ox-LDL) is recognized not only by LDL receptors but also by the cleansing receptor pathway in macrophages, which results in foam cell formation resulting in irregular cholesterol accumulation (14, 33).

Blood lipids are mainly cholesterol, triglycerides, phospholipids and free fatty acids. Hyperlipidemia plays an important role in the development of many cardiovascular disorders such as atherosclerosis, angina pectoris, myocardial infarction and stroke (16). Excessive inflammatory fibroproliferative events in response to various conditions lead to atherosclerotic lesions by damaging the arterial wall smooth muscles and endothelium (23). Increased lipid accumulation in vascular endothelium is one of the factors that trigger inflammatory processes (16). It is suggested that increased C-reactive protein (CRP) and TNF-$\alpha$ due to hyperlipidemia are closely related to the onset of the inflammatory process and thus anti-inflammatory applications against hyperlipidemia may be effective (26). There are also reports that inflammatory events independent from hyperlipidemia are associated with the onset of atherosclerosis (35).

The increase in obesity and adipose tissue caused by diabetes leads to an increase in releasing of peptides such as leptin, adiponectin and vaspin from these tissues, while it is also observed the increase in production of some proinflammatory cytokines in the same tissues (18, 22, 41). It has been reported that interleukin-6 (IL-6) and TNF-$\alpha$ are released from adipose tissue and its plasma levels increase in parallel with adipose tissue increase (11, 25). In addition, it was claimed that there is a

correlation between these inflammatory cytokines and both endothelial dysfunction and the development of atherosclerosis (8, 49).

Melatonin, known as the hormone of darkness, has an important role in various functions on metabolic events as well as the regulation of the biological rhythm (31). It has been suggested that melatonin modulate lipoprotein metabolism and improve the negative changes in plasma triglyceride, total cholesterol, LDL and HDL levels in diabetic patients. On the other hand, it was suggested that melatonin has hypocholesterolemic effect by reducing cholesterol absorption from the intestines (12). It has been reported that melatonin administration to diabetic rats has positive effects on changes in plasma and erythrocyte GSH, triglyceride, cholesterol and HDL levels (28).

The aim of this study was to determine the effects of melatonin application on changes in plasma lipid profile caused by streptozotocin-induced diabetes.

## MATERIAL AND METHOD

In this study, 32 adult male Wistar Albino rat was used. Rats were kept in proper conditions (heat, humidity and light) during the study period. The animals were divided into four groups. Standard rat diet was fed ad libitum to animals in all groups for 8 weeks. No application was made to animals in control group (K, n=6). The animals in the melatonin (M, n=6) group were intraperitoneally injected 50 mg/kg melatonin (Sigma-Aldrich, St. Louis, MO, USA) every day for 8 weeks. In diabetes group (D, n=9), diabetes was induced by subcutaneous injections of streptozotocin (Sigma-Aldrich, St. Louis, MO, USA) at dose of 40 mg/kg in 0.1 M citrate buffer (pH 4.5) for two days as a single daily dose. Animals in Diabetes+Melatonin group (DM, n=10) were made diabetic by application of streptozotocin in the same way and then were intraperitoneally injected with 50 mg/kg melatonin during 8 weeks. Six hours after streptozotocin administration, rats were orally received 5% dextrose solution to prevent hypoglycemia for 3 days. One week after the streptozotocin injection, blood glucose levels were measured by glycometer (PlusMED Accuro, Taiwan) and rats which have 250 mg/dl or high blood glucose levels were included in the diabetic groups (group D and DM). One animal from the diabetes group died due to hypoglycemia during the study. At the end of 8 weeks, the TNF-$\alpha$, Triglyceride, Total Cholesterol, LDL and HDL levels were determined in blood samples.

TNF-$\alpha$ level were determined with ELISA (Biotek ELx800, Biotek Instrumentations, Inc, Winooski, VT, USA) using sandwich enzyme-linked immunosorbent method via commercial kits (Elabscience), while Triglyceride, Total Cholesterol, LDL and HDL levels were determined the Abbott C8200 autoanalyzer using Abbott kits.

The data obtained from the study were analyzed by one-way ANOVA (SPSS 19). Differences among the groups were determined by Duncan's multiple range test. Differences were considered significant at $p<0.05$. The study protocol was approved by The Ethical Committee of Selcuk University Experimental Medicine Research and Application Center (Report no. 2017-15).

## RESULTS

The effects of melatonin administration on plasma total cholesterol, triglyceride, some lipoprotein levels and TNF-$\alpha$ in streptozotocin-induced diabetic rats are summarized in Table 1.

TNF-$\alpha$, a proinflammatory cytokine, was found to be significantly higher in diabetes group than the control group (Table 1, $p<0.05$), whereas it was significantly lower in melatonin administrated diabetic rats than in the diabetes group (Table 1, $p<0.05$). In the study, it was determined that plasma triglyceride level was significantly higher in rats with experimental diabetes than the control group (Table 1, $p<0.05$). In diabetic rats, decrease in plasma HDL level (Table 1, $p<0.05$) and increase in LDL level (Table 1, $p<0.05$) were found to be significant compared to the control group, but the increase in total cholesterol level was not significant. With 50 mg/kg melatonin administration to diabetic rats, plasma HDL level were found to be significantly higher compared to diabetic animals (Table 1, $p<0.05$) and LDL level were significantly lower than in diabetic animals (Table 1, $p<0.05$). The changes in plasma total cholesterol and triglyceride levels with melatonin administration to diabetic rats were not important when compared to diabetes group.

Table 1. Effect of melatonin on total cholesterol, triglyceride, LDL, HDL and TNF-α levels in streptozotocin-induced diabetic rats (Mean±SE).

| | Total Cholesterol (mg/dl) | Triglyceride (mg/dl) | LDL (mg/dl) | HDL (mg/dl) | TNF-α (pg/ml) |
|---|---|---|---|---|---|
| K | 87.33±6.63$^{ab}$ | 62.50±5.13$^{b}$ | 43.83±1.87$^{bc}$ | 39.67±3.65$^{a}$ | 91.54±3.96$^{c}$ |
| M | 80.83±6.29$^{b}$ | 61.17±7.31$^{b}$ | 39.50±1.18$^{c}$ | 44.50±4.96$^{a}$ | 89.28±7.14$^{c}$ |
| D | 105.50±4.92$^{a}$ | 86.50±5.16$^{a}$ | 64.90±3.93$^{a}$ | 28.10±3.43$^{b}$ | 127.49±5.35$^{a}$ |
| DM | 92.11±6.27$^{ab}$ | 79.56±7.09$^{ab}$ | 51.78±4.70$^{b}$ | 41.78±3.46$^{a}$ | 109.42±4.56$^{b}$ |

a-c The difference between mean values with different superscripts in the same column is significant at the $p<0.05$ level

## DISCUSSION

Diabetes affecting millions of people worldwide is characterized by high blood glucose levels, insulin resistance or insufficiency. Some of the complications responsible for the mortality are considered as triopaty (retinopathy, neuropathy and nephropathy), dyslipidemia and cardiovascular diseases (5, 39). In recent years, there has been a growing interest in the use of various alternative products for the treatment and prevention of diabetes (3, 4, 20, 39, 42). Melatonin depend on its many physiological effects has been used as an option in preventions of diabetes and its complications (28, 43).

TNF-α is a proinflammatory cytokine which is produced by macrophages and adipose tissue. The plasma level of TNF-α is reported to be high in diabetes studies conducted in human and rat (6, 10, 13, 15, 32, 40, 46). It is stated that TNF-α production and release increased in response to systemic inflammation plays a role in dyslipidemia and vascular pathophysiology related to diabetes (44, 45). It is reported that increased TNF-α in diabetes further exacerbates the current situation by inhibiting the kinase activities that form the insulin signaling pathway in skeletal muscles, fat tissue, endothelial cells and other tissues (1, 37). It has been shown that TNF-α increase the levels of triglyceride and very low density lipoprotein (VLDL) as it affects lipolysis in mouse, rat and human fat cells (13, 36, 49). One of the best known properties of melatonin, also known as the hormone of darkness, is reported as its effect on anti-inflammatory mechanisms (43). It has been suggested that melatonin inhibits proinflammatory cytokines in polymorphic nuclear leukocytes, endothelial cells and colitis, thereby alleviating tissue damage and cell migration due to inflammation (17, 30, 43). The effects of melatonin on proinflammatory cytokines, especially TNF-α, are attributed to the inhibition of mRNA expression of these cytokines (21). In paralelly, administration of oral melatonin has been reported to modulate overexpression of TNF-α (9, 38). The decrease in plasma TNF-α level with melatonin administration to diabetic rats can be explained with the mechanisms stated above. The TNF-α level in diabetic animals treated with melatonin was still higher than both control and melatonin group levels. This can be accepted a sign of systemic inflammation relatively continouied due to diabetes.

Plasma triglyceride levels were significantly higher in rats with experimentally induced diabetes than the control group (Table 1, $p<0.05$). In diabetic rats, decrease in plasma HDL level (Table 1, $p<0.05$) and increase in LDL level (Table 1, $p<0.05$) were found to be significant compared to the control group. With 50 mg/kg melatonin administration to diabetic rats, plasma HDL level were found to be significantly higher compared to diabetic animals (Table 1, $p<0.05$) and LDL level were significantly lower than in diabetic animals (Table 1, $p<0.05$). Melatonin administration to rats with diabetes resulted in obviously improving HDL and LDL levels but the effects of melatonin on plasma triglyceride and total cholesterol levels were found to be limited. There are some reports that hyperglycemia generally caused hypertriglyceridemia and hypercholesterolemia (48). The findings obtained from our study appear to be consistent with the data of researches conducted on the same subject (19, 24, 48). The positive changes observed in the plasma lipid parameters by the administration of melatonin are attributed to the reasons such as suppressed tissue lubrication (34, 47), increased lipoprotein lipase activity and increased insulin sensitivity resulting in decreased

of lipolysis in adipose tissue (34). Mechanisms such as inhibition of cholesterol absorption (12) and synthesis (2), increased conversion of cholesterol to bile acids, increased LDL receptor activity (2, 29), and inhibition of metabotropic receptors involved in the transport of fatty acids (7) are considered among the corrective effects of melatonin on the lipid profile (27).

## CONCLUSION

When considering significant changes obtained in TNF-$\alpha$, HDL and LDL levels with melatonin application and partial positive changes in total cholesterol and triglyceride levels, it was thought that melatonin application might have a corrective effect on dyslipidemia seen in diabetes.

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# Leisure time management in Marmara university and Kilis 7 aralik university students training in sports sciences

**Aytekin ALPULLU,Ahmet YILGIN**

[1]Marmara University Faculty of Sport Sciences/Sport Management/İstanbul/Turkey
[2]Kilis 7 Aralık University School of Physical Education and Sports/Kilis/Turkey
Corresspondending Author to A.ALPULLU,e-mail: aytekin.alpullu@marmara.edu.tr

**Abstract**

This sport science research in an undergraduate Faculty of Marmara University Sports Science and Kilis 7 Aralık University of Physical Education and Sports School students of "Leisure Management" ideas are evaluated.Free time management scale; Wei-Ching Wang et al. (2011) and Akgül and Karaküçük (2015) by adapting to Turkish by making validity and reliability study consists of 15 items and 4 sub-dimensions. 285 students from Marmara University Faculty of Sport Sciences and Kilis 7 Aralık University School of Physical Education and Sports participated in the study. In data analysis, descriptive statistics, t-test, ANOVA test were used. As a result of the statistical analysis, it was seen that the majority of the participants consisted of Marmara University students, while in the departments, there was a larger number of male students. In the other findings, it was understood that there was more participation in the 18-20 age group, they were single in marital status and they were more in the 1st class and they participated in their activities in leisure time 2-3 days a week. While there was a significant difference between the total scale scores of the participants and the variables of the universities, it was found that there was no significant difference in gender, marital status variables. There was a significant difference between the scale sub-dimensions and the activities of universities, age, leisure time and classes. As a result, it is understood that leisure time is better managed in metropolitan cities and that students who are studying in the field of sports should be directed to leisure time activities.

**Keywords:** leisure management, university students, programming, evaluation and goal setting and methods.

## INTRODUCTION

Management can be expressed as a decision-making process against all kinds of thoughts, feelings, situations and similar cases in the time course that begins with the existence of humanity. Human beings have a tendency to be managed and managed in accordance with the environment in which they were then involved. Some people make more effective decisions based on their ability to manage and others tend to be managed by others. However, in an environment in which we are present, what the individual does requires a self-management and decision-making skill, that is to say self-leadership, as required by the social environment. Self-leadership skills to control the behaviour of individuals is expressed as a process (7). Decisions in self-leadership in this process are decisions made in the form of necessity and free time action, but competing with time. The level of self-management in the leisure time is directly related to the consciousness and it is possible that the person decides what to do by own questioning. The concept of leisure time constantly examined in the field. While (5) says "in ancient Greece, the time to think of human beings as a kind of basic tasks and to produce information about the future is

understood", according to (14); Leisure time in free time (free time) is expressed as the actions of freedom of the individual. According to (2) leisure time; expresses the time required by the good planning and evaluation of the time as a time period that human beings can freely use in order to be able to play, relax, have fun or improve themselves in accordance with their tendencies and wishes. Leisure time; is the connection of man to his own existence and to find himself with the universe he is in. People are testing the reason for being, their inner world only with their inner speeches and other actions in their free time. The free time that a person calls himself (9) refers to objective time as a resource that can be measured as natural and artificial, and subjective time is expressed as a perceived moral value according to the environment. Express the positive or negative fictions (concert sportive activity or alcohol, speed passion) determined by the experiences that prepare life and teach life. In this process; time, activity, state of mind and cultural approaches are indicated (1). According to (9), it is stated that there is a need for leisure time because people with low time management skills who cannot divide time cannot succeed in their original works, where the balance of life is impaired, and when the individual achieves his / her job and social duties, leisure time should be managed.

As the Greek philosopher Heracleitus mentioned by saying "the only thing that doesn't change is change itself" the words of leisure activities and thoughts have been changed in the present time the leisure time management of individuals has become quite difficult (22). Due to globalization and competition, individuals are forced to convert leisure time into artificial recreational activities. In line with Veblen's Leisure Class Theory, (5); stated that leisure time is the habitat of the upper layer and that it is an objectified object that the pretentious consumption society has been created and that everything can be bought and sold. Therefore, in the technological age where opportunities are provided by capital management, the pain of not reaching the essence of the individual man can be transformed into deeper social suffering. Health expenditures of countries are the most obvious example of this. In the simplest sense, the stress that triggers many diseases can be due to the inability to manage free time, the failure of the individual to achieve freedom and self-rule.

Community culture has an average consciousness. It was stated that taste, taste level, individual presentation, perception and expressions were uniformized through the culture industry and put into a standard form. Students who are educated in sports sciences are known to be more conscious about basic movements, physical activities and recreational activities (5). However, considering the fact that the students of the sports sciences who are among the average group of individuals in today's culture industry cannot get out of the system, how these students manage their free time according to their free will is considered as the problem of the research. In a study done by (6) conducted with students studying in university sports sciences, it was stated that gender and weekly free time period were an important factor in free time satisfaction and age was an important variable in terms of free time management. In a study on the leisure time of students and public employees, (15) stated that the majority of the students and the women working in the public sector had the opportunity to do the activity but could not participate in the leisure activities due to lack of economic reasons and facilities. Otherwise (10) concluded that university students have difficulty in participating in leisure time activities and that male students are more inclined to participate in sports activities in their free time than women. And also (3) stated that the students spend their leisure time and these behaviours are caused by individual attitudes and thus affect leisure time management.

In this study, it is aimed to investigate the leisure time of Marmara University Faculty of Sport Sciences and Kilis 7 Aralık University Physical Education and Sports School by (2) scale adapted to Turkish.

## METHOD

The aim of this study is to reveal the thoughts of leisure time in the sample group consisting of randomly selected students studying at Marmara University Faculty of Sport Sciences and Kilis 7 Aralık University Physical Education and Sports School according to the Free Time Management Scale.

### *Universe and Sample*

According to the 2018 activity report of Marmara University, 1046 students from Physical Education and Sports College (21) and 160 students from Kilis 7 Aralık University School of Physical Education and Sports constitute the universe. 285 students (20), who were included in the study as a volunteer by chance, constitute the sample.

### *Data Collection Tool*

In data collection, Free Time Management Scale, this was developed by Wei-Ching Wang at all. (2011) and adapted to Turkish by Akgül and Karaküçük (2015) were used. The scale was used in 15 items and 4 sub-dimensions (Setting Goals and Method, Leisure Attitude, Programming and Evaluation) with a 5-point Likert-type score of 1-5.

### *Data Analysis*

Data obtained from the participants were obtained by using SPSS 23 package program and the personal information of the participants was obtained by descriptive statistics with percentage and frequency analysis. Independent-Samples T-Test and One-Way

ANOVA analysis were performed according to the mean scores of the participants.

## RESULTS

Mentioned that the validity and reliability studies of the Emotional Management Scale were conducted (2), and the scale Cronbach Alpha coefficient was 0.83, the sub-dimensions were between 0.71 and 0.81, and the internal consistency was good. According to the findings obtained from the data;

**Table 1.** Demographic Information Distribution

| Demographic Information | f | % | Demographic Information | f | % |
|---|---|---|---|---|---|
| Universities | | | Departments | | |
| Marmara University | 170 | 59.6 | Coaching | 91 | 31.9 |
| Kilis 7 Aralık University | 115 | 40.4 | Sport Management | 68 | 23.9 |
| Total | 285 | 100 | Teacher | 126 | 44.2 |
| Genders | | | Marital Status | | |
| Female | 96 | 33.7 | Single | 282 | 98.9 |
| Male | 189 | 66.3 | Married | 3 | 1.1 |
| Ages | | | Classes | | |
| 18-20 | 177 | 62.1 | 1. Class | 208 | 73 |
| 21-23 | 91 | 31.9 | 2. Class | 8 | 2.8 |
| 24-25 | 10 | 3.5 | 3. Class | 20 | 7 |
| 26< | 7 | 2.5 | 4. Class | 49 | 17.2 |
| Activity Days per Week | | | | | |
| 1 Day per week | 56 | 19.6 | | | |
| 2-3 Days per week | 143 | 50.2 | | | |
| 4-5 Days per week | 52 | 18.2 | | | |
| 6-7 Days per week | 34 | 11.9 | | | |

According to the data in Table 1: It is understood that the majority of the participants in the study were Marmara University students (59.6%), Education and Teaching between departments (44.2%); male students in gender variable (66.3%), 18-20 years old students (62.1%) in age sub-dimension and single (98.9%) students in marital status, when look at the grade level, it was found that Class 1 (73%) was higher; and students do leisure time activities mostly 2-3 days per week (50.2%).

**Table 2.** Independent Samples T-Test Between Independent Variables with the Scale of University and lower Sub-dimensions

| Universities | | N | $\bar{x}$ | SS | t | p |
|---|---|---|---|---|---|---|
| Scale | Marmara University | 170 | 2.56 | 0.45 | 2.716 | 0.007* |
| | Kilis 7 Aralık University | 115 | 2.41 | 0.42 | | |
| Programming | Marmara University | 170 | 3.64 | 0.99 | 2.344 | 0.020* |
| | Kilis 7 Aralık University | 115 | 3.36 | 0.98 | | |

P<0.05

According to the data in Table 2, there was a significant difference (p <0.007) between 95% confidence interval between universities variable and scale, and the reason of this difference is that students at Marmara University (x̄: 2,56) are more successful in leisure time than students of Kilis 7 Aralık University (x̄: 2,41).

It was found that there was a significant difference (p <0,020) in the programming sub-dimension with the universities variable and the reason for this difference is that the students in Marmara University (x̄: 3,64) plan more leisure time than the students of Kilis 7 Aralık University (x̄: 3,36). There was no significant difference in other sub-dimensions.

**Table 3.** One-Way ANOVA Test Between Age Variable and Leisure Time Attitude

| | | | | | | | | | | | Descriptive Statistics |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | One-Way ANOVA | | | | Post Hoc Analysis Tukey HSD | | | | | |
| Dimensions | Age Group | KT | KO | F | p | (I) age | (J) age | p | $\bar{x}$ | SS | Difference |
| Leisure Time Attitudes | Between Groups | 14.423 | 4.808 | 8.331 | 0.000* | a-18-20 | 21-23 | .031* | 1.85 | 0.83 | a>b a<c b<c and d |
| | | | | | | | 24-25 | .030* | | | |
| | | | | | | b-21-23 | 18-20 | .031* | 1.58 | 0.66 | |
| | | | | | | | 24-25 | .001* | | | |
| | | | | | | | 26< | .005* | | | |
| | In Group | 162.149 | 0.577 | | | c-24-25 | 18-20 | .030* | 2.53 | 0.28 | |
| | | | | | | | 21-23 | .001* | | | |
| | | | | | | d-26< | 21-23 | .005* | 2.57 | 0.16 | |

P<0,05

According to the data in Table 3, a significant difference was found between age variable and leisure attitude sub-dimension. (f value = 8,331, p = 0,000 <.05). It was understood that the difference was caused by the groups of 18-20 years (x̄: 1,85) and 21-23 years (x̄: 1,58) and 24-25 years (x̄: 2,53) (a> b and a <c). The other difference obtained in the findings is understanding of differences (b<c and d) between the ages of 21-23 years (x̄: 1,58) and 24-25 years (x̄: 2,53) and 26 years and older (x̄: 2,57). It is understood that there is a low level of leisure attitude among the age groups of 21-23 age group. There was no significant difference in other sub-dimensions.

**Table 4.** One-Way ANOVA Test Between Class Variable and Programming

| | | | | | | | | | | | Descriptive Statistics |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | One Way ANOVA | | | | Post Hoc Analysis Tukey HSD | | | | | |
| Dimension | Class Group | KT | KO | F | p | (I) class | (J) class | p | $\bar{x}$ | SS | Difference |
| Programming | Between Groups | 11.844 | 3.948 | 4.107 | 0.007 | a-1. class | b-2 class | 1.000 | 3.41 | 0.99 | a<d |
| | | | | | | | c-3 class | 0.076 | | | |
| | | | | | | | d-4 class | 0.027* | | | |
| | In Group | 270.098 | 0.961 | | | d-4. class | a-1 class | 0.027* | 3.85 | 1.01 | |
| | | | | | | | b-2 class | 0.653 | | | |
| | | | | | | | c-3 class | 0.970 | | | |

P<0.05

According to the data in Table 4, a significant difference (f value = 4,107, p = 0,007 <.05) was found between the class variable and the programming sub-dimension. It is understood that the difference is between 1st grades (x̄: 3,41) and 4th grades (x̄: 3,85) and as a result, the programming skills of 4th grade students are more developed. There was no significant difference in other sub-dimensions

.

**Table 5.** One-Way ANOVA Test Between Leisure Time Activity Day Variable and Programming

| One Way ANOVA | | | | | | Post Hoc Analysis Tukey HSD | | | Descriptive Statistics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dimension | Leisure Time Activity Day | KT | KO | F | p | (I) day | (J) day | p | $\bar{x}$ | SS | Difference |
| Programming | Between Groups | 10.307 | 3.436 | 5.806 | 0.001 | a-1 day | 2-3 days | 0.004* | 2.13 | 0.89 | a>b and d |
| | | | | | | | 4-5 days | 0.369 | | | |
| | | | | | | | 6-7 days | 0.002* | | | |
| | | | | | | b-2-3 days | 1 days | 0.004* | 1.71 | 0.66 | |
| | | | | | | | 4-5 days | 0.484 | | | |
| | | | | | | | 6-7 days | 0.551 | | | |
| | In Group | 166.265 | .592 | | | d-6-7 days | 1 days | 0.002* | 1.52 | 0.68 | |
| | | | | | | | 2-3 days | 0.551 | | | |
| | | | | | | | 4-5 days | 0.129 | | | |

P<0.05

According to the data in Table 5, a significant difference was found between the free time activity day variable and the leisure attitude sub-dimension (f value = 5.806, p = 0.001 <.05). The difference (a> b and d) was found between 1 day ($\bar{x}$: 2.13) and 2-3 days ($\bar{x}$: 1.71) and 6-7 days ($\bar{x}$: 1.52) between groups. As a result, it is understood that 1-day activities are doing by more programming. There was no significant difference in other sub-dimensions.

## DISCUSSION

Leisure time is the times when we feel the freedom in our inner world where hopes and dreams determine our daily life and our future life. In the management of this time, there are many effects from social environment besides personal skill. According to the data obtained from the study, it was observed that Marmara University students had more participation than Kilis 7 Aralık University. This result is thought to be caused by the number of students. When we examine the gender variable of the participants, it was seen that the male students had more participation, the age variable was between the ages of 18-20, and the class variable was the 1st grade students. According to the days of participation in activities, it is seen that the students have the habits to participate in leisure activities for 2-3 days per week. In different studies, (18) stated that the majority of students play mobile games as leisure activities. In addition, it was concluded that the students who were staying in studio apartments by (11) spent time on internet in their recreational activities in the study of leisure time habits. In the study conducted by (6), it was stated that the weekly free time period of the participants was between 1 and 5 hours. (19) in the study conducted with the public employees with grooves of 1-3 hours a day are specified daily. Istanbul and Kilis provinces are cities with different locations and development levels. Students living in different cities according to their own way of living and leisure time management has been the subject of curiosity. As a result of our study, it was understood that there was a significant difference between the two universities studied, and that Marmara University students were better at managing leisure time and more successful in programming. In our study, it was stated that there was no significant difference according to gender variable, and there was no difference between gender variable just as in the study free time management conducted by (6). While there was a significant difference between the students' classroom variables and the level of programming, it was observed that this difference was between 1st grades and 4 grades, and it was seen that 4th grade

students were more successful in programming in their free time. In a different study by (8), it was stated that those who went to the gym were more interested in programming their free time. It was found that there is a significant difference between the participants' leisure time activity and leisure time attitudes. As a result of the statistical data, it is observed that those who have 1-day free time activity have more free time attitudes than those who activate 2-3 days and 6-7 days. In a similar study by (13), it was concluded that young police officers working in the Police Department were more involved in leisure activities as they improved their habits in leisure activities. If we examine the researches in this field; (3) marked that the students' daily leisure time influences their attitudes in leisure time activities, and those who are more successful in their studies are more positive towards leisure activities compared to others. However, in another study by (16) He mentioned that the students spend their time relaxing, but they are not conscious of managing leisure time despite having sufficient awareness about the usefulness of leisure activities. By (23) stated that there is a lack of information and guidance on how to evaluate leisure time. A different study by (12) the important part is that people who are mostly young people play football for active recreation in their leisure time habits and they do activities just like listening music, watching TV and reading books for passive reconditioning.

## CONCLUSION

As a result, it is understood that the students who study in physical education and sports in the university have spare time 2-3 days a week. However, it is understood that the majority of students do a maximum of one day of leisure time activity per week. It is thought that as age increases, students are more successful in leisure time management and this is due to their experience in more leisure activities. It is understood that when students have leisure management purposes, more meaningful things are done and evaluation and programming skills are developed in this regard. However, as it is stated in the literature, it is understood that the developing technology has a negative effect on the leisure time of the individual due to the global capital in the clamp of production and consumers. It should be taken into consideration that students who are studying at the university need occasional awareness and need to be guided for their leisure time activities. For this reason, it is thought that it will be more effective to apply the lessons to some applications and field studies. It has been understood that leisure time is better managed in metropolitan cities and that students who are studying at the university should be directed to leisure time activities.

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# Examining the social media teacher-student interactions of physical education teachers

**Çağrı Hamdi ERDOĞAN[1], Ziya BAHADIR[2], Ramazan TOPUZ[3]**

[1]*Çömlekçi Middle School, Ministry of Education, Kayseri, Turkey*
[2]*Erciyes University, Faculty of Sport Sciences, Kayseri, Turkey*
[3]*Selçuk University, Faculty of Sport Sciences, Konya, Turkey*
*Address Correspondence to ÇH. ERDOĞAN e-mail: erdoganhamdi@hotmail.com*

**Abstract**

This study was The aim of this research is to examine the interactions between the physical education teachers and students in social media based on some variables. In the study, a descriptive survey method was used, which aimed at revealing the existing situation. There search group was comprised of 390physicaleducationteachersactivelyworking at the state schools of Kayseri province in the 2018-2019educationyear.Personal Information Form and Social Media Teacher – Student Interaction Scale were used in the study as the data collection tools. SPSS program was used in the analysis of the data. According to results of the research, it was determined that the social media teacher-student interaction levels of the physical education teachers were at the medium range. In addition, it was determined that virtual leader characteristics of physical education teachers were prominent. Also a significant difference was found concerning the social media teacher-student interaction levels of the physical education teachers for the variables school location, sport branch, physical education infrastructure in the school, the school team status, regular exercise, age, monthly income perception; however, statistically no significant difference was determined concerning the variables school type, marital status, and gender.

**Keywords:** Physical Education Teacher, Student, Social Media

## INTRODUCTION

Human being has been under the influence of technological developments in the 21st century. Information technologies have appeared in every division of life. Hi-tech televisions, computers, and mobile devices have been indispensable for the daily life. Our age is named as the internet age. World has witnessed numerous innovations through internet. One of those innovations is the social media.

Social media is a combination of social network sites supported by activities such as content sharing and personal comments that allow internet users to communicate online with each other in an interactive way (18). Based on the experiences of people with each other on the social networks, social media is the sum of the relationships that keep together the users with same fields of interest (11).

Social media is one of the technological innovations that allow the creation, sharing and exchange of information and ideas in virtual communities and networks. Social media ensures a social interaction among people by allowing the sharing of ideas and information with other people (27). Social media is a web-based interface that allows its users to create profiles, and communicate and contact about certain issues (17).

Social networks provide its users with rich contents and interactions with other users. This situation can be clearly observed in the interaction

pattern of social media users. Social networks are not comprised of only family members or friends,additionally there are teachers, school personnel, neighbors, who are a part of our daily life, and other individuals finding a place in the social network (7).

Social media is widely used among the students as well. Majority of the students using social media use it as a means of entertainment and relief, and they spend an important amount of time like three hours daily average in social media (20).Moreover, it is reported that the students use the social media for sharing photos, music, video, and contents related with lessons, for being in contact concerning the lessons, and for being involved in interaction with other friends during this mentioned daily time periods in the social media (23).

The basic aim of using the social media is the involvement of the users in social interactions (22). Interaction is the most basic element of any educational process (2). With the use of social media being widespread, it is also stated that the teacher-student interaction in the school is spread to the areas outside the school (9).

It is mentioned that the use of social network platforms by students for education will provide important gains (24). It is reported that use of social media in education is necessary (14). It is emphasized that the social media platforms develop the communication between teachers and students (1).

The main aim of this research study is to investigate the social media teacher-student interactions of the physical education teachers. Moreover, the social media teacher-student interaction levels of physical education teachers were compared in terms of some variables.

## MATERİAL AND METHOD

### Research Model

The research was conducted as a survey model for examining the social media teacher–student interactions of physical education teachers. Survey model is a research approach that attempts to identify a situation as it was in the past or as is in the present (15).

### Research Group

The research group is consisted of a total of 390 physical education teachers, who work in the public schools within the provincial borders of Kayseri in the 2018-2019 academic year. 81 (20.8%) of the physical education teachers from the research group were female and 309 (79.2%) were male.

### Data Collection Tools

In the research, "Personal Information Form" and "Social Media Teacher–Student Interaction Scale" were used as data collection tools. The Personal Information Form was prepared by the researchers, taking into account the expert opinion and similar research in the literature. The Social Media Teacher–Student Interaction Scale was developed by Korucu and Usta (19).

The Social Media Teacher–Student Interaction Scale is a five point likert scale consisting of 34 items and six sub-dimensions. The average scores were calculated through the scores ranging from 1 to 5 (minimum score to gain from the scale in this research study is 1 and maximum is 5), and the findings were obtained in this way. Higher scores obtained from the scale indicate higher level of social media teacher–student interaction.In their analyses, Korucu and Usta (19) the cronbach alpha reliability coefficients of the scale according to the factors in between .74 and .84, and test-retest reliability coefficients in between .87 and .88.

### Data Analysis

The SPSS program was used for statistical analysis in this research. In order to examine the social media teacher–student interactions of physical education teachers, the arithmetic average ( ) and standard deviation (Sd) techniques were used, which are the elements of the descriptive statistics. In the analyses, it was investigated through Kolmogorov-Smirnov Test whether the data followed a normal distribution. As a result, it was found that social media teacher–student interaction scores did not follow a normal distribution (p=.000). Since social media teacher–student interaction scores did not follow a normal distribution, the Mann-Whitney U Test was employed for paired comparisons, and Kruskal Wallis H Test for multiple comparisons. Significance (p) level was accepted as $p<0.05$.

## FINDINGS

**Table 1.** The distribution of some of the characteristics of the physical education teachers from the research group

| Gender | n | % |
|---|---|---|
| Female | 81 | 20.8 |
| Male | 309 | 79.2 |
| **Age** | **n** | **%** |
| 20-29 Years Old | 159 | 40.8 |
| 30-39 Years Old | 159 | 40.8 |
| 40 and Over | 72 | 18.4 |
| **Marital Status** | **n** | **%** |
| Married | 333 | 85.4 |
| Single | 57 | 14.6 |
| **Location of the School** | **n** | **%** |
| Rural | 132 | 33.8 |
| Urban | 258 | 66.2 |
| **Monthly Income Perception** | **n** | **%** |
| Low | 84 | 21.5 |
| Medium | 261 | 66.9 |
| High | 45 | 11.6 |

| Physical Education Infrastructure in the School | n | % |
|---|---|---|
| Sufficient | 159 | 40.8 |
| Insufficient | 231 | 59.2 |
| **Sport Branch** | **n** | **%** |
| Individual Sport | 141 | 36.2 |
| Team Sport | 249 | 63.8 |
| **Doing Regular Exercise?** | **n** | **%** |
| Yes | 189 | 48.5 |
| No | 201 | 51.5 |
| **Training A School Team?** | **n** | **%** |
| Yes | 219 | 56.2 |
| No | 171 | 43.8 |
| **School Type** | **n** | **%** |
| Secondary School | 168 | 43.1 |
| High School | 222 | 56.9 |
| **Total n:** 390 | | |

Among the physical education teachers from the research group; 81 (20.8%) were female and 309 (79.2 %) were male; 159 (40.8%) were 20-29 years old, 159 (40.8%) 30-39 years old, and 72 (18.4 %) of them were 40 and over; 333 of them (85.4%) were married and 57 (14.6%) were single; the school locations of 132 (33.8%) were rural, while those of 258 (66.2%) were urban; the physical education infrastructures of 159 teachers (40.8%) were sufficient, while those of 231 (59.2%) were insufficient; 141 (36.2%) had individual sport branches, while 249 teachers (63.8%) had team sport branches; 189 (48.5%) were doing regular exercises, while 201 (51.5%) were not; 219 of them (56.2%) trained a school team, whereas 171 (43.8%) did not; 84 teachers (21.5%) had a low income perception, while 261 (66.9%) at medium level, and 45 (11.6%) had a high level income perception; 168 (43.1%) were working in secondary schools, and 222 (56.9%) in high schools.

**Table 2.** The average scores that the physical education teachers from the research group obtained from the social media teacher-student interaction scale

| Sub-dimensions of Social Media Teacher – Student Interaction Scale | n | $\overline{X}$ | Sd |
|---|---|---|---|
| Virtual Leader | 390 | 3.64 | .787 |
| Traditional Teacher | 390 | 2.93 | 1.066 |
| Observing Teacher | 390 | 3.16 | 1.094 |
| Virtual Activeness | 390 | 3.10 | 1.128 |
| Social Sharing | 390 | 3.46 | 1.253 |
| Academic Sharing | 390 | 3.42 | 1.258 |
| **Total** | **390** | **3.34** | **.785** |

As is seen in Table 2, it is observed that the physical education teachers obtained following average scores from the sub-dimensions of Social Media Teacher-Student Interaction Scale; Virtual Leader $\overline{X}$=3.64, Traditional Teacher $\overline{X}$=2.93, Observing Teacher $\overline{X}$=3.16, Virtual Activeness $\overline{X}$=3.10, Social Sharing $\overline{X}$=3.46, and Academic

Sharing $\overline{X}$=3.42. According to these results, it was determined that the physical education teachers from the research group obtained the highest score from the "virtual leader" sub-dimension. It was also determined that the physical education teachers from the research group obtained an average score of $\overline{X}$=3.34 in general, from the Social Media Teacher-Student Interaction Scale. Accordingly, it can be mentioned that the social media teacher-student interactions of the physical education teachers are at a "medium range".

**Table 3.** Comparison of the social media teacher-student interaction levels of the physical education teachers concerning gender, marital status, school type, and school location

| | | n | $\overline{X}$ | Sd | U | p | Difference |
|---|---|---|---|---|---|---|---|
| **Gender** | Female | 81 | 3.16 | .672 | 1163.000 | .192 | No |
| | Male | 309 | 3.38 | .808 | | | |
| **Marital Status** | Married | 333 | 3.39 | .799 | 826.000 | .132 | No |
| | Single | 57 | 3.04 | .636 | | | |
| **School Type** | Secondary School | 168 | 3.45 | .871 | 1889.000 | .389 | No |
| | High School | 222 | 3.26 | .707 | | | |
| **School Location** | Rural | 132 | 3.99 | .735 | 607.500 | .000* | Yes |
| | Urban | 258 | 3.00 | .571 | | | |

*p<0.05

As is seen on Table 3, the social media teacher-student interaction levels of the physical education teachers from the research group did not demonstrate any statistically significant difference concerning gender, marital status, and school type; however, a statistically significant difference was determined concerning the location of the school. The social media teacher-student interaction levels of the physical education teachers working in the rural areas determined to be higher compared to those of the physical education teachers working in urban areas.

**Table 4.** Comparison of the social media teacher-student interaction levels of the physical education teachers from the research group concerning sport branch, lesson infrastructure, school team, and doing regular sport

| | | n | $\overline{X}$ | Sd | U | p | Difference |
|---|---|---|---|---|---|---|---|
| **Sport Branch** | Individual Sport | 141 | 3.10 | .722 | 1438.500 | .013* | Yes |
| | Team Sport | 249 | 3.48 | .789 | | | |
| **Lesson Infrastructure** | Sufficient | 159 | 3.58 | .754 | 1456.500 | .006* | Yes |
| | Insufficient | 231 | 3.17 | .768 | | | |
| **School Team** | Yes | 219 | 3.51 | .748 | 1492.000 | .006* | Yes |
| | No | 171 | 3.12 | .784 | | | |
| **Regular Exercise** | Yes | 189 | 3.49 | .795 | 1682.500 | .046* | Yes |
| | No | 201 | 3.19 | .752 | | | |

*p<0.05

As is seen in Table 4, the social media teacher-student interaction levels of the physical education teachers from the research group demonstrated a statistically significant difference concerning sport branch, lesson infrastructure, training a school team, and doing regular exercise. It was determined that the physical education teachers, who dealt with team sport, had higher

social media teacher-student interaction levels compared to the teachers dealing with individual sports; the teachers, who were training school teams, had higher levels than those, who did not train a school team, and the teachers, who regularly did exercise, had higher scores compared to those, who did not.

**Table 5.** Comparison of the social media teacher-student interaction levels of the physical education teachers from the research group concerning age and monthly income perception

| | | | N | $\overline{X}$ | Sd | $\chi^2$ | p | Difference |
|---|---|---|---|---|---|---|---|---|
| **Age** | (a) | 20-29 Years Old | 159 | 3.73 | .854 | 20.814 | .000* | Yes (a) > (b) (a) > (c) |
| | (b) | 30-39 Years Old | 159 | 3.14 | .590 | | | |
| | (c) | 40 and Over | 72 | 2.90 | .621 | | | |
| **Monthly Income Perception** | (x) | Low | 84 | 3.08 | .706 | 9.307 | .010* | Yes (z) > (x) (z) > (y) |
| | (y) | Medium | 261 | 3.32 | .751 | | | |
| | (z) | High | 45 | 3.93 | .856 | | | |

*p<0.05

As is observed in Table 5, the social media teacher-student interaction levels of the physical education teachers from the research group demonstrated a statistically significant difference concerning age and monthly income perception. It was determined that the physical education teachers, who were 20-29 years old, had higher social media teacher-student interaction levels compared to the teachers between 30-39 and 40 and over; the teachers with higher monthly income perceptions had higher social media teacher-student interaction levels compared to those with low and medium perception levels.

## CONCLUSION & DISCUSSION

According to the results of this study, social media teacher-student interaction levels of the physical education teachers were determined at "medium level". Additionally, it was also determined that "virtual leader" characteristics of the physical education teachers shone out. It was determined that there was statistically significant difference in social media teacher-student interaction levels of the physical education teachers concerning school location, sport branch, physical education lesson infrastructure, training a school team, doing regular exercises, age, and monthly income perceptions; however, there was statistically no significant difference concerning gender, marital status, and the type of the school of the teachers.

Toğay et al. (29) stated that the education processes should be supported with social media; Ajjan and Hartshorne (1) suggested that social media well supports the information sharing necessary for active learning. Öztürk and Talas (25) emphasized that social media provides a more effective communication between the teachers and the students. McLoughlin and Lee (21) reported that social media networks can be considered as pedagogical tools; Albion (3) stressed the importance of use of new technologies in the context of education. Ferdig (12) suggested that social media support the pedagogical approaches such as active learning, social learning, implementation, and learning communities. Bartlett-Bragg (6) mentioned that the new technologies including the social networks are quite appropriate domains for cooperative learning; Selwyn (28) asserted that social media is available for informal learning. Pettenati and Ranieri (26) stated that social networks ensure the formation of the application communities of online cooperative learning. Gray (13) mentioned that social media provides opportunities for learning. Considering the abovementioned views, that the social media teacher-student interaction levels of the physical education teachers were determined at "medium range" in this study, can be defined as a negative situation. It can be explained by the fact that the physical education teachers could not use effectively the internet-based social media networks emerged through the recent technological developments, or perhaps, it is because they are not sufficiently educated in this issue.

Avcı (5), Yetim and Göktaş (30), Çelikten et al. (8), Altıntaş (4), Eren Ökten and Karakuş (10), Katılmış and Balcı (16) stated that the teacher is the role model of the student. Since the "virtual leader" characteristics of the teachers came to the fore in this study, it can be considered as a pleasing result considering that there is sensitivity over displaying

responsible behaviors in the social media, taking the lead and being an example.

In this research study, it can be considered as a surprising situation that the social media teacher-student interaction levels of the physical education teachers working in rural areas are higher compared to the ones working in urban areas. It can be said that there are more technological availabilities in urban areas; however, it can be explained by recent increase in the widespread use of mobile devices.

In this research study, it was determined that the social media teacher-student interaction levels of the physical education teachers training a school team are higher compared to the ones doing individual sport. It can be mentioned that team sports create more open settings for the socialization processes and thus, it can be considered that this situation is not surprising.

In the study, it was determined that the social media teacher-student interaction levels of the physical education teachers working at schools with sufficient infrastructure of physical education lessons are higher compared to the ones with insufficient infrastructure. Considering that the teachers with sufficient infrastructure of physical education lesson conduct more implementations in their lessons and in a more effective way, it can be suggested as an expected situation.

In this research study, it was determined that the social media teacher-student interaction levels of the physical education teachers training a school team are higher compared to the ones without a school team. It can be considered that the teachers training a school team enjoy the coaching experience and therefore, they are involved in a close communication with their students. Similar cases might be the motives behind this result.

In this research study, it was determined that the social media teacher-student interaction levels of the physical education teachers doing regular exercises are higher compared to the ones without regular exercise. It can be mentioned that doing regular exercises contributes to the harmony with the social environment. Therefore, it can be suggested that this result is not anomalous.

In this research study, it was determined that the social media teacher-student interaction levels of the younger physical education teachers are higher compared to the older ones. It can be stated that young individuals use internet more compared to the old ones. This result can be attributed to this explanation.

In this study, it was determined that the social media teacher-student interaction levels of the physical education teachers with high perceptions about their monthly incomes are higher compared to the ones with low levels of perception. It can be suggested that the teachers believing in themselves to be richer will use internet more, and this result can be attributed to this explanation.

## RECOMMENDATIONS

In order to improve the use of social media, conferences and seminars can be organized by the experts for the physical education teachers. Students can also attend educations about social media. The motives behind the shining "virtual leader" characteristics of the physical education teachers can be investigated through different studies. Similar research studies can be conducted with different research groups to contribute to the literature. It is considered useful that the social media teacher-student interactions of the physical education teachers be investigated through qualitative research studies.

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# Investigation of the relationship between patellofemoral (q) angle differences with lower extremity performance in young and veteran volleyball players

Kursat HAZAR[1]

[1]*Mugla University, Rectorship, Physical Education and Sports Department, Mugla, Turkey.*
*Address Correspondence to K. Hazar e-mail: e-mail: kursathazar@hotmail.com*

**Abstract**

This study was carried out to determine the relation between patella femoral (Q) angle differences and static equilibrium, flexibility and take-off force in young and veteran volleyball players. To the study 20 young males with an average age of 18 ± 00, 19 young females with a mean age of 18 ± 73, 21 veteran males with a mean age of 49 ± 04, 20 veteran females with a mean age of 48 ±70 who are registered players in Muğla Provincial Directorate of Youth and Sports, a total of 80 athletes voluntarily participated. The height, body weight, right and left leg Q angles in standing and laying, balance, flexibility and vertical take-off measurements were performed in the research group respectively. The statistical evaluation of the obtained data was done in SPSS 21.00 package program on a personal computer. In the data with normal distribution, the parametric statistical methods were used. While the analysis of variance (ANOVA) test was used for intergroup comparisons, the Turkey test was used for multiple comparisons, and the correlation level was used to determine the relationship between the variables and the significance level was taken as $p < 0.05$. According to the findings, there were significant differences between the Q angles, balance, flexibility, and take-off values of the participants ($p < 0.01$). Also, there was a positive relationship between Q angle values and elasticity values in standing and laying position, and a negative relationship between balance and take-off force values ($p < 0.05$).As a result: Q angle values of volleyball players were examined and it was seen that the difference between groups has resulted from gender; the difference between young and veteran volleyball players was not statistically significant. As the Q angle increased, the increase in the elasticity values and the decrease in the balance and splash values were determined. In this respect, Q angle differences are thought to be related to lower extremity performances of young and veteran volleyball players.

**Key words:** Volleyball, Q Angle, Lower Extremity Performance.

## INTRODUCTION

Studies on moving athletic performance forward and what factors are effective in sports to whet the appetite of the scientists on the basis of the studies conducted in the direction of developments in the sports sciences. Considering the differences between sports branches, it has become a focus of interest to know whether the postural properties of the branch affect the bio-motor characteristics.

When looked at volleyball players; besides lower extremity's being powerful as a basis, lower extremity which is a primary factor in the continuity of the sports and effective on aerobic performance has to be at a specific level (11). Especially in today's volleyball, although it is known that players' having high technical characteristics is not an absolute structure on success; the difference that you can create between two teams which have the same players who have equal technique levels passes from the force feature (1). As in all team sports, in the struggle to have the ball in volleyball in the quick force and force continuity comes into the prominence (9). The physical and physiological

structure required by this sports branch has an important role in achieving success (10). At the same time, success depends on good technique as well as a good application of basic motor properties (7).

While volleyball is defined as power volleyball in today's world; if you add enough force to the technical characteristics of the athlete, the probability of success will increase (20). In addition, volleyball is not a time-dependent, high-paced, quickness, force, mobility, flexibility, durability, and leap-based dynamic game (12). In the conducted studies, it was found that being successful in volleyball was directly related to basic motor characteristics such as vertical take-off, speed, flexibility (8). Volleyball requires some special physical requirements such as finger force for the pass, high take-off for block movement, flexibility, and speed for dunking (11).

Performance in volleyball players is effective motoric features as well as postural properties affecting these characteristics. In this respect, it is necessary to determine which physical or physiological characteristics affect each other in order to increase performance. Besides Patellafemoral angle is commonly used in the kinesiological evaluation of the knee joint and lower extremity, it is defined as Q angle in today's world. The angle Q is the angle of the m.quadriceps femoris muscle and is defined as the narrow-angle at the intersection of the midline of the patella with the Spina iliaca anterior superior and the middle of the patella and the tuberositas tibiae laterally (2). When this angle is embraced mechanically, it is understood that patella is effective on femoral translation (16). When angle Q is above 15-20 degrees, it is considered that the knee joint causes deterioration of the extension mechanism and patella causes femoral pain with increasing tendency to slide laterally (3). It has been emphasized that it causes various pain and disability in abnormally low values (19).

However, it is possible to incorporate the postural characteristics of the individual into the structural feature when it is mentioned about the necessity of structural and personality factors (15). as a prerequisite for obtaining efficiency in sports. In this study, it is important to know whether these differences have any relation with lower extremity performance by examining Q angle differences between young and veteran volleyball players. In this respect, the study was carried out to determine whether the angles of Q are related to static equilibrium, flexibility and take-off force performances.

## MATERİAL AND METHOD

**Participants:** To the study 20 young males with an average age of 18 ± 00, 19 young females with a mean age of 18 ± 73, 21 veteran males with a mean age of 49 ± 04, 20 veteran females with a mean age of 48 ±70 who are registered players in Muğla Provincial Directorate of Youth and Sports, a total of 80 athletes voluntarily participated. The participants were given detailed information before the measurements and signed a document indicating that they were volunteers. In addition, participants with health problems and knee injuries, and both medial condyle and medial molleol intervals of 2,5 cm and above were excluded from the scope of the study by accepting genu varus and genu valgus (knee deformity).

### Data Collection Methods:

The height, body weight, right and left leg Q angles in standing and laying, balance, flexibility, and vertical take-off measurements were performed in the research group respectively.

### Height and Body Weight Measurements:

The height values of the groups included in the study were measured with a stadiometer with a sensitivity of 0.01 m and body weight values were measured with a precision scale of 0.1 kg (SECA, Germany).

### Q Angle Measurements:

In the measurements made in standing position, the quadriceps femoris muscle was loosened by asking the participants to press the bare feet to the ground, while the knee joint was an extension and the hip was measured while the hip was loose flexion. Measurements were made with 60 cm long arm, 25 cm-short armed goniometer. The measurements were carefully marked with the center of the patella and the midpoint of the tuberositas tibia from the spinal iliac anterior valve (SIAS). The center of the long arm to the midpoint of the gynameter was placed in the middle of the long arm and the short arm was taken to the middle of the tuberositas tibia. In addition to their

angles, varus and valgus deformities were determined. Both medial molleoles and medial condyle ranges were measured with a modified caliper. In the measurements, the distance between the medial femoral condyles and those with a diameter of 2.5 cm and above was determined as valgus deformity.

**Static Balance measurements:**

The static balances of the study group were determined by flamingo balance test (FBT). The participant tries to maintain his balance with his dominant foot on a wooden balance beam 50 cm long, 4 cm high and 3 cm wide. He pulls his other foot from his knees bent to the buttocks and holds it with his hand on the same side. While the one foot is on the balance beam, the time is started and he tries to maintain his balance for 1 minute. In cases where the balance is broken (if he leaves his feet, falls from the wooden floor, touches the ground with any part of his body) the time is stopped. The participant enters the balance instrument again and re-starts the balance from where it left off. When the 1-minute period is completed, the participant's attempt to maintain a balance is recorded as a piece (17).

**Flexibility Measurements:**

The flexibility measurements of the participants in the research group were done with 32 cm. height and 35 cm. length box, top of which was divided into cm using sit and reach test method. The participants sat with a barefoot in front of the sit and reach box and stretch their legs and put their soles on the stand. The participant then extended his trunk without bending his knees as far as possible in the dimensioned section on the stand. The most extreme point that fingers can reach was measured in cm and the maximum value that was achieved after the measurements were taken was recorded.

**Vertical Take-off Measurements:**

Participants extend their hands upwards on a flat wall, the point where the fingertip touched is marked. Then they step on the wall from where they are without stepping up to the wall touches. The obtained value by measuring the distance that the athlete took-off was recorded in cm. This test was repeated three times and the highest value was determined as the jump distance of the athlete (18).

**Data analysis:**

Statistical analysis of the obtained data was done in SPSS 21.00 package program on a personal computer. The normality test was performed with the Kolmagorow-simirnov test and the data were found to be in normal distribution. In the comparisons between groups, while analysis of variance (ANOVA) test was used, multiple comparisons were made by Tukey test and correlation analysis was used to determine the relationship between the variables. The significance level was taken as $p < 0.05$ in parametric tests.

**FINDINGS**

Table 1. Descriptive Statistics of the Participants

| Variables | | Minimum | Maximum | Mean | Std. D. |
|---|---|---|---|---|---|
| Young Males N=20 | Age | 17.00 | 19.00 | 18.00 | .794 |
| | Height | 176.00 | 192.00 | 183.00 | 5.619 |
| | Weight | 58.00 | 86.50 | 72.68 | 9.979 |
| | Sports Year | 3.00 | 11.00 | 7.60 | 3.315 |
| Young FemalesN=19 | Age | 16.00 | 21.00 | 18.73 | 1.557 |
| | Height | 164.00 | 178.00 | 171.57 | 4.610 |
| | Weight | 56.00 | 85.00 | 65.84 | 6.825 |
| | Sports Year | 4.00 | 13.00 | 8.89 | 2.998 |
| Veteran Males N=21 | Age | 41.00 | 58.00 | 49.04 | 7.116 |
| | Height | 169.00 | 190.00 | 182.00 | 6.188 |
| | Weight | 73.00 | 96.00 | 82.19 | 6.749 |
| | Sports Year | 15.00 | 46.00 | 27.19 | 9.325 |
| Veteran Females N=20 | Age | 40.00 | 63.00 | 48.70 | 7.623 |
| | Height | 155.00 | 175.00 | 162.80 | 6.287 |
| | Weight | 51.00 | 78.50 | 62.25 | 7.901 |
| | Sports Year | 5.00 | 45.00 | 18.8000 | 13.563 |

Table.2. Comparison Analysis on Q Angle Values of the Groups in the Research

| Variables | | N | ± | Std. D. | F | P |
|---|---|---|---|---|---|---|
| Standing Right Leg Q Angle | Young Male | 20 | 9.75 | .850 | 73.640 | .000** |
| | Young Female | 19 | 16.68 | 3.037 | | |
| | VeteranMale | 21 | 10.80 | 1.030 | | |
| | Veteran Female | 20 | 18.05 | 2.855 | | |
| Standing Left Leg Q Angle | Young Male | 20 | 10.90 | 1.483 | 77.785 | .000** |
| | Young Female | 19 | 19.42 | 2.610 | | |
| | Veteran Male | 21 | 9.71 | 2.390 | | |
| | Veteran Female | 20 | 16.90 | 2.770 | | |
| Laying Right Leg Q Angle | Young Male | 20 | 11.00 | 1.654 | 78.148 | .000** |
| | Young Female | 19 | 20.42 | 2.387 | | |
| | Veteran Male | 21 | 9.52 | 2.337 | | |
| | Veteran Female | 20 | 17.00 | 3.554 | | |
| Laying Left Left Q Angle | Young Male | 20 | 10.20 | 1.641 | 69.441 | .000** |
| | Young Female | 19 | 17.05 | 1.508 | | |
| | Veteran Male | 21 | 8.52 | 1.913 | | |
| | Veteran Female | 20 | 16.75 | 3.711 | | |

**:p<0.01

When we look at Table 2, it is seen that there is a significant difference (p <0.01) between the standing right leg, standing left leg and laying right leg and laying left leg Q angle values.

Table.3.Multiple Comparisons of Q Values of the Groups in the Research

| Variables | (I)Category | (J) Category | Mean Difference | Std. D. | P. |
|---|---|---|---|---|---|
| Standing Right Leg Q Angle | Young Male | Young Female | -6.93421* | .69340 | .000 |
| | | Veteran Male | -1.05952 | .67626 | .404 |
| | | Veteran Female | -8.30000* | .68445 | .000 |
| | Young Female | Young Male | 6.93421* | .69340 | .000 |
| | | Veteran Male | 5.87469* | .68531 | .000 |
| | | Veteran Female | -1.36579 | .69340 | .209 |
| | Veteran Male | Young Male | 1.05952 | .67626 | .404 |
| | | Young Female | -5.87469* | .68531 | .000 |
| | | Veteran Female | -7.24048* | .67626 | .000 |
| | Veteran Female | Young Male | 8.30000* | .68445 | .000 |
| | | Young Female | 1.36579 | .69340 | .209 |
| | | Veteran Male | 7.24048* | .67626 | .000 |
| Standing Left Leg Q Angle | Young Male | Young Female | -8.52105* | .75715 | .000 |
| | | Veteran Male | 1.18571 | .73843 | .382 |
| | | Veteran Female | -6.00000* | .74738 | .000 |
| | Young Female | Young Male | 8.52105* | .75715 | .000 |
| | | Veteran Male | 9.70677* | .74831 | .000 |
| | | Veteran Female | 2.52105* | .75715 | .007 |
| | VeteranMale | Young Male | -1.18571 | .73843 | .382 |
| | | Young Female | -9.70677* | .74831 | .000 |
| | | Veteran Female | -7.18571* | .73843 | .000 |
| | Veteran Female | Young Male | 6.00000* | .74738 | .000 |
| | | Young Female | -2.52105* | .75715 | .007 |
| | | VeteranMale | 7.18571* | .73843 | .000 |
| Laying Right Leg | Young Male | Young Female | -9.42105* | .82488 | ,000 |
| | | VeteranMale | 1.47619 | .80449 | .265 |
| | | Veteran Female | -6.00000* | .81424 | .000 |
| | Young Female | Young Male | 9.42105* | .82488 | .000 |
| | | Veteran Male | 10.89724* | .81526 | .000 |
| | | Veteran Female | 3.42105* | .82488 | .000 |
| | Veteran Male | Young Male | -1.47619 | .80449 | .265 |

| | | | | | |
|---|---|---|---|---|---|
| Q Angle | | Young Female | -10.89724* | .81526 | .000 |
| | | Veteran Female | -7.47619* | .80449 | .000 |
| | Veteran Female | Young Male | 6.00000* | .81424 | .000 |
| | | Young Female | -3.42105* | .82488 | .000 |
| | | Veteran Male | 7.47619* | .80449 | .000 |
| | Young Male | Young Female | -6.85263* | .75948 | .000 |
| | | Veteran Male | 1.67619 | .74070 | .116 |
| | | VeteranFemale | -6.55000* | .74968 | .000 |
| | Young Female | Young Male | 6.85263* | .75948 | .000 |
| | | Veteran Male | 8.52882* | .75062 | .000 |
| | | Veteran Female | .30263 | .75948 | .978 |
| Laying Left Leg Q Angle | Veteran Male | Young Male | -1.67619 | .74070 | .116 |
| | | Young Female | -8.52882* | .75062 | .000 |
| | | Veteran Female | -8.22619* | .74070 | .000 |
| | Veteran Female | Young Male | 6.55000* | .74968 | .000 |
| | | Young Female | -.30263 | .75948 | .978 |
| | | Veteran Male | 8.22619* | .74070 | .000 |

*:p<0,05, **:p<0,01

When the right leg Q angle values are examined; there were significant differences between the average values of young and veteran males and young and veteran females

(p <0.01). The values of young and veteran men are lower than those of young and veteran women, respectively.

There was a significant difference between young men and young and veteran women in standing left leg Q angle values (p <0.01). There was a significant difference between the values of young females and young veteran men and veteran women; veteran males and young and veteran females; veteran women and young males, young women and veteran males (p <0.01).

While there were significant differences between the genders in the laying right leg Q angle values (p <0.01), the values of young and veteran males were lower than the females'.

In addition, there was a significant difference between the values of young females and veteran females in the right leg Q angle values (p <0.01). It is seen that the values of veteran females are lower than the values of young females.

There was a significant difference between the average values of young and veteran males and young and veteran females in the left leg Q angle values (p <0.01). The values of veteran males were found to be lower than that of young males and the values of veteran females were lower than the values of young females.

Table.4. Comparison on Lower-Extremity Performances of the Groups in the Research

| Variables | | N | Mean | Std. D. | F | P |
|---|---|---|---|---|---|---|
| Balance | Young Male | 20 | 3,4500 | 1,14593 | 13,209 | ,000** |
| | Young Female | 19 | 5,0526 | 1,07877 | | |
| | Veteran Male | 21 | 4,1905 | 1,03049 | | |
| | Veteran Female | 20 | 5,7000 | 1,52523 | | |
| Flexibility | Young Male | 20 | 30,0000 | 5,50598 | 25,918 | ,000** |
| | Young Female | 19 | 35,2105 | 3,70554 | | |
| | Veteran Male | 21 | 20,1905 | 7,27749 | | |
| | Veteran Female | 20 | 29,8000 | 4,85148 | | |
| Take-Off Force | Young Male | 20 | 56,3000 | 6,79086 | 90,033 | ,000** |
| | Young Female | 19 | 37,4211 | 6,23000 | | |
| | VeteranMale | 21 | 28,6190 | 7,13075 | | |
| | Veteran Female | 20 | 27,2000 | 4,91614 | | |

**:p<0,01

When Table 4 is examined, it was found that there was a significant difference between the

balance, flexibility and take-off force performance values of the groups in the study (p <0.01).

Table.5. Multiple Comparisons on Lower-Extremity Performances of the Groups in the Research

| Variables | (I) Category | (J) Category | Mean Difference | Std. D. | P |
|---|---|---|---|---|---|
| Balance | Young Male | Young female | -1.60263* | .38775 | .001 |
| | | Veteranmale | -.74048 | .37816 | .213 |
| | | Veteranfemale | -2.25000* | .38275 | .000 |
| | Young Female | Young male | 1.60263* | .38775 | .001 |
| | | Veteranmale | .86216 | .38322 | .119 |
| | | Veteranfemale | -.64737 | .38775 | .347 |
| | Veteran Male | Young male | .74048 | .37816 | .213 |
| | | Young female | -.86216 | .38322 | .119 |
| | | Veteranfemale | -1.50952* | .37816 | .001 |
| | Veteranfemale | Young male | 2.25000* | .38275 | .000 |
| | | Young female | .64737 | .38775 | .347 |
| | | Veteranmale | 1.50952* | .37816 | .001 |
| Flexibility | Young Male | Young female | -5.21053* | 1.77367 | .022 |
| | | Veteran male | 9.80952* | 1.72982 | .000 |
| | | Veteran female | .20000 | 1.75079 | .999 |
| | Young Female | Young male | 5.21053* | 1.77367 | .022 |
| | | Veteran male | 15.02005* | 1.75298 | .000 |
| | | Veteran female | 5.41053* | 1.77367 | .016 |
| | Veteran Male | Young male | -9.80952* | 1.72982 | .000 |
| | | Young female | -15.02005* | 1.75298 | .000 |
| | | Veteran female | -9.60952* | 1.72982 | .000 |
| | Veteran Female | Young male | -.20000 | 1.75079 | .999 |
| | | Young female | -5.41053* | 1.77367 | .016 |
| | | Veteran male | 9.60952* | 1.72982 | .000 |
| Take-Off Force | Young Male | Young female | 18.87895* | 2.02980 | .000 |
| | | Master male | 27.68095* | 1.97961 | .000 |
| | | Master female | 29.10000* | 2.00361 | .000 |
| | Young Female | Young male | -18.87895* | 2.02980 | .000 |
| | | Veteran male | 8.80201* | 2.00612 | .000 |
| | | Veteran female | 10.22105* | 2.02980 | .000 |
| | Veteran Male | Young male | -27.68095* | 1.97961 | .000 |
| | | Young female | -8.80201* | 2.00612 | .000 |
| | | Veteran female | 1.41905 | 1.97961 | .890 |
| | Veteran Female | Young male | -29.10000* | 2.00361 | .000 |
| | | Young female | -10.22105* | 2.02980 | .000 |
| | | Veteran male | -1.41905 | 1.97961 | .890 |

*:p<0,05, **:p<0

As seen in Table 5, there was a significant difference between the values of young males and young and veteran females in the balance values of the groups in the study (p <0.01).Young males' balances are better than young and veteran females.However, there was a significant difference between veteran males and veteran females (p <0.01). The balance of veteran males is better than veteran females.

When the flexibility values were examined, there was a significant difference between the average values of young males and young females and veteran males (p<0.01). The values of young females are higher than those of young and veteran males, while the values of young males are higher than veteran males. There was also a significant difference between the values of young females and veteran females (p <0.01). The values of young females are higher than veteran female.

Table.6. Q Angle Variables' Relationship with Other Variables Related to the Groups

| Variables | Standing Right Leg | Standing Left Leg | Laying Right Leg | Laying Left Leg | Balance | Flexibility | Take-Off Force |
|---|---|---|---|---|---|---|---|
| StandingRight Leg Q Angle | 1 | .766** | .778** | .789** | -.367** | .337** | -.433** |
| | | .000 | .000 | .000 | .001 | .002 | .000 |
| Standing Left Leg Q Angle | .766** | 1 | .832** | .839** | -.125 | .460** | -.158 |
| | .000 | | .000 | .000 | .268 | .000 | .160 |
| Laying Right Leg Q Angle | .778** | .832** | 1 | .861** | -.226* | .507** | -.156 |
| | .000 | .000 | | .000 | .044 | .000 | .168 |
| Laying Left Leg Q Angle | .789** | .839** | .861** | 1 | -.215 | .446** | -.179 |
| | .000 | .000 | .000 | | .055 | .000 | .112 |

*:p<0,05, **:p<0,01

Although Table 6 shows that there is a positive correlation between Q angle values and flexibility values in standing and laying right leg position, there was a negative relationship between the Q angles, the balance and take-off force values in the standing and laying position (p <0.05).

**DISCUSSION AND RESULT**

Determining whether there is a relationship between lower-extremity performance and these differences and with the aim of defining the relationship between static balance, flexibility and take-off force by examining the Q angle differences of the young and veteran volleyball in the study; in the result of the comparison analysis about Q angle values of the groups in the research, it is found that standing right leg Q angle average of the young males is 9,7500; young females 16,6842; veteran males 10,8095; veteran females 18,0500; standing left Q angle averages of the young males 10,9000; young females 19,4211; veteran 9,7143; veteran females 16,9000; laying right leg Q angle of the young females 11,0000; young females 20,4211; veteran females 9,5238; veteran females 17,0000; laying left leg Q angle of the males 10,2000; young females 17,0526; veteran males 8,5238; veteran females 16,7500. It was found that there was a significant difference (p <0.01) between the standing right leg, standing left leg and laying right leg and laying left leg Q angle values.

Significant differences were found between the Q-angle values of the young and veteran volleyball players in the standing and supine positions where the measurements were made, and these angles were found to be lower in the young and veteran female volleyball players and lower in the young and veteran male volleyball players. Although there was no significance related to the changes in Q angles due to aging in the research hypothesis, the Q angle values of veteran male and female volleyball players were lower in both positions compared to the values of young male and female volleyball players.

Although there is no definite value for Q angle averages in the literature, it is reported that the general reference values are 8-14 (average 10 degrees) in males and 11-20 (average 15 degrees) in females. In males and 15 females, values greater than 20 degrees were evaluated as abnormal(13). In a study, Horton and hall (6).found that there is a correlation in terms of gender at the Q angles. In another study, it was found that Q angles were higher in females compared to males in the measurements of standing and laying position (4). In this study, values close to the reference values in the literature were obtained (14). Q angles of young and veteran female volleyball players compared to younger and veteran female volleyball players are found to have higher values, the research is considered to overlap with the literature.

In addition, it was found that there was a significant difference between the balance, flexibility and take-off force performance values of the groups (p <0.01). In the balance values of the groups in the study, the balance values of the young males were found to be higher than the young and veteran females, while the balance values of the veteran males were found to be significantly higher than the veteran females (p <0.01). In the values of flexibility, the values of young females were found to be significantly higher than in males (p <0,01). When the vertical take-off values were examined, the values of young males were found to be higher than young females and veteran males' values were

found to be higher than the veteran females ($p < 0.01$).

There are studies suggesting that male athletes' balance values are higher than females and flexibility values of female athletes are higher than males (4). In addition, cuadriceps shows that the strength and the force emerging in the muscle is higher due to the increased muscle mass and hamstring muscle fibers (5). In line with this information, our study is consistent with the literature.

In addition, there was a positive correlation between Q angle variables and flexibility values of the groups, while it was found that there was a negative correlation between Q angle values in standing and laying position and balance and take-off force values ($p < 0.05$).

**As a result**, Q angle values of volleyball players are examined; the difference between groups was found to be gender-related, while the difference between young and veteran volleyball players was not statistically significant. As the Q angle increased, the increase in the flexibility values and the decrease in the balance and take-off values were found. In this respect, Q angle differences are thought to be related to lower extremity performances of young and veteran volleyball players

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# The Effect of Mental Toughness of Individuals Doing Outdoor Sports on their Decision-Making Skills

Burak GÜRER[1], Enise Merve KARABABA[1], Esra CANLI[1,]

[1]*Gaziantep University, Physical Education and Sport, Gaziantep / TURKEY*

*Address Correspondence to Burak GÜRER e-mail: e-mail: burakgurer27@gmail.com*

**Abstract**

This study intends to examine the impact of the mental toughness of athletes doing outdoor sports on their decision-making skills. The study population is composed of 504 athletes doing outdoor sports in various disciplines in Turkey in 2017. The mental toughness in sports scale developed by Sheard et al. (29) and adapted to Turkish by Altıntaş and Bayar Koruç (1) and the Melbourne Decision Making Scale I-II Scale developed by Mann et al. (35) and adapted to Turkish by Deniz (11) were used. The Independent Samples T test was used to analyze the data obtained as well as the One Way Analysis of Variance (One Way Anova) used in case of the existence of more than two groups and the correlation analysis for the relationship between the two groups. As a result, significant differences were found by the variables gender, marital status, age, educational status, the type of outdoor sports engaged in and experience. Accordingly, mental toughness has effects on decision-making skills when doing outdoor sports. There is a low level of positive correlation between mental toughness and decision-making skills. It is thought that the seasons and the types of outdoor sports done have an impact on these results.

**Key words:** Outdoor sports, mental toughness, decision-making

## INTRODUCTION

Living and spending time in nature has its benefits (17). People turning to different sports have begun to choose among sports branches that give them joy and push their boundaries (38). Extreme sports, adventure sports, action sports, and even individual outdoor sports have shown a large increase in popularity over the last 20 years (28). Between 2000 and 2007, the number of people participating in one or more outdoor sports activities increased by 4.4%, from 208 million to 217 million (7). Between 1990 and 2006, the number of members of the British Mountaineering Council increased by 37,514 (12, 2). On the basis of this exponential increase, investigators explored the benefits of doing outdoor sports and found that it has positive influences on taking responsibility, leadership skills, decision-making, trust, socialization, happiness and risk taking (34). Those who do outdoors sports often have agile personalities. They are usually strong, tough, and well-disciplined people who have to make immediate and correct decisions (24).

Mental toughness is one of the most important psychological components for good performance and has recently attracted attention as an important study topic (3, 21, 10). Mental toughness is positive psychological capacities that can help one recover in a number of negative situations such as mishaps, failures, conflict situations, or increased responsibility (25). Mentally resilient athletes tend to be highly competitive, decisive, self-motivated, focused in stressful situations, resilient in the face of difficulty, and highly self-confident even after failure (9). Mental strategies such as focus, mental stability, setting short-term goals, having a track record in climbing, knowledge of one's own body, feeling supported by other climbers and athletes, and believing in one's own capacity are crucial for success in climbing (4). Mental toughness is a

clear strategy to cope with obstacles in nature and in the mountains. A mountain-climber climbing Everest once said, "Mental toughness is extremely important. Some people are more affected by high altitudes. There is no comfort at high altitudes, so you must be mentally and physically tough; otherwise you will have to go back" (4:19), pointing to the significance of mental toughness for dealing with challenges. Due to the inherent risk of injury and death, a tremendous amount of physical toughness and mental strength are necessary for a successful climb (14).

For every challenge nature presents, there is a counter-strategy that can be employed (4). Those who do outdoor sports and outdoor sports instructors are involved in complex decision-making environments and there are multiple factors in this decision-making environment (16). Decision-making is a dynamic process in which individuals play an active role. People who have to make a decision have to satisfy their inner needs as well as meet the expectations of those around them. To accomplish this, individuals must utilize their personal and environmental resources effectively and competently (36). Decision-making is defined as being able to select actions among others that are needed to achieve a specific goal (31). According to Maddi (33), the quest for meaning characterized by the existential approach of psychology involves continuous decision-making processes. When making a decision, people are left to choose between pursuing a well-trodden path in light of past experiences or exploring new, uncharted territory. For leaders of outdoor sports, decision-making is considered one of the most important skills that a professional should have, as in many other areas. Decision-making in a natural setting is defined in literature as a common function of task characteristics and decision-maker's knowledge and expertise with respect to the task (16). Drury et al. (13) and Priest and Gass (27) regard the judgement and decision-making processes of leaders and instructors of outdoor sports as a rational process while Galloway (16) views it as decision-making processes in a natural setting (6).

study intends to demonstrate the impact of mental toughness of athletes doing outdoor sports on their decision-making skills.It's thought that the research will outdoor guide the leaders of outdoor sports and contribute to the development of mental skills. In this context, the following questions are tried to be answered. (10).

1. Do demographic variables affect decision making and mental endurance?

2. Is there a relation between mental endurance and decision making?

3. Is mental endurance significant in outdoor sports?

4. Is decision making skill is significant in outdoor sports?

## MATERIAL AND METHOD

### Method

Outdoor sports have been gaining popularity in Turkey through festivals, contests and organizations. Through these contests and festivals, performers of outdoor sports also find a chance to improve themselves. The study uses the survey collection technique, a quantitative research method.

### Population and Sample

The study population is composed of outdoor athletes in Turkey while the study sample is made up of randomly selected performers of outdoor sports from the cities of Eskişehir, İstanbul, Konya, İzmir, Malatya, Mersin, Adana, Gaziantep, Kayseri, Antalya and Trabzon. It has been assumed that the cities chosen as the study's sample contain large numbers of outdoor sports performers. A total of 504 people (330 men, 174 women) were included in the study, 23.2% of whom do mountain climbing, 41.3% hiking, 6.5% paragliding, 2.2% caving, 11.9% mountain biking, 8.1% rock climbing and 6.7% other sorts of outdoor sports.

### Data Collection Tool

In order to determine the mental toughness of individuals engaged in outdoor sports, the mental toughness in sports scale developed by Sheard et al. (29) and adapted to Turkish by Altıntaş and Bayar Koruç (1) was used and the Melbourne Decision Making Scale I-II Scale developed by

Mann et al. (35) and adapted to Turkish by Deniz (11) was used in order to examine the athletes' decision-making ability.

The mental toughness scale in sports consists of 3 sub-sets, which are: confidence, control and continuity. "Confidence" refers to belief in one`s talents and seeing oneself above competitors to reach the target in challenging situations. "Continuity" means taking responsibility, concentrating, and not giving up to achieve the goals set (30), while "control" refers to keeping composure, maintaining calm and being comfortable in the face of pressure or unexpected situations (30). Confidence is made up of items 1, 5, 6, 11, 13, 14, continuity 3, 8, 10, 12 and control 2, 4, 7, 9 (29).

The Melbourne Decision-Making scale has two parts. Part 1 : aims to determine self-respect (self-confidence) in decision-making. It consists of 6 items in total, and the three items (2-4-6.) are scored reversely. The scoring is made on the basis of the answers "True" (2 points), "True in certain situations" (1 point) and "Not true" (0 points). The highest score on the scale is 12, and high scores indicate a high level of self-esteem when making decisions. Part II consists of 22 items and measures decision-making styles and has 4 sub-factors, which are Attentive, Evasive, Procrastinative and Panic Decision Making. High scores indicate that the relevant decision-making style is used (11). The items that measure the sub-sets of decision-making styles are items 2-4-6-8-12 and 16 for careful decision-making, items 3-9-11-14-17 and 19 for evasive decision-making, items 5-7-10 -18 and 21 for procrastinative decision-making and items 1-13- 15-20 and 22 for panic decision making. The lowest score for careful and evasive decision- making is 0, and the highest score is 12, and the lowest score is 0 and the highest score is 10 for procrastinative and panic decision-making (11).

**Data Collection**

Information such as the purpose of the research, how the questionnaire form is to be marked and what should be paid attention in marking and the name, surname and title of the person conducting the research and of the consultant and the name of the organization where they work was given on top of the questionnaire forms used in the research. The scale was applied to outdoor sports athletes in 2017. The scale was applied by the researchers during climbing and in training camps on those who voluntarily participated in the research.

**Reliability and Validity Analyses of Data Collection Tool**

For general reliability, Cronbach's Alpha coefficient was calculated. The most common method used in the examination of reliability is Cronbach's Alpha coefficient. Significance was defined as $p<0.05$ and $p<0.01$. Reliability is a concept that includes the consistency and validity of all the questions and the homogeneity to measure the formation. The method improved to evaluate the reliability of the tests is defined as reliability analysis and the evaluation of the questions is entitled as question analysis. The most widely used method to determine the reliability is Cronbach's Alpha coefficient. Cronbach's Alpha is;

$0.60 \leq \alpha < 0.80$ scale is quite reliable

$0.80 \leq \alpha < 1.00$ scale is highly reliable

In our study, Cronbach's Alpha Value of the scale was calculated as 0.80 (mental toughness) and .79 (decision-making).

**Data Analyses**

The data collected in the study were analyzed using the statistical package program (SPSS 22.0), after which the results were interpreted. The data showed a normal and homogeneous distribution. The Independent samples t test was used when reviewing the relationship between data and demographic variables and comparing quantitative data between the groups. Kolmogorov-Smirnov and Shapiro-Wilk normality tests were performed in order to determine whether research data shows a normal distribution or not. It was given a look to Kurtosis-Skewness values for data sets that do show a normal distribution and it is assumed that data showed normal distribution because the values are between +1/-1. Where there were more than two groups, the One Way ANOVA test was used for comparison of parameters between groups. Correlation analysis was performed to measure the relationship between mental toughness and decision-making skills in sports.

**Results**

This study, the variables gender, age, educational status, marital status, the type of outdoor sport done and experience with outdoor sports were examined and statistically significant differences were founded.

**Table 1:** Distribution of the mental toughness and decision-making values of the athletes by gender

| | | Gender | N | Mean | SD | t | p |
|---|---|---|---|---|---|---|---|
| **Sports Mental Toughness** | **Confidence** | Male | 330 | 3.0571 | .45725 | 5.495 | **.000*** |
| | | Female | 174 | 2.8238 | .44538 | | |
| | **Constancy** | Male | 330 | 2.5894 | .34369 | .610 | .542 |
| | | Female | 174 | 2.5675 | .40154 | | |
| | **Control** | Male | 330 | 2.3818 | .63075 | -2.501 | **.013*** |
| | | Female | 174 | 2.5330 | .67253 | | |
| **Decision Making** | **Self-confidence** | Male | 330 | ,9854 | .22665 | 3.368 | **.001*** |
| | | Female | 174 | .9119 | .24419 | | |
| | **CarefulDecision MakingStyle** | Male | 330 | 1.6253 | .36934 | -1.602 | .110 |
| | | Female | 174 | 1.6743 | .30243 | | |
| | **Avoidant Decision Making Style** | Male | 330 | .6884 | .41941 | 1.252 | .211 |
| | | Female | 174 | .6379 | .44994 | | |
| | **ProcrastinationDecision Making Style** | Male | 330 | .5848 | .42464 | -1.230 | .219 |
| | | Female | 174 | .6345 | .44197 | | |
| | **Panicky Decision Making Style** | Male | 330 | .5915 | .47367 | -1.475 | .141 |
| | | Female | 174 | .6552 | ,43510 | | |

When mental endurance and decision making skills are examined according to gender of outdoor athletes in Table 1, statistically significant differences have been found in trust, control and self-esteem dimensions. According to these results men believe in their mental abilities and think that they are better than their opponents. Women are better at remaining calm, controlled and relaxed (30).

Table 2: Distribution of the mental toughness and decision-making values of the athletes by age

| | | Age | N | Mean | SD | F | P | Difference |
|---|---|---|---|---|---|---|---|---|
| Sports Mental Toughness | Confidence | 18-21 age | 232 | 2.8764 | .46582 | 8.686 | .000* | 3-1 6-1 6-2 6-3 6-5 |
| | | 22-25 age | 124 | 2.9476 | .46677 | | | |
| | | 26-29 age | 54 | 3.0895 | .38813 | | | |
| | | 30-33 age | 11 | 3.0455 | .21201 | | | |
| | | 34-37 age | 22 | 3.0530 | .37581 | | | |
| | | 38 age+ | 61 | 3.2760 | .45122 | | | |
| | Constancy | 18-21 age | 232 | 2.6250 | ,37725 | 7,755 | .000* | 1-3. 1-4 5-1. 1-6 2-3. 2-4 5-2. 2-6 5-3. 3-4 5-4. 6-4 |
| | | 22-25 age | 124 | 2,6089 | ,35390 | | | |
| | | 26-29 age | 54 | 2,4537 | ,30357 | | | |
| | | 30-33 age | 11 | 2,2273 | ,30526 | | | |
| | | 34-37 age | 22 | 2,8068 | ,36131 | | | |
| | | 38 age+ | 61 | 2,4590 | ,29290 | | | |
| | Control | 18-21 age | 232 | 2,5938 | ,58164 | 17,800 | .000* | 1-3. 1-4 1-5. 1-6 2-3. 2-4 |
| | | 22-25 age | 124 | 2,5948 | ,56453 | | | |
| | | 26-29 age | 54 | 2,0880 | ,66616 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 30-33 age | 11 | 1,7955 | ,67840 | | | 2-5, 2-6 |
| | | 34-37 age | 22 | 2,1477 | ,73864 | | | |
| | | 38 age+ | 61 | 2,0246 | ,61527 | | | |
| Decision Making | Self-confidence | 18-21 age | 232 | .9346 | .23192 | 1.139 | .338 | |
| | | 22-25 age | 124 | .9718 | .26435 | | | |
| | | 26-29 age | 54 | .9907 | .15329 | | | |
| | | 30-33 age | 11 | .9545 | .21201 | | | |
| | | 34-37 age | 22 | 1.0000 | .24125 | | | |
| | | 38 age+ | 61 | .9918 | .24424 | | | |
| | Careful Decision MakingStyle | 18-21 age | 232 | 1.6961 | .28209 | 3.846 | .002* | 1-2. 1-4 1-6. 5-4 5-6 |
| | | 22-25 age | 124 | 1.6035 | .41352 | | | |
| | | 26-29 age | 54 | 1.6173 | .27592 | | | |
| | | 30-33 age | 11 | 1.4545 | .34230 | | | |
| | | 34-37 age | 22 | 1.7500 | .37001 | | | |
| | | 38 age+ | 61 | 1.5328 | .43228 | | | |
| | Avoidant Decision Making Style | 18-21 age | 232 | .8211 | .44729 | 15.466 | .000* | 1-2. 1-3 1-4. 1-5 1-6. 2-3 2-6 |
| | | 22-25 age | 124 | .6492 | .40537 | | | |
| | | 26-29 age | 54 | .4105 | .28172 | | | |
| | | 30-33 age | 11 | .5455 | .21201 | | | |
| | | 34-37 age | 22 | .5076 | .26961 | | | |
| | | 38 age+ | 61 | .4563 | .36629 | | | |
| | Procrastination Decision Making Style | 18-21 age | 232 | .6500 | .44420 | 3.113 | .009* | 1-3. 1-5 2-3. 2-5 |
| | | 22-25 age | 124 | .6274 | .43530 | | | |
| | | 26-29 age | 54 | .4630 | .39778 | | | |
| | | 30-33 age | 11 | .7091 | .38329 | | | |
| | | 34-37 age | 22 | .4091 | .33510 | | | |
| | | 38 age+ | 61 | .5410 | .39723 | | | |
| | Panicky Decision Making Style | 18-21 age | 232 | .7517 | .42160 | 15.770 | .000* | 1-2. 1-3 1-5. 1-6 2-3. 2-5 2-6. 4-3 4-5. 4-6 |
| | | 22-25 age | 124 | .6323 | .46004 | | | |
| | | 26-29 age | 54 | .4333 | .51943 | | | |
| | | 30-33 age | 11 | .7273 | .28667 | | | |
| | | 34-37 age | 22 | .2273 | .29790 | | | |
| | | 38 age+ | 61 | .3279 | .37244 | | | |

Group 1: 18-21 Group 2: 22-25 Group 3: 26-29 Group 4: 30-33 Group 5: 34-37 Group 6: 38 +

Outdoor athletes' mental endurances and decision making skills are examined in Table 2. There are statistically significant differences among in mental endurance's subcategories; trust, continuity and control. There are statistically significant differences among decision making subcategories; careful decision making style, avoidant decision making style, procrastination decision making style and panicky decision making style. According to this, when age increases trust and continuity points increase as well. Youngsters have higher points for being controlled. In decision making, youngsters have more avoidant and panicky decision making style. 34-37 ages have more careful decision making style

Table 3. Distribution of the mental toughness and decision-making values of the athletes by the type of outdoor sports done

| | | The Type Of Outdoor Sports | N | Mean | SD | F | P | Fark |
|---|---|---|---|---|---|---|---|---|
| Sports Mental Toughness | Confidence | Rock climbing | 41 | 3.0772 | .49735 | 4.340 | .000 | 1-4. 1-6 1-7. 3-2 2-4. 2-6 2-7. 3-4 3-6. 3-7 5-7 |
| | | Mountaineering | 117 | 3.0385 | .45401 | | | |
| | | Paragliding | 33 | 3.2424 | .35865 | | | |
| | | Hiking | 208 | 2.9167 | .48460 | | | |
| | | Caving | 11 | 3.1667 | .38006 | | | |
| | | Mountain bike | 60 | 2.8944 | .42182 | | | |
| | | Other | 34 | 2,8333 | .40410 | | | |
| | Constancy | Rock climbing | 41 | 2,5976 | .42160 | 2.165 | .045 | 1-7, 2-7 4-7, 5-6 5-7 |
| | | Mountaineering | 117 | 2,6346 | .38358 | | | |
| | | Paragliding | 33 | 2,5833 | .35171 | | | |
| | | Hiking | 208 | 2,5781 | .35724 | | | |
| | | Caving | 11 | 2,7727 | .43952 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Mountain bike | 60 | 2,5333 | .29640 | | |
| | | Other | 34 | 2,4265 | .32292 | | |
| | Control | Rock climbing | 41 | 2.1402 | .55071 | 4.505 | .000 | 1-2. 4-1 6-1. 7-1 2-1. 2-3 4-3. 6-3 7-3. 4-5 |
| | | Mountaineering | 117 | 2.4359 | .63581 | | |
| | | Paragliding | 33 | 2.0985 | .51135 | | |
| | | Hiking | 208 | 2.5349 | .68299 | | |
| | | Caving | 11 | 2.1136 | .52872 | | |
| | | Mountain bike | 60 | 2.4667 | .63524 | | |
| | | Other | 34 | 2.5368 | .55777 | | |
| Decision Making | Self-confidence | Rock climbing | 41 | .9309 | .25813 | .513 | .799 | |
| | | Mountaineering | 117 | .9387 | .23631 | | | |
| | | Paragliding | 33 | .9949 | .16396 | | | |
| | | Hiking | 208 | .9663 | .25101 | | | |
| | | Caving | 11 | .9848 | .30235 | | | |
| | | Mountain bike | 60 | .9806 | .20606 | | | |
| | | Other | 34 | .9510 | .19038 | | | |
| | Careful Decision MakingStyle | Rock climbing | 41 | 1.6748 | .33737 | 1.007 | .420 | |
| | | Mountaineering | 117 | 1.6282 | .32562 | | | |
| | | Paragliding | 33 | 1.6566 | .31988 | | | |
| | | Hiking | 208 | 1.6563 | .35482 | | | |
| | | Caving | 11 | 1.4848 | .41133 | | | |
| | | Mountain bike | 60 | 1.5833 | .40303 | | | |
| | | Other | 34 | 1.7059 | .29030 | | | |
| | Avoidant Decision Making Style | Rock climbing | 41 | .6545 | .43524 | 3.601 | .002 | 2-3. 2-6 4-3. 7-3 4-6. 7-6 |
| | | Mountaineering | 117 | .7393 | .45664 | | | |
| | | Paragliding | 33 | .4798 | .28185 | | | |
| | | Hiking | 208 | .7115 | .45325 | | | |
| | | Caving | 11 | .4848 | .18936 | | | |
| | | Mountain bike | 60 | .5222 | .33819 | | | |
| | | Other | 34 | .7157 | .40312 | | | |
| | ProcrastinationDecision Making Style | Rock climbing | 41 | .5756 | .44090 | 1.120 | .349 | |
| | | Mountaineering | 117 | .6256 | .46129 | | | |
| | | Paragliding | 33 | .4424 | .34913 | | | |
| | | Hiking | 208 | .6288 | .45887 | | | |
| | | Caving | 11 | .5273 | .27236 | | | |
| | | Mountain bike | 60 | .5667 | .34379 | | | |
| | | Otherr | 34 | .6294 | .36889 | | | |
| | Panicky Decision Making Style | Rock climbing | 41 | .5268 | .39939 | 2.285 | .035 | 4-2. 4-5 6-5. 7-6 7-5 |
| | | Mountaineering | 117 | .5436 | .48555 | | | |
| | | Paragliding | 33 | .5758 | .47106 | | | |
| | | Hiking | 208 | .6731 | .48638 | | | |
| | | Caving | 11 | .3091 | .24271 | | | |
| | | Mountain bike | 60 | .6433 | .41349 | | | |
| | | Other | 34 | .6765 | .33399 | | | |

Group 1: Rock climbing Group 2: Mountain climbing Group 3: Paragliding Group 4: Hiking Group 5: Caving Group 6: Mountain biking Group 7: Other

Mental endurance and decision making skills are examined according to the type of outdoor sports in Table 3. There are statistically significant differences among mental endurance substyles; trust, continuity and control. There are statistically significant differences among decision making subcategories; careful decision making style, avoidant decision making style, procrastination decision making style and panicky decision making style. According to this, in terms of mental endurance, paragliders (X=3.24) believe in their ability and think that they are better than their opponents. Cavers (X=2,77) are better in taking responsibility and concentrating, hikers (X=2.53) are better to act calm under pressure or face with unexpected conditions. In decision making, while mountaineers have avoidant decision making style, hikers have panicky decision making style.

Table 4: Distribution of the mental toughness and decision-making values of the athletes by experience

| | | Experience | N | Mean | SD | F | P | Difference |
|---|---|---|---|---|---|---|---|---|
| Sports Mental Toughness | Confidence | 1-3 year | 307 | 2.9446 | .43808 | 4.017 | .008 | 4-1. 4-2 |
| | | 4-7 year | 118 | 2.9647 | .56017 | | | |
| | | 8-11 year | 59 | 3.0650 | .38658 | | | |
| | | 12 year + | 20 | 3.2750 | .37179 | | | |
| | Constancy | 1-3 year | 307 | 2.6034 | .36840 | 10.547 | .000 | 1-3. 1-4 2-3. 2-4 |
| | | 4-7 year | 118 | 2.6547 | .37399 | | | |
| | | 8-11 year | 59 | 2.4237 | .28713 | | | |
| | | 12 year + | 20 | 2.2875 | .09159 | | | |
| | Control | 1-3 year | 307 | 2.5529 | .59909 | 18.285 | .000 | 1-3. 1-4 2-3. 2-4 |
| | | 4-7 year | 118 | 2.4280 | .72139 | | | |
| | | 8-11 year | 59 | 2.0212 | .51963 | | | |
| | | 12 year + | 20 | 1.8625 | .48310 | | | |
| Decision Making | Self-confidence | 1-3 year | 307 | .9636 | .24558 | .955 | .414 | |
| | | 4-7 year | 118 | .9322 | .21817 | | | |
| | | 8-11 year | 59 | .9831 | .19002 | | | |
| | | 12 year + | 20 | 1.0000 | .28613 | | | |
| | Careful Decision MakingStyle | 1-3 year | 307 | 1.6477 | .30947 | 5.346 | .001 | 1-4. 2-4. 3-4 |
| | | 4-7 year | 118 | 1.6808 | .41321 | | | |
| | | 8-11 year | 59 | 1.6356 | .34943 | | | |
| | | 12year+ | 20 | 1.3500 | .37813 | | | |
| | Avoidant Decision Making Style | 1-3 year | 307 | .7389 | .42963 | 16.321 | .000 | 1-3. 1-4. 2-3 |
| | | 4-7 year | 118 | .6864 | .44024 | | | |
| | | 8-11 year | 59 | .3446 | .27831 | | | |
| | | 12year+ | 20 | .5000 | .25363 | | | |
| | ProcrastinationDecision Making Style | 11-3 year | 307 | .6463 | .42173 | 6.199 | .000 | 1-3. 2-3 |
| | | 4-7 year | 118 | .5966 | .47139 | | | |
| | | 8-11 year | 59 | .3864 | .32348 | | | |
| | | 12year+ | 20 | .5900 | .43274 | | | |
| | Panicky Decision Making Style | 1-3 year | 307 | .7055 | .47754 | 16.612 | .000 | 1-2. 1-3. 1-4. 2-3. 2-4 |
| | | 4-7 year | 118 | .5695 | .42537 | | | |
| | | 8-11 year | 59 | .3458 | .31695 | | | |
| | | 12year+ | 20 | .2500 | .17014 | | | |

Group 1: 1-3 years Group 2: 4-7 years Group 3: 8-11 years Group 4: 12 year +

Mental endurance and decision making skills are examined according to experience in Table 4. There are statistically significant differences among mental endurance substyles; trust, continuity and control. There are statistically significant differences among decision making subcategories; careful decision making style, avoidant decision making style, procrastination decision making style and panicky decision making style. According to this, in terms of mental endurance, believing in abilities in tough times and to be better than opponents increase when experience increases (confidence).

Generally, continuity and control decreases when experience increases. 4-7 age athletes have more careful decision making style. Avoidant decision making, procrastination decision making and panicky decision making decrease when experience increases.

Table 5: Analysis of correlations between mental toughness and decision-making skills of the athletes

| | | Self-confidence | Decision Making | Mental Toughness |
|---|---|---|---|---|
| Self-confidence | r | 1 | | |
| | P | | | |
| | N | 504 | | |
| Decision Making | r | 106* | 1 | |
| | P | .017 | | |
| | N | 504 | 504 | |
| Mental Toughness | r | .298** | .206** | 1 |
| | P | .000 | .000 | |
| | N | 504 | 504 | 504 |

There is meaningful relation between mental endurance and decision making skill in Table 5. There is a low positive relation between decision making and self-esteem [r=.106; p<.05]. There is a low positive relation between mental endurance and decision making [r=.206; p<.01]. There is a low positive relation between mental endurance and self-esteem [r=.298; p<.01]. In general. it could be said that there is a relation between mental endurance decision making.

**Discussion and Conclusion**

This study intends to examine the impact of the mental toughness of athletes doing outdoor sports on their decision-making skills.

Spending time in nature is becoming a popular lifestyle in today's society. For this reason, it has become a necessity to produce a variety of programs, activities and projects in order to increase leisure time activities and expand their spectrum (23). In our study, the variables gender, age, educational status, marital status, the type of outdoor sport done and experience with outdoor sports were examined and statistically significant differences were found ($p < 0.05$).

Statistically significant differences were found in the subsets of mental toughness and self-confidence (Decision Making) by the gender variable (table 1). Besides, men have higher levels of self-esteem at decision making.The main reason men are more into physical activities is because men's body structure is more robust than that of women (22). It can be assumed that due to this physical advantage, men mentally display a more confident attitude towards outdoor sports, that is to say men rely on their physical strength. There are studies that support this conclusion (37). Besides, being calm and even-tempered may have to do with women's personality traits. According to our study, mental toughness displays itself in the form of confidence for men and self-control for women. Men, therefore, believe in their skills to reach targets in challenging situations and think they are better (30) than other athletes. Women, on the other hand, tend to remain calm under pressure or in the face of unexpected situations (30). Psychological skills help athletes maximize their physical skills (39). As regards decision-making skills, men make decisions with more self-confidence than women. The fact that men are more confident with their decisions in outdoor sports than women may be due to their spending more time doing outdoor sports. Using psychological skills is important for athletes who are engaged in high-risk sports (26).

Mental toughness is a concept with different impact dynamics that changes depending on the sports branch according to the general view (18). According to our study, mental toughness displays itself in the form of confidence for men and self-control for women in outdoor sports. As regards decision-making skills, men make decisions with more self-confidence.

Statistically significant differences were found in the subsets of mental toughness and decision-making by the age variable (table 2) (p<.001). In our study, as age increases in the subsets of confidence and continuity, so does mental toughness and as age decreases, control behaviors increase. In other words, as age increases, it can be said that the strength for reaching the targets in challenging circumstances, believing in one's talents, taking responsibility in line with the targets set, focusing, as well as the strength for fighting for an end increases. Young people, on the other hand, tend to remain calm under pressure or in the face of unexpected situations (30). Haran Larre (20) has found that two-thirds of accidents that occur during hiking affect people at the age of 50 and over. In such cases, progression of age constitutes a risk, and mental toughness gains more importance for the elderly. Decision-making is thought to have an important place in outdoor sports. In terms of decision-making, the results look more favorable for young people. Bull et al. (3) noted that good judgment impacts on coping under pressure. Decision-making skills have emerged as a more decisive trait for young people. This can be explained by the fact that young people are more enthusiastic and driven to prove themselves.

According to the type of outdoor sports done (Table 3), statistically significant results have been obtained in mental toughness and decision-making skills (p <.001). We have also found that of the outdoor sports studied, those who are engaged in paragliding, mountain

climbing, rock climbing and caving take more responsibility, have more of a fighting spirit and believe in their ability to reach their targets (29), while those who go hiking keep their calm under pressure or in the face of unexpected situations (29). It is thought to be an expected feature to be a fighter for those involved in sports such as rock climbing, paragliding and mountain climbing. Being mentally durable in these sports is particularly determinant to success. Inevitably dangerous high-risk sports are distinguished from traditional sports by the environment they are performed in (26). Nicholls et al. (37) did not find any significant differences in mental toughness by the kind of sports played. Fourie and Potgieter (15) examined mental toughness and its components and collected them under 12 headings. This includes mental toughness. Statistically significant results were found between evasive decision-making and panic decision-making. Accordingly, mountain climbers and hikers make more evasive decisions. Doing risky sports requires the ability to keep composure in stressful situations, to overcome difficulties, to cope with emotional and physical discomfort, to be decisive in tough conditions, and to be able to cope with frightening situations (39). These skills are also thought to have an impact on decision making. It is known that outdoor sports are risky sports. According to Galloway (16), decision-making is an important skill. Decision-making is especially important for those who guide large groups. Adventure sports guides should have the ability to reason effectively about the risk levels, the potential benefits of the situation and the possible consequences (5).

As experience has increased (table 4), the belief in mental toughness and abilities and the belief that one is better than his/her opponents have increased, and it has been seen that taking responsibility and concentrating and keeping composure in the face of challenging or unexpected situations, being in controlled and the sense of comfort decreased. According to these results, experience has an important influence on mental toughness. Increased experience in athletes is a behavior that affects their ability to believe in their abilities. This will lead to success at the end of a mental process. That kind of toughness will create the right decision making mechanism. According to some studies, more than one-third of the victims who suffered trauma as a result of an accident while doing outdoor sports had little or no experience in mountain sports (20). Connaughton et al. (8) reported that competition- based experience was an important factor in the development of mental toughness for the athletes. In addition, mental toughness can be regarded as an important attribute when the difficulties of outdoor sports are considered. In one study, Nicholls et al. (37) found significant results with regard to mental toughness and the fighting spirit based on experience. According to our results, the more the experience, the more trust athletes have in their talents. This may be related to the fact that these athletes have gained valuable experiences following the accidents they have seen and experienced. According to our findings, as experience increases, evasive decision-making, deferential decision-making and panic decision-making decrease. This can be explained by the fact that outdoor sports require a sudden decision-making ability. Because there is uncertainty in outdoor sports, this uncertainty forces leaders or individuals to make sudden decisions. Negative experiences and confidence building result in attainment of goals. This will provide opportunities for personal development and enable learning of important lessons (9). According to the research, as the number of climbing increases, it develops in physical and psychological characteristics (40). Contrary to what was expected in our study, as experience increased, there was a decrease in the careful decision making sub-dimension.

This can be explained by the athletes taking no responsibility under difficult conditions. Being mentally strong and coping with challenges in nature helps achieve success (4). Decision-making in this process can have a positive impact on mental strength. According to Galloway (16), in emergencies, the rate of highly experienced leaders being influenced by the group decreases. Accordingly, having a high level of experience has an important impact on decision-making.

When Table 5 was examined, a positive correlation was seen between mental toughness, decision-making ability ($r = .206$, $p < .000$) and self-confidence ($r = .106$, $p < .017$). Accordingly, though not very much so, mental toughness affects decision-making and self-confidence positively. Making the right decisions increases the person's trust in

themselves. This also affects self-confidence. Draper et al. (12) concluded that stress affects rock climbing psychologically. This type of stressful situation can affect the mental toughness and the ability to make a decision to achieve a goal. In general, when looking at the profiles of mountain and nature athletes, it is seen that age, experience, and gender have an impact on accidents. People who are experienced and experts in their fields have been found to be exposed to more accidents (32). As a result, it can be said that as mental toughness increases, so do decision-making skills and confidence, that is to say. Decision making in outdoor athletes is an important skill (19).

**Conclusion**

Mental toughness has an important influence on outdoor sports. It has a direct influence on reaching the target. Decision-making also emerges as a critical skill when it is thought that outdoor sports are carried out under difficult conditions and the risk of accidents is high. In general, demographic variables influence mental toughness and decision-making. It should be noted that decision-making ability increases as mental toughness increases. Accordingly, decision-making becomes more important for sportsmen, especially those who lead crowded groups. The right decisions will make the group feel safe. It is suggested that individuals at every age, gender should be steered to do outdoor sports, places and stage for outdoor sports. In addition, relaxation exercises can be performed.

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# Comparison of Upper Extremities of Children Who Playing and Not Playing Basketball

Orhan Ahmet ŞENER [1], E Şerife ALPA[2]

[1]Selçuk University, Faculty of Sport Sciences, Physical Education and Sports Department, Konya/TURKEY
[2] KTO Karatay University, Faculty of Medicine, Department of Anatomy, Konya/TURKEY
Address Correspondence to: Şerife ALPA mail: serife.cinar@karatay.edu.tr

**Abstract**

In this study, it is aimed to compare the upper extremities of children who play and do not play basketball. In this study, measurements were taken in the upper extremities of a total of 200 secondary school students playing basketball and non-playing, with a mean age range of 11 ± 1.08 (did play sports) - 11 ± 0.8 (did not play sports). The average height and weight ratio of the students who did and did not play sports were 153.5 ± 12.9 - 149.2 ± 8.1 cm and 46.7 ± 12.04 - 43.08 ± 12.9 kg respectively. In the right and left upper extremities of the students who play sports, arm length was 28.4 ± 3.1 - 28.4 ± 3.01. the forearm length was 24.1 ± 2.4 - 24.1 ± 2.4. hand length was 15.9 ± 1.8 to 15.9 ± 1.6. arm circumference was 23.2 ± 3.9 - 23.0 ± 3.8. the circumference of forearm was 20.8 ± 2.5 - 20.6 ± 2.5. hand width was 7.8 ± 0.8 to 7.9 ± 0.8. The results of the biacromial width and bideltoid width measurements were 25.5 ± 3.13 and 39.2 ± 4.7. respectively. In the right and left upper extremities of students who did not do sports, arm length was 26.8 ± 2.5 - 26.6 ± 2.4. forearm length was 23.3 ± 2.1 - 23.3 ± 2.0. hand length was 16.0 ± 1.5 - 16.2 ± 1.5. arm circumference was 22.4 ± 3.5 to 22.4 ± 3.5. circumference of forearm was19.4 ± 2.5 - 19.4 ± 2.5. hand width was 7.6 ± 0.9 - 7.7 ± 0.9.

The results of the biacromial and bideltoid width measurements were 28.8 ± 3.8 and 37.6 ± 4.4. respectively. As a result of the evaluation made, there was a difference between arm circumference measurements ($p = 0.02$) when the measurements taken from the right and left extremities of the students who did sports and did not do sports were compared. It was observed that the difference between right - left arm length ($p = 0.001$) and right - left hand length ($p = 0.02$) was significant in the students who did not do sports. Playing basketball increases the arm circumference and forearm circumference in children.

**Key words:** Anthropometry, Basketball, Upper Extremity

## INTRODUCTION

Medical science, aiming at human health, should evaluate the human being in a meaningful and socio-cultural environment to achieve this goal. The effect of sport exercises on body proportions has always been a subject of research. Anthropometry, which finds the most commonly used methods among the method used to determine the growth and development levels of children in the society. With anthropometric measurements it is possible to obtain samples of physical growth that occur until the end of the child's adolescence period. There is a close relationship between child growth and development and the general health and economic levels of the society. The most

important factors affecting physical growth and development in children are genetic features and environment. The best way to determine the results of these factors is to assess the children's well-being in terms of growth and development in each period (1).

There are social benefits in the sport's multi-faceted benefits to children's organism. Improves leadership and personality characteristics of children, for example from the moment of birth and on, some measurements are made on the human being (3.13). The

height, head circumference, chest circumference and weight are the first values measured with birth. These measurements are regarded as indicators of baby's compliance with normal standards, development and nutrition level. As the child grows and develops gradually, it becomes a measure for shoes and clothes. In short, we measure and evaluate many dimensions related to our body in every period of life (4).

Anthropometric perimeter and length measurements are used in pediatrics, norm studies and assessment of body development. The growth of the body is followed by the transverse growth of the body to grow longitudinally. Middle childhood is the time to start school at the age of 7 in Turkey and it is an age when growth is widely considered (1). The purpose of the sport anthropometry is to investigate the general and specific conditions of the physical development changes, which are caused by the sporty fitness level of the athlete with respect to the body structure and the regular sporty training in accordance with the purpose. The determination of anthropometric and physiological profiles may contribute to the selection of criteria for achieving success for young basketball players. When the developmental profiles of young basketball players are followed, it is clear that the athlete's fitness with respect to the body structure and, physical development changes, general and special changes as a result of the regular sport training can be observed (5, 9).

In parallel with the change of environmental and social culture structures in our country, it is observed that families prefer popular sports in directing their children to sport. Since sport plays an important role in the multifaceted development and socialization of the child, it is recommended to start the sport at an early age. Children play games themselves while they are learning about their surroundings. When the child is between the ages of 6 and 11, when the child starts to relate to the people around him, the form of sports-type behavior occurs. If you are between the ages of 12-14, the child gets tired of this game-sport relationship and enters new quests. In this period, it requires technical rules that determine the use of gaming devices and the sport concept for the child begins. Teaching basketball in the age of development (ages 12-14) depends on a number of sensitive points. Young males who develop rapidly in terms of coordination, special movements, speed, and agility in pre-adolescence period, show pause in this period (17, 8).

Today, sport is defined as a more comprehensive definition of "movements that improve the state of health of a person and maintain improved health status". It is seen that sports from past to present day have an important place in society. The successes achieved in the international arena have been an important factor in people's sport orientation. Today, basketball and football have an important place, especially athletics, which is considered as the ancestor of all sports branches. For this reason, it is important to know the motor and anthropometric properties of the athletes in these branches and to create a branch specific athlete profile. Basketball is becoming popular with its dynamic features as a team sport today. It is a fun sport that all kinds of individuals with different genders and ages can easily do. Basketball is a team sport that develops physical qualities such as strength, speed, skill and mobility, and brings these features to a higher level during adulthood starting from childhood or youth (15, 19). Primary growth and body development is the fastest period (10, 11). Determining the potential performance in sports at an early age will lead the athletes to the correct sport and provide the optimum success. Regular physical activity is important for maintaining muscle strength, joint structure, joint function and bone health (20). It has been stated that even the colors of clothes create perceptual differences on individuals (21). It is accepted by many educators that sport plays a role in the development of personality and character traits (6).

This study, we aimed to show how development of children is affected by sports through measuring some body proportions of the children who play basketball and do not play during their developmental stages

## MATERIAL AND METHOD

Students participating in the study were evaluated in two groups as students who played sports and who did not play sports. A total of 200 secondary school students participated in the study. Considering that the students have not undergone any surgical intervention for any disability while being

assessed. Measurements of the right and left upper extremities of the students were taken with the help of a tape measure (Figure 1., 2. and 3.). The measurements were taken in accordance with the following definitions as a result of literature review.

**The study Height Length:** In normal anatomic position, the distance between bastion and vertex is measured.

**Arm Length:** The distance between the acromion and the olecranon was measured while the arm was in flexion 90.

**Forearm Length:** The distance between the olecranon and the stylus was measured while the arm was flexed 90 degrees.

**Hand Length:** The distance between stylus and acromelion is measured when the arm is brought to 90 flexion in a normal anatomical position.

**Biacromial width:** The distance between right and left acromion points was measured in normal anatomic position.

**Bideltoid width:** The distance between right-left deltoid points is measured in normal anatomic position.

**Hand Width:** In the normal anatomic position, the distance between the distal ends of the second and fifth hand cardiac bones was measured.

**Arm Circumference:** In normal anatomic position, the gauze is measured on the line passing through the middle of the arm when the arms are slightly open to the side.

**Forearm Circumference:** In normal anatomic position, the arms were measured with a cloth tape measure on the line passing through the middle point of the forearm while slightly opened to the side.

Out of these measurements, height and weight measurements were also taken from the students.

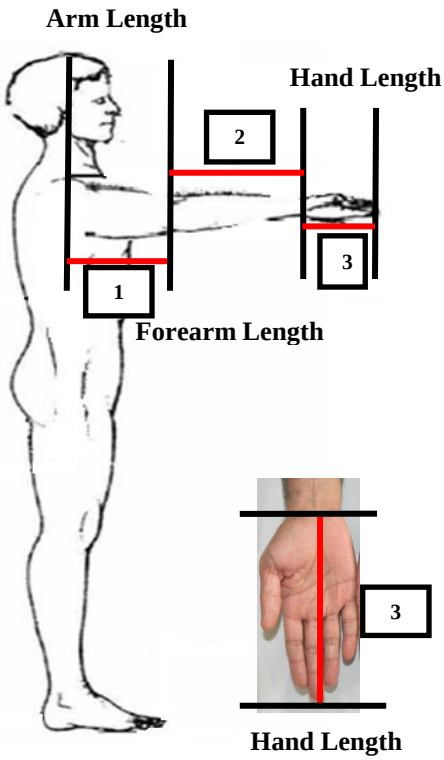


Figure 1: Measurements taken from the upper extremity; 1. Arm Length, 2. Forearm Length, 3. Hand Length

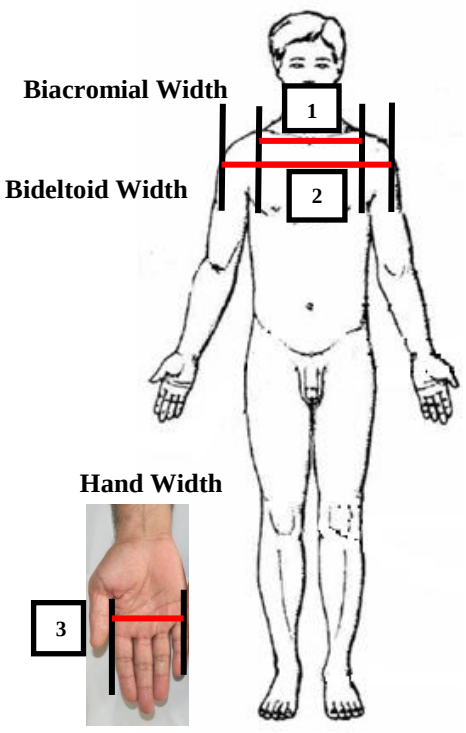


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Figure 2: Measurements taken from the upper extremity; 1. Biacromial Width, 2. Bideltoid Width, 3. Hand Width

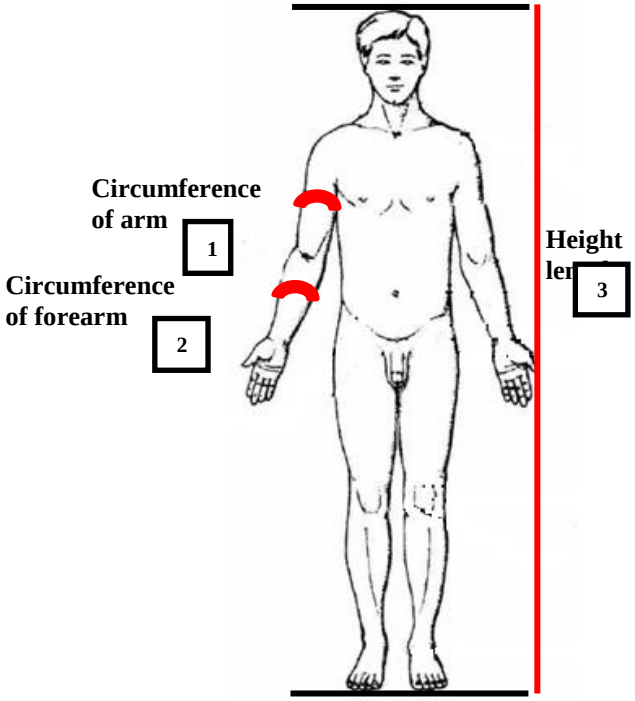


Figure 3: Measurements and height measurements taken from the upper extremity; 1. Circumference of arm, 2. Circumference of forearm, 3. Height length

### Statistics

All analyses of the study were performed by SPSS 22.0 (IBM Inc., IL, Chicago, USA) software. Descriptive statistics were calculated, and categorical variables as frequencies and percentages and continuous variables were presented as mean±SD in tables. The normality assumption of continuous variables were detected by Kolmogorov-Smirnov test. Student t-test was used to compare two independent groups and two related samples. Chi-square test was used to determine the relation between categorical variables. In all analyses, p value of less than 0.05 was considered as statistically significant result for 5% type-1 error.

### Results

200 secondary students participated to the study. When the measurement results were taken into account, the age range of the students who played and did not play basketball was 11 ± 1.08 and 11 ± 0.8, respectively. The average height of the students who played and did not play basketball; were 153.5 ± 12.9 - 149.2 ± 8.1 cm and the weight was 46.7 ± 12.04 - 43.08 ± 12.9 kg respectively (Table 1).

Table 1: Average height and weight of students who played and did not play basketball

| | Played Basketball | Did not Play Basketball |
|---|---|---|
| Height Lenght | 153.5 ± 12.9 cm | 149.2 ± 8.1 cm |
| Weight | 46.7 ± 12.04 kg | 43.08 ± 12.9 kg |

In the right and left upper extremities of students who played Basketball; arm length was 28,4 ± 3,1 cm - 28,4 ± 3,01 cm, forearm length was 24,1 ± 2,4 cm - 24,1 ± 2,4 cm, hand length was 15,9 ± 1,8 cm - 15.9 + - 1.6 cm, arm circumference 23.2 ± 3.9 cm - 23.0 ± 3.8 cm, circumference of forearm 20.8 ± 2.5 cm - 20.6 ± 2.5 cm, hand width was 7,8 ± 0,8 cm - 7,9 ± 0,8 cm. Biacromial width and bideltoid width measurement results were measured as 25.5 ± 3.13 cm and 39.2 ± 4.7 cm, respectively (Table 2).

Table 2: Measurements taken from the upper left and right extremitiesof students who played basketball

| | Right upper extremities | Left upper extremities |
|---|---|---|
| Arm length | 28.4 ± 3.1 cm | 28.4 ± 3.01 cm |
| Forearm length | 24.1 ± 2.4 cm | 24.1 ± 2.4 cm |
| Hand length | 15.9 ± 1.8 cm | 15.9 ± 1.6 cm |
| Arm circumference | 23.2 ± 3.9 cm | 23.0 ± 3.8 cm |
| Forearm circumference | 20.8 ± 2.5 cm | 20.6 ± 2.5 cm, |
| Hand width | 7.8 ± 0.8 cm | 7.9 ± 0.8 cm |
| Biacromial width | 25.5 ± 3.13 cm | |
| Bideltoid width | 39.2 ± 4.7 cm | |

In the right and left upper extremities of students who did not play Basketball; arm length was 26.8±2.5 cm – 26.6±2.4 cm, forearm length was 23.3±2.1 cm – 23.3±2.0 cm, hand length was 16.0±1.5 cm – 16.2±1.5 cm, arm circumference was 22.4±3.5 cm – 22.4±3.5 cm, forearm circumference was 19.4±2.5 cm – 19.4±2.5 cm, hand width was 7.6±0.9 cm – 7.7±0.9 cm respectively. The results of biacromial and bideltoid width measurements were 28.8 ± 3.8 cm and 37.6 ± 4.4 cm, respectively (Table 3).

| Table 3: Measurements taken from the upper left and right extremities of students who did not play basketball | | |
|---|---|---|
| | Right upper extremities | Left upper extremities |
| Arm length | 26.8 ± 2.5 cm | 26.6 ± 2.4 cm, |
| Forearm length | 23.3 ± 2.1 cm | 23.3 ± 2.0 cm |
| Hand length | 16.0 ± 1.5 cm | 16.2 ± 1.5 cm |
| Arm circumference | 22.4 ± 3.5 cm | 22.4 ± 3.5 cm, |
| Forearm circumference | 19.4 ± 2.5 cm | 19.4 ± 2.5 cm, |
| Hand width | 7.6 ± 0.9 cm | 7.7 ± 0.9 cm |
| Biacromial width | 28.8 ± 3.8 cm | |
| Bideltoid width | 37.6 ± 4.4 cm | |

According to the results obtained in the comparison between groups in the result of statistical evaluation; the differences between right arm lengths (p=0.000) and left arm lengths (p=0.000). right forearm lengths (p=0.027) and left forearm lengths (p=0.044). right hand widths (p=0.033). right forearm peripheral widths (p=0.001) and left forearm peripheral widths (p=0.001) were significant (p<0.05).

As a result of the evaluation made. there was a difference between arm circumference measurements (p = 0.02) when the measurements taken from the right and left extremities of the students who did sports and did not do sports were compared. It was observed that the difference between right - left arm length (p = 0.001) and right - left hand length (p = 0.02) was significant in the students who did not do sports.

| Table 4: Comparison of arm circumference and forearm circumference in basketball and non-basketball players | | | | |
|---|---|---|---|---|
| | | Mean | Std. Deviation | t-test |
| Arm circumference (right) | Basketball players | 23.02 | 1.74 | 2.24* |
| | Not Basketball players | 22.04 | 1.82 | |
| Arm circumference (left) | Basketball players | 23.00 | 1.70 | 2.19* |
| | Not Basketball players | 22,04 | 1,82 | |
| Forearm circumference (right) | Basketball players | 20.8 | 2.14 | 3.03* |
| | Not Basketball players | 19.40 | 1.66 | |
| Forearm circumference (left) | Basketball players | 20.60 | 2.47 | 2.41* |
| | Not Basketball players | 19.40 | 1.66 | |
| *p<0.05 | | | | |

## Discussion

For Each sport is known to have its own characteristic. The athletes with special physical-built suitable to branches, it is known that their features are effective in competition. Successful athletes may be a model for knowing the physical characteristics of talent selection. It is important to make physical measurements such as length, environment, etc. (18). We aimed to reveal the differences in the individuals doing the sports with the length and the environmental measurements we made in the students who did and did not do sports, and to be able to model the physical features.

In a study by Kılınç (12), length and width measurements were taken in a group of students who had an average age of 14 in rowing. For students with high and low rowing performance, mean height length was 145.8 ± 3.5 and 139.9 ± 3.5, weight was 36.4 ± 7.0 and 33.7 ± 4.4 kg, arm length was 46.3 ± 4.4 and 43.2 ± 5.1 cm, forearm length was 22.3 ± 1.2 and 21.2 ± 1.6, hand length was 15.7 ± 0.7 and 15.1 ± 0.8, respectively. When we compared the results with our study, it was observed that there was a difference between the measurements with the exception of hand length. It is believed that this difference is due to sports in different branches and to different age groups. In this case it is shown that there are differences in

extremity lengths depending on different sports branches (12). In the study conducted by Bektaş and colleagues (2), anthropometric measurements were taken from individuals with a mean age of 13.84 + 4.34. From the measurements they have taken, the biceps circumference is measured in terms of tiny, star, young, big categories was determined as 22.1 ± 1.9, 22.8 ± 1.7, 24.5 ± 3.1 and 29.1 ± 8.0, respectively. In our study, it was observed that the comparison with the individuals playing basketball was compatible with the tiny, star and young categories.

Mahakizadeh and his colleagues (14) have taken hand length measurements from individuals aged 18-25 years. According to the results obtained, the average hand length measurement was 21.21 cm. It is seen that when we make comparisons for the individuals who do sports and those who do not in our study, there is a difference. This was thought to be due to the age difference of the individuals (14).

Erol and his colleagues have taken some anthropometric measurements to evaluate the body fat pattern and somatotype from 16-year-old basketball star national team players. From these measurements, the arm circumference measurement result average was determined as 27.32 cm. We observed that the result we obtained in our study was lower due to the age difference (7). In the study conducted by Pazarözyurt and colleagues (16), anthropometric measurements of elite female basketball players were taken. Individuals who are included in the evaluation are between the ages of 23-25. The averages of the hand lengths of the players who played in different positions were 19.24 ± 0.68, 20.2 ± 0.82, and 21.04 ± 1.34 cm, respectively, in the playmaker, striker and pivot positions (16). It was found meaningful that basketball players had larger arm circumference and forearm circumference than not Basketball players ($p<0.05$).

**Conclusion**

In this study we have tried to reveal the differences between the upper extremity measurements of the students who played basketball and did not play basketball and at the same time we tried to reveal characteristic upper extremity measurements in the 11-years old average. Playing basketball increases the arm circumference and forearm circumference in children. Based on our literature review, we have observed that the upper extremity measurements are not frequently compared in the studies on the individuals who do and do not do sport. Thus, we believe that our study will be a reference for this age range.

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# Investigation of university students attitudes toward leisure time activities (ardahan university sample)

Talha MURATHAN[1], Ali TÜRKER[2], Fatih MURATHAN[3]

[1]*Ardahan University School of Physical Education and Sport, Department of Sport Management, Ardahan, Turkey*
[2]*Alparslan University School of Physical Education and Sport, Department of Sport Management, Muş, Turkey*
[3]*Adıyaman University, School of Physical Education and Sport, Department of Physical Education Teaching, Adıyaman, Turkey*
*Address Correspondence to A, Türker, e-mail: aturker@alparslan.edu.tr*

**Abstract**

The aim of this research is to identify the attitudes of university students towards leisure activities, their levels of participation in activities and the state of adequate opportunities. The population of the study consists of 5200 students having studied in the education year of 2017-2018 and the sample of the study consists of 1057 (538 male, 519 female) volunteer students. In the research "Free Time Attitude Scale" was used as a data collection tool developed by Akgül and Gürbüz (1). According to the findings of the study, the distribution of students ' gender is close to each other. No difference has been found in the attitudes towards leisure activities according to the gender factor (p = 0.402). It has been found that leisure time attitudes of the students in the Faculty of Engineering and School of Physical Education and Sport higher than the other faculties. In the age factor, the difference has been found only in the behavioral area. While the participants think that their academic GPA effects success positively, no significant difference has been observed in pearson correlation analysis. As a result, it can be said in the research that female students are much more social and positive compared to male students in decision making in terms of leisure time activities.

**Key words:** University student, Recreation, Attitude, Leisure Time.

## INTRODUCTION

Time; is a section that is long or short termed in terms of the place of human being, can be measured by hour and whose beginning and ending is definite It is stated that time can be measured and its limits are definite (20). People perceive time so different from a psychologic aspect. The chain of occasions, effect of past memories and prudential desire and requests cause people perceive real time measured by hours as shorter or longer. One lives depending on time but everyone perceives duration of that time different from each other. Course time is short for the teacher who wants to teach well, but the same time may be quite long for the student who thinks about the game after the course (11).

Leisure time is expressed as "the time that one can spend totally with his/her own free will" in the book named Recreation Executive Report (17). After recreation fulfills individuals' professional, familial, social obligations, it is for individuals to participate in serial relaxation that they can choose with a free will, entertainments, knowledge and skills enhancement and interest to adopt themselves to refresh (10). First and most important social environment leading and forming one's leisure time behaviors is family. Starting from early childhood, the family as the smallest social unit in which an individual maintains to learn his/her own subculture values also provides a basis for the creation of leisure time behavior models (9). In the process of socialization the tend to recreation that individual acquired in childhood can share similarity with recreation in adulthood. The models of recreation elapsed time until adulthood years are being learned circumstantially, developed, remained or learned again (13).

Although the university students and teens who spend significant amount of their times together in daily life are from the same society, they have different subcultural structures according to their environment in which they live, educational

background, participation in production, families' socio cultural and socioeconomic structures. This difference reflects on teens and university students' attitudes and behaviors related to recreation.

In this study, it is aimed to identify the attitudes towards leisure time activities of 1057 volunteer students having studied in the education year of 2017-2018 in Ardahan University, their level of participation in the activities and the state of opportunities.

## MATERIAL & METHOD

The universe of the research consists of 5200 students having studied education year of 2017-2018 in Ardahan University and the sample of the study consists of 1057 volunteer students (538 male, 519 female) studying in Ardahan University and having selected by coincidence. Datum were practiced with mutual negotiation technique by carrying out the scale after the necessary informing in first-hand to the students was made.

### Reliability and Validity of the Scale

Turkish version of "Leisure Attitude Scale: LAS" developed by Ragheb and Beard (1982) was done by Akgül and Gürbüz (1,18). It has been found that the internal consistency coefficients (Cronbach Alfa) of the scale have changed between Cognitive 0.81 and Affective 0.92 and they are 0.92 in total (1). Leisure Time Attitude Scale consists of 36 items in total and has three dimensions with equal distribution as (1) Cognitive, (2) Affective and (3) Behavioral. In the scale in 5 Likert type, expressions are answered as Strongly disagree- Disagree- I'm not sure- Agree- Strongly Agree. At least 36 points and maximum 180 points can be got from the scale.

The reliability of the scores obtained with the application of the scale has been tested through Cronbach Alpha reliability coefficient and in the as a result of the analyses made, it has been identified that the internal consistency coefficients of the scale have changed between 0.83 Affective and 0.87 Cognitive. The total reliability co-efficient of the scale has been found as 0,92. In Cronbach Alpha co-efficient reliability test done for this study, cognitive as 0,910, affective as 03932, behavioral as 0,909 and total reliability has been found as 0.961. These values obtained have a high reliability. The fact that the total internal consistency coefficient of the scale is high shows that the items available in the scale for on hand work are coherent with each other and it consists of the items that aim to evaluate the factors of the same feature.

## INTERPRETATION of ANALYSIS & FINDINGS

Analysis of the data obtained in the computer environment was made in SPSS (Statistical Package for Social Sciences) 23.0 package program. T test and ANOVA were used to reveal the situation of differentiation of the subjects aimed at recreation attitude and in the evaluation of relation between variables the normality test was applied to the datum. In the test result, we benefited from the Correlation analysis. Tukey test has been used for multiple comparisons. In the analysis and interpretation of all data, the significance level $p<0.05$ has been considered.

When the research results were examined, while a significant difference in cognitive sub dimensions has been found during the evaluation of recreation according to the gender variable ($p<0.05$), no significant difference has been found in other sub dimensions and total number ($p>0.05$) (Table 1). Considering the arithmetic mean towards gender variable of the participants, while it is examined that the highest average score in females $\bar{x}$:49.566+12.306 and in males $\bar{x}$: 50.141+13.392 is in behavioral area, it is also examined that both females $\bar{x}$:32.574+8.889 and males $\bar{x}$:33.703+7.947 again have the lowest average score in cognitive area. According to the research results, it is pointed out that the female and male students studying in Ardahan University have the similar attitudes towards recreation. When the test results were examined, the gender difference has been pointed out only in the cognitive area. Accordingly, it can be said that female students have the ability to make a decision in terms of recreation and are more social compared to male students.

Table 1. Table of Leisure Time Attitudes T Test Analysis According To the Gender Factor

| | Groups | N | $\bar{x}$ | Ss | t | P |
|---|---|---|---|---|---|---|
| Cognitive | Male | 538 | 32.574 | 8.889 | -2.174 | 0.030* |
| | Female | 519 | 33.703 | 7.947 | | |
| Affective | Male | 538 | 43.894 | 11.49 | -1.412 | 0.158 |
| | Female | 519 | 44.824 | 10.27 | | |
| Behavioral | Male | 538 | 50.141 | 13.392 | 0.017 | 0.468 |
| | Female | 519 | 49.566 | 12.306 | | |
| Total | Male | 538 | 126.609 | 30.702 | 0.002 | 0.402 |
| | Female | 519 | 128.093 | 27.355 | | |
| p<0.05* | | | | | | |

When the results of one way variance analysis aimed at age factor in Table 2 were examined; while no significant difference has been found according to affective, cognitive and total results, a significant

difference has been observed in only behavioral sub dimension (p<0.05).

Table 2. Table of one way Variance Analysis in terms of recreation attitudes According to the Age Factor

| | Groups | N | $\bar{x}$ | df | F | p |
|---|---|---|---|---|---|---|
| Cognitive | 17 and 18 years | 143 | 32.811 | 3 | 1.572 | 0.195 |
| | 19 and 20 years | 477 | 33.733 | | | |
| | 21 and 22 years | 281 | 32.448 | | | |
| | 23 years and older | 156 | 32.794 | | | |
| Affective | 17 and 18 years | 143 | 43.489 | 3 | 0.592 | 0.62 |
| | 19 and 20 years | 477 | 44.664 | | | |
| | 21 and 22 years | 281 | 44.039 | | | |
| | 23 years and older | 156 | 44.801 | | | |
| Behavioral | 17 and 18 years | 143 | 47.272 | 3 | 3.223 | 0.022 |
| | 19 and 20 years | 477 | 50.511 | | | |
| | 21 and 22 years | 281 | 49.259 | | | |
| | 23 years and older | 156 | 51.314 | | | |
| Total | 17 and 18 years | 143 | 123.573 | 3 | 1.696 | 0.166 |
| | 19 and 20 years | 477 | 128.909 | | | |
| | 21 and 22 years | 281 | 125.747 | | | |
| | 23 years and older | 156 | 128.91 | | | |

p<0.05*

According to the faculty factor in Table 3, the significant differences have been found in the recreational conditions of the participants (p<0.05). In Tukey multiple comparison test result; the significant difference has been found in the area of cognitive, affective and in total between Faculty of Humanities and Letters and Vocational School, in affective area between Vocational School and the School of Physical Education and Sport (SPES), in behavioral area and in total between SPES and both Faculty of Economics and Administrative Sciences (FEAS) and Vocational School (p<0.05). It is seen that the students studying in SPES and Faculty of Engineering can value their spare time generally better and they have higher average scores in the scales. It is also seen that those studying in FEAS and Vocational School have the lowest average scores.

Table 3. Table of One Way Variance Analysis In terms of Leisure Time Attitudes According to the Institution, Faculty and College being studied

| | Groups | N | $\bar{x}$ | df | f | p |
|---|---|---|---|---|---|---|
| Cognitive | FHAL | 556 | 33.733 | 5 | 3.318 | 0.006** |
| | Fine Arts | 39 | 30.974 | | | |
| | FEAS | 98 | 31.622 | | | |
| | Engineering | 7 | 36.571 | | | |
| | VSHE | 223 | 31.91 | | | |
| | SPES | 134 | 34.194 | | | |
| Affective | FHAL | 556 | 44.983 | 5 | 3.295 | 0.006** |
| | Fine Arts | 39 | 43.538 | | | |
| | FEAS | 98 | 42.398 | | | |
| | Engineering | 7 | 47.142 | | | |
| | VSHE | 223 | 42.533 | | | |
| | SPES | 134 | 46.335 | | | |
| Behavioral | FHAL | 556 | 50.156 | 5 | 3.880 | 0.002** |
| | Fine Arts | 39 | 51.102 | | | |
| | FEAS | 98 | 46.642 | | | |
| | Engineering | 7 | 54.142 | | | |
| | VSHE | 223 | 48.269 | | | |
| | SPES | 134 | 53.037 | | | |
| Total | FHAL | 556 | 128.874 | 5 | 3.960 | 0.001** |
| | Fine Arts | 39 | 125.615 | | | |
| | FEAS | 98 | 120.663 | | | |
| | Engineering | 7 | 137.857 | | | |
| | VSHE | 223 | 122.713 | | | |
| | SPES | 134 | 133.567 | | | |

p<0.05*,p<0.01**

When Table 4 was examined according to level of income factor, any significant difference has not been found in all subscales in terms of the state of participants' recreation. It has been seen that high-income participants are more social. It has been found that as long as participants' level of income increases, they become more social.

Tablo 4. Results of One way Variance Analysis in Recreation attitudes According to the monthly income

| | Groups | N | $\bar{x}$ | df | FF | p |
|---|---|---|---|---|---|---|
| Cognitive | less than 500 TL | 553 | 32.884 | 3 | 0.96 | 0.411 |
| | 501-1000 TL | 209 | 32.990 | | | |
| | 1001-1500 TL | 144 | 33.159 | | | |
| | 1501-2000TL | 151 | 34.185 | | | |
| Affective | less than 500 TL | 553 | 44.20 | 3 | 0.527 | 44.048 |
| | 501-1000 TL | 209 | 44.25 | | | |
| | 1001-1500 TL | 144 | 44.048 | | | |
| | 1501-2000TL | 151 | 0.639 | | | |
| Behavioral | less than 500 TL | 553 | 49.842 | 3 | 0.564 | 0.639 |
| | 501-1000 TL | 209 | 49.325 | | | |
| | 1001-1500 TL | 144 | 51.048 | | | |
| | 1501-2000TL | 151 | 49.523 | | | |
| Total | less than 500 TL | 553 | 126.927 | 3 | 0.315 | 0.814 |
| | 501-1000 TL | 209 | 126.569 | | | |
| | 1001-1500 TL | 144 | 128.256 | | | |
| | 1501-2000TL | 151 | 129.092 | | | |
| $p<0.05$* | | | | | | |

Table 5. Descriptive Statistics Table Aimed at effect of students' leisure time activities on success

| | *N* | $\bar{x}$ | *Ss* |
|---|---|---|---|
| **Cognitive** | 818 | 33,820 | 8,335 |
| | 112 | 30,339 | 9,147 |
| | 127 | 31,133 | 7,799 |
| | 1057 | 33,128 | 8,454 |
| **Affective** | 818 | 45,221 | 10,773 |
| | 112 | 41,008 | 10,883 |
| | 127 | 41,763 | 10,939 |
| | 1057 | 44,359 | 10,913 |
| **Behavioral** | 818 | 50,982 | 12,621 |
| | 112 | 45,973 | 13,168 |
| | 127 | 46,047 | 12,876 |
| | 1057 | 49,859 | 12,867 |
| **Total** | 818 | 130,024 | 28,607 |
| | 112 | 117,321 | 30,063 |
| | 127 | 118,944 | 28,085 |
| | 1057 | 127,347 | 29,103 |

It is pointed out that the effect of the students' recreational activities on academic success increases with a percentage of 77.4, it decreases the success with 10.6 percentage and it has no effect on it with a percentage of 12.

Table 6. Descriptive Statistics Table For the time of students' daily leisure time

| | N | Daily Leisure Time | X̄ | Ss |
|---|---|---|---|---|
| Cognitive | 101 | No time | 31.445 | 9.917 |
| | 115 | less than 1 hour | 30.86 | 9.315 |
| | 209 | 1-3 Hours | 32.933 | 8.808 |
| | 373 | 3-5 Hours | 33.734 | 7.615 |
| | 179 | 5-7 Hours | 34.15 | 7.27 |
| | 80 | over 7 hours | 33.912 | 9.665 |
| | 1057 | Total | 33.128 | 8.454 |
| Affective | 101 | No time | 41.445 | 12.471 |
| | 115 | less than 1 hour | 41.382 | 11.602 |
| | 209 | 1-3 Hours | 43.971 | 11.077 |
| | 373 | 3-5 Hours | 45.471 | 9.898 |
| | 179 | 5-7 Hours | 45.458 | 10.19 |
| | 80 | over 7 hours | 45.687 | 12.159 |
| | 1057 | Total | 44.359 | 10.913 |
| Behavioral | 101 | No time | 46.802 | 14.033 |
| | 115 | less than 1 hour | 47.86 | 12.344 |
| | 209 | 1-3 Hours | 49.215 | 13.506 |
| | 373 | 3-5 Hours | 50.624 | 12.064 |
| | 179 | 5-7 Hours | 50.977 | 11.976 |
| | 80 | over 7 hours | 52.2 | 15.006 |
| | 1057 | Total | 49.859 | 12.867 |
| Total | 101 | No time | 33.676 | 33.676 |
| | 115 | less than 1 hour | 30.338 | 30.338 |
| | 209 | 1-3 Hours | 30.098 | 30.098 |
| | 373 | 3-5 Hours | 26.256 | 26.256 |
| | 179 | 5-7 Hours | 26.251 | 26.251 |
| | 80 | over 7 hours | 33.844 | 33.844 |
| | 1057 | Total | 29.103 | 29.103 |

The students have remarked for their time to recreate as 12,6 % Strongly Inadequate, %17,2 Inadequate, 34,3 % Normal, 24,5% Strongly Adequat

Table 7. Frequency Percentage Analysis Table of the Remarks For the Recreational Opportunities that the Universities Offer to Students

| | N | % Frequency |
|---|---|---|
| Strongly Inadequate | 310 | 29.3 |
| Inadequate | 248 | 23.5 |
| Normal | 364 | 34.4 |
| Adequate | 101 | 9.6 |
| Strongly Adequate | 34 | 3.2 |

The students have remarked for the opportunities that the university offered them as %29,3 Strongly Inadequate, %23,5 Inadequate, 34,4% Normal, 9,6% Adequate and 3,2% Strongly Adequate.

Table 8. Frequency Percentage Analysis Table Regarding How Students Spend Their Free Time

| | N | % Frequency |
|---|---|---|
| By Resting | 544 | 51.5 |
| By Attending Sport Activities | 162 | 15.3 |
| By Attending Social Activities | 195 | 18.4 |
| By Attending Cultural Activities | 46 | 4.4 |
| By Attending Artistic Activities | 64 | 6.1 |
| By Attending Touristic Activities | 45 | 4.4 |

The students have remarked for how they spend their free time as 51,5% by resting, 15,3 % by attending sport activities, 18,4 % by attending social activities,,4% by attending cultural activities, 6,1% by attending artistic activities and 4,4% by attending touristic activities.

Table 9. Correlation Analysis Table Regarding students' attitudes towards recreation according to their academic grade point averages

| | | Total | Cognitive | Affective | Behavioral |
|---|---|---|---|---|---|
| Grade Point Average | *R* | 0,031 | 0,031 | 0,050 | 0,008 |
| | *P* | 0,308 | 0,308 | 0,107 | 0,788 |

When the students' academic grade point averages with total and sub dimensions have been examined, it has been seen that there is a positive in low level and insignificant relation between cognitive (R=0,031), behavioral (R=0,008), affective (R=0,050) and their totals (p>0.05).

## DISCUSSION

538 male ,519 female and in total 1057 people participated in this study in which the attitudes of the students studying in Ardahan University regarding recreational activities have been researched. 143 students are aged between 17 and 18 years, 477 of them are aged of 19-20, 281 people are aged of 21-22 and 156 of them are aged over 23 years old.

According to the results of one-way variance analysis regarding age factor, while there has no significant difference in cognitive, affective areas and in total, there has a significant difference only in behavioral area (p<0,05). The fact that Asma, B. and others (4) in their study have indicated there has no significant difference in total number in the evaluation of recreation according to age factor specify parallelism with our research. Paksoy and his friends (16) in their studies where they conveyed on the factors effecting the participation in recreational activities of the students in Abdullah Gül University, they indicated that they have found a difference in the way of preference between the age of 17-20 and 21 and aged over 21. We can explain this situation by stating as the change of the interests associated with the age.

According to the results of T test applied on the gender variable of the students, while no significant difference has been found in cognitive, behavioral and in total scores, it has been observed that there is a significant difference only in cognitive area according to the gender factor on behalf of female students (p<0,05). In their study in which Asma and friends (4) Yüzüncü Yıl Uni. have carried out with the students staying in higher education student loans and dormitories institution, they have stated that they found a significant difference on behalf of females. Serçek and Serçek (19) in their study in which they searched the relation between the university students' participation in recreational activities and their socialization, they have found there is a significant difference on behalf of females. Demir and Demir, Altergoot and Mccreddy and Moccia have stated that one of the most important factor in individuals' participation in free time activities is the gender (3,8,15). İn the study which they conveyed on the university students in Ankara has found that the females have participated in the activities less (5). The information in literature supports our results.

Çelik (7) in his master's thesis called "Observation of the Students' Attitudes in Ankara Police College Towards Recreational Activities" has researched the attitudes of the students in Ankara Police College towards free time activities. In this study, the researcher has suggested that they the students in Ankara Police College have an active recreational life. When the results regarding recreation have been examined according to the faculties that the students belong to, a significant difference has been observed in all sub scales and in total (p<0.05). And in Tukey multiple comparison test, a significant difference has been found in cognitive, affective areas and in total between faculty of Humanities and Letters and Vocational School, in affective area between Vocational School and School of Physical Education and Sport, and in behavioral area and in total between School of Physical Education and Sport and both faculty of Economics and School of Physical Education and Sport. When the total differences have been observed, it has been figured out that the students studying in School of Physical Education and Sport have the highest average points. Kılıç and Şener (14) in their study in which they researched the sociologic factors and structural restrictions in the university students' participations in recreational activities, they have stated that there is no much significant difference between the recreational activities according to the faculty/higher school variable except School of Physical Education and Sport. Asma and friends (4) have indicated that they found a statistical difference between the recreational preferences of the faculties in which they are studying and the students in School of Physical Education and Sport prefer doing sports. Akyüz (2) in his study in which they carried out on the students from 7 different faculty/higher school in Bartın University, has stated that the score of School

of Health Occupation is the highest one with 144.235 points, Faculty of Educational Science as the second highest with 144.235 points and School of Physical Education and Sport as the third highest one in total average score with 140.219 points. According to that, having higher average points of School of Physical Education and Sport points out that they have more positive attitudes towards recreation. With the reason of that sport is a social activity, it can be said that sport makes the students studying at school of physical education and sport advantageous in leisure time activities compared to the students from other departments.

Although level of income of half of the students is less than 500 TL, no statistical difference has been found. We can explain this situation with the fact that the number of the activity in city center and university campus that students cannot afford is few. Kaya (12) has observed the students' preferences towards recreational activities in his master's thesis called "Observation of the University Students' Atitudes Towards Recreational Activities and Their Leisure Time Motivation According to Some Variables". In this study, sample group consists of 2000 people. Kaya (12) in this study has determined that the university students' level of income are low and the opportunities and facilities in the university campus are not enough for the recreational activities.

The students have stated for their free times as 12,6% Strongly Inadequate, 17,2% Inadequate, 34,3% Normal, 24,5% Adequate, and 11,4% Strongly Adequate. We can say that the students have enough free time. According to the result of one-way variance analysis, the significant difference has been found in all sub dimensions and in total. And when looking at the average points, it has been seen that as the participants' time for recreation increases, their average points are getting higher. According to this, we can conclude that the duration of recreation effects the attitudes towards leisure time activities.

The students have stated for the effect of recreation on their success as 77,4% Increase Success, 10,6% Decrease Success and 12% no effect. However, in the Pearson Correlation Analysis applied for the academic average points that the students have, even if having a positive effect in a low matter has parallelism with the students' remarks, it does not predicate significance statistically.

The students have remarked about how they spend their free times as 51,5% by resting, 15,3% by attending sport activities, 18,4% by attending social activities, 4,4% by attending cultural activities, 6,1% by attending artistic activities and 4,4% by attending touristic activities. In the light of these findings, it is seen that the university students generally spend rest of their time by resting. While there is a high possibility to choose with an idea of that sportive and social activities would be more fun; it can be said that cultural and artistic activities are rare and especially the touristic activities are preferred less because they can be unaffordable.

The students have answered for the opportunities that the university offer them as 29,3% Strongly Inadequate, 23,5 % Inadequate, 34,4% Normal, 9,6% Adequate, 3,2% Strongly Adequate. According to this conclusion, it is thought that the initiatives of the senior staffs in Ardahan University to increase the recreational opportunities of the university can be for the benefit of the students.

## CONCLUSION & RECOMMENDATIONS

It has been seen that female and male students in Ardahan University have similar attitudes in terms of the gender factor regarding recreation. The difference has been found only in cognitive area. Accordingly, it can be said that female students compared to males are more social and positive in decision making regarding recreation.

When the differences in recreation according to the students' departments have been examined, it can be seen that the students studying in the School of Physical Education and Sport and Faculty of Engineering have spent their free time better and have higher average scores in the scales. It has been seen that the students studying in Faculty of Economics and Vocational School have the lowest average points.

Although the differences in recreation according to the students' level of incomes have been considered as insignificant, it can be seen that the students with a higher level of incomes have higher average points. It shows that the students having low income level involve in recreational activities less.

It has been seen that the academic average points have no effect on socialization and recreation. Nevertheless, the students think that recreational activities have a positive effect on success.

Even though recreation time that the students take is enough, it has been considered that 51,5% of

the participants by resting, %15,3 by attending sport activities, 18,4% by attending social activities, 4,4% by attending cultural activities, 6,1% by attending artistic activities and 4,4% by attending touristic activities have spent their free time.

The students think about the opportunities that the university offer them considering 29,3% of them Strongly Inadequate, 23,5% Inadequate, 34,4% Normal, 9,% Adequate, and 3,2% Strongly Adequate. It has been identified that university students have requested from the authorities of the university to have conditions that they can perform social, cultural, artistic, sportive and healthy life activities to value their free time well.

• The number of the orientation meetings can be increased for the university freshmen to get used to the environment and school faster.

• It can be provided for the students to socialize by promoting to create student clubs related to their interest.

• While considering that the level of income has a positive effect on the socialization, it will be appropriate to plan activities being carried out by the university to be free or suitable to each student's level of income.

• The extra working dolmush (couch) lines or getting a special access by the university will be beneficial to have more participants in the activities performed within the university.

• Besides being host in the events organized by the university, having an encouraging side will make the number of the activities increase.

• Forming the activities with the suggestions of the student clubs and the university's support these financially at a minimum will be profit.

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# Investigating the effect of testosterone supplement on heart and muscle damage in rats applied with swimming exercise

Ömer KULAKSIZ, Sefa LÖK[1]

[1]*Selcuk Universty, Faculty of Sport Science, Konya, Turkey*
*Address Correspondence to S, Lok, e-mail: sefalok@selcuk.edu.tr*

**Abstract**

Anabolic Androgenic Steroids which are a synthetic derivative of testosterone are known to be used by some sportsmen in order to improve performance. The present study was conducted to investigate the effect of testosterone supplement on heart and muscle damage in rats applied with swimming exercise. The study was conducted on 30 day-old 27 (Wistar, male) rats that were supplied from "Selçuk University Experimental Medicine Research and Application Center". The rats were divided into 4 groups. The rats in control groups (n:6) were fed during the study without doing any application. The rats in testosteronegroup (n:7) were supplied with a 10 mg/kg dose of testosterone 5 days a week for 3 weeks. The rats in exercise group (n:7) did freestyle swimming exercise for 30 minutes a day for 5 days a weekfor 3 weeks. The rats in testosterone + exercise group (n:7) did freestyle swimming exercise for 30 minutes and were administered with 10 mg/kg dose of testosterone supplement for 5 days a week for 3 weeks. At the end of the trial, necessary biochemical parameters were measured in serums obtained by drawing blood from tails of the rats. While levels of Serum, LDH, CK-MB, and CKwere studied by using an autoanalyzer, Troponin I level was analyzed by using ELISA kit. SPSS 15.0 packaged software was usedin statistical evaluation of the data and the results were given as mean±SE. Since the data were convenient with the normal distribution, ANOVA test was applied for betweengroups comparison and Duncan test was used to identify from which group the difference was resulted. When between-groups values of troponin I, ck-MB, and LDH, which are indicators of heart damage, and enzyme CK, which is an indicator of muscle damage,for control, exercise, testosterone, and testosterone+exercise groups were compared, a statistically significant difference was determined between control, exercise, testosterone, and testosterone+exercise groups ($p<0.05$). As a result of statistically analysis performed on all groups, the difference was found to be caused by testosterone and testosterone+exercise groups. Because testosterone production is naturally increased in the body during the exercise, swimming exercise and testosterone administration led to significant occurrence of troponin I, ck-MB, LDH, which are heart damage indicators in rats, and CK value, which is an indicator of muscle damage, in the blood.

**Keywords:**, Heart, Muscle Damage, Swimming Exercise, Testosterone

## INTRODUCTION

AASs have been used by athletes for many years to increase strength, speed and durability. Although its effect seems to be positive at first, it is known that it has many physiological effects in human body (4). Because of the great effect on the body's muscle structure, testosterone is used to increase muscle performance in athletes (testosterone or synthetic androgen instead of testosterone) (6,7). Because AASs provide hypertrophy (10,11) to increase muscle mass by athletes because of its provision of hypertrophy (16), it is physically good in young people that the recovery period is fast (2,3,15,16).

It has profound effects on the human body of the hormones secreted by the endocrine system. Therefore, it is known that any change in the endocrine system may affect the blood level and also affect human metabolism (32).

The hormone that determines gender-specific attitudes and behaviors in humans, especially in men, is testosterone. Testosterone is a hormone that easily passes the blood brain barrier with a steroid structure produced by cholesterol (1). Testosterone is more present in the body than other androgenic hormones. However, most testosterone is converted to dihydrotestosterone, which is more active in target tissues (21). Testosterone and dihydrotestosterone are all steroid compounds. Testosterone is the hormone, which is generally responsible for the formation of a distinct male sex character of the human body. In the life of the fetal

life, the testes are stimulated with the presence of the gingival gonadropins in the placenta and secrete moderate testosterone. This hormone is present in the body during the fetal development period and even 10 or more weeks after birth. Therefore, testosterone is not produced until the age of 10-13 years. Then, testosterone production increases rapidly with the stimulation of anterior pituitary gonadotropic hormones during puberty (29).

When side effects of AAS were examined, it was stated that it causes sudden heart attack in the cardiovascular system, cerebrovascular diseases in the brain and nervous system, disrupting the function of the liver, causing hepatitis, increasing the risk of cancer and in the blood LDL and HDL (17). Another side effects of AAS are gender. Long-term use of steroids causes women to exhibit masculine behavior, excessive hair formation in certain regions, thickening of the vocal cords, deformity of the breasts, irregularity in the period and hair loss. In males, it is known that testosterone level may cause decrease in sperm quality and number and abnormal reduction in testes (33). In addition, it can affect the formation of pregnancy by increasing the internal structure of the uterus in the womb and causing an abnormal expansion of the testosterone intake (8).

The aim of this study was to investigate the effect of testosterone supplementation on heart and muscle damage in swimming rats.

## MATERIALS & METHODS

The study was performed on 27 rats (Wistar, male), 30 days from Selcuk University Experimental Medicine Research and Application Center. The study was approved by the Ethics Committee of the Center for Experimental Research and Application at Selcuk University (number of decisions: 2016-29). Rats were fed and housed in the experimental animal unit, plastic rat cages, 23 ± 2 $^{o}$C at room temperature, 50 ± 10% humid environment, 12/12 day / night light period, ad-libitum. The rats were provided with daily fresh water (~ 50 ml / day / rat) that they could drink at any time. Animals were divided into 4 groups as follows.

1. Group: C (Control group, n: 6), Standard rat feed and drinking water ad libitum were given during the study period.

2. Group T (Testosterone group, n: 7), Standard rat feed and drinking water ad libitum were given during the study period. Testosterone (sustanon) was administered at a dose of 10 mg / kg / rat diluted 100 ml in peanut oil and administered intraperitoneally for 5 days and 3 weeks.

3. Group: E (Exercise group, n: 7), Standard rat feeding and drinking water ad libitum were given during the study period. The rats in this group were given swimming training for 3 weeks and 5 days a week for 30 minutes.

4. Group: TE (Testosterone + Exercise group, n: 7), Standard rat feed and drinking water ad libitum were given during the study period. Testosterone (sustanon) was administered to this group by intraperitoneal injection at a dose of 10 mg / kg for 5 days per week and was included in the exercise program 1 hour before the start of the exercise.

The rats in all groups, including the control group, were weighed by weighing with a precision scale (Ohaus CS 200 Compact scala, Mexico) once a week for the duration of the experiment and before the experiment, and the mean weight was measured weekly. The required dose adjustment was carried out weekly in terms of the live weight of the rats belonging to testosterone treated groups.

Exercise Program: Swimming exercises were performed in swimming pool for 3 weeks, 5 days 30 min. The water tank was filled with water with a temperature of 25 $^{0}$C and rested for 1 hour and the water temperature was 22-25 $^{0}$C. For adaptation to water at the start of exercise, the rats were kept free in water for 10 minutes and then a swimming exercise program was applied. At the end of the exercise time, the rats were removed from the water tank and dried with a towel.

Measurements and Analysis: At the end of the experiment, the necessary biochemical parameters were obtained from the sera of the rats. Serum, LDH, CK-MB, CK levels were determined in autoanalyser (Ilab 300 Plus, Milan, Italy) and Troponin I levels were determined by ELIZA kit.

Statistical Analysis: Statistical data were analyzed using SPSS 15.0 (SPSS 15.0 for Windows / SPSS® Inc., Chicago, USA). ANOVA and Duncan test were used to compare data between groups.

## RESULTS

Table 1. The levels of control (c), exercise (E), testosterone (T) and testosterone + exercise (TE) were compared with blood troponin I, creatinine kinase (ck), ck-MB and LDH values. (Mean ± SE)

| Groups | Troponin I (ng/mL) | ck-MB (ng/mL) | LDH (mg/dL) | Creatine Kinase (ck) (U/L) |
|---|---|---|---|---|
| **Control** | 13.25±6.71$^{b}$ | 342.68±105.46$^{c}$ | 277.16±76.28$^{bc}$ | 266.50±40.61$^{b}$ |
| **Exercise** | 10.88±1.53$^{b}$ | 280.33±32.36$^{c}$ | 170.33±40.56$^{c}$ | 184.50±18.98$^{b}$ |
| **Testosterone** | 16.17±2.64$^{b}$ | 616.66±105.59$^{b}$ | 648.16±132.70$^{b}$ | 401.33±102.15$^{ab}$ |
| **Tes+Exercise** | 34.32±7.50$^{a}$ | 954.16±45.03$^{a}$ | 1078.16±198.60$^{a}$ | 590.33±115.02$^{a}$ |

Different letters in the same column (a, b, c) are statistically significant (Duncan test, $p < 0.05$).

When C,E, T and TE groups were compared between the groups. the values of troponin I protein were determined as C (13.25 ± 6.71 ng/mL), E (10.88 ± 1.53 ng/mL), T (16.17 ± 2. 64 ng/mL) and TE (34.32 ± 7.50 ng/mL) were found to be statistically significant differences ($p < 0.05$). Post hoc test was used to determine which group the difference was caused and it was seen that the difference was caused by TE group.

When the values of C, E, T and TE groups of creatine kinase-MB (ck-MB) were compared in the determination of heart injury. C (342.68 ± 105.46 ng/mL), E (170.33 ± 40.56 ng/mL), T ( 616.66 ± 105.59 ng/mL) and TE (954.16 ± 45.03 ng/mL) groups were found to be statistically significant ($p < 0.05$). Post hoc test was used to determine which groups caused the difference and it was seen that the difference was caused by T and TE groups.

When we compared the values of C, E, T and TE groups of LDH enzyme in determination of heart damage. C (277.16 ± 76.28 mg/dL), E (170.33 ± 40.56 mg/dL), T (648.16 ± 132.70 mg/dL) and TE (1078.16 ± 198.60 mg/dL) were found to be statistically significant differences ($p < 0.05$). Post hoc test was used to determine which groups caused the difference and it was seen that the difference was caused by T and TE groups.

When the values of C. E. T and TE groups were compared between C, E, T and TE groups. C (266.50 ± 40.61 U/L), E (184.50 ± 18.98 U/L), T (648.16 ± 132.70 U/L) and TE (401.33 ± 102.15 U/L) groups were found to be statistically significant differences ($p < 0.05$). Post hoc test was used to determine which groups caused the difference and it was seen that the difference was caused by T and TE groups.

## DISCUSSION

Anabolic androgenic steroids have many side effects in both young and adults (22). Nandrolone Decanoate application of the effects of the application of Nandrolone Decanoate on the heart muscle was investigated in rats. It was reported that the use of Nandrolone Decanoate had negative effects on the heart muscle and could negatively affect the benefits of exercise (14).

Troponin I protein is an important protein in the determination of heart damage in the body (5). During exercise, the body naturally increases testosterone production. In some studies, uncontrolled exercise can also reduce testosterone production. Exercises that are appropriate and specific at the rhythm can provide better production and functioning of the testosterone hormone secreted by the body. On the contrary, it is stated that overdose cardio exercise may decrease the testosterone level (12,18). When testosterone supplementation is taken with the level of tetstosterone increased by exercise, it causes more harm than good in the body (16). The most important of these is the Troponin I protein, which has a high blood value in heart failure (25). In the study, which investigated the effects of AAS use on swimming-exercised rats, it was reported that the use of AAS impaired cardiac hypertrophy and adversely affected the benefits of aerobic exercise (26).

The creatine kinase-MB (CK-MB) enzyme is an enzyme found in skeletal muscle, brain, heart and other organs in the human body (9). When CK-MB enzyme rises in the blood, it can cause heart attack. The enzyme used as a marker of heart damage is secreted from the damaged cell and then mixed with the blood to increase the level of CK-MB in the blood. (27). Exercise can automatically increase the CK-MB level in the blood. Therefore, careful planning of exercise programs is necessary. When testosterone is supplemented with exercise, the CK-MB level rises rapidly in the blood in a short time (34). In the present study, CK-MB enzyme was higher in Tve TE groups than the other groups. In addition, the value of the enzyme was measured at the highest level in the group where the swimming exercise and testosterone supplement were

administered. CK-MB enzyme can be a significant marker of heart damage when taken with exercise and testosterone supplementation similar to the effect of Troponin I protein.

Another important marker of heart damage is the LDH enzyme. LDH is an enzyme necessary for use in the production of energy normally used. It is found in all the body cells. In case of any damage, the level of the blood rises rapidly (20). Troponin I, CK-MB and LDH enzymes should be considered together to determine heart damage (3). During heart attack, LDH enzyme increases in blood. In severe and compelling exercises, it may cause elevated levels of LDH in the blood (34). In the present study, the LDH enzyme in the T and TE groups given testosterone was higher in blood than E and K groups. The highest number of heart damage occurred in the TE group, who received both testosterone and swimming exercises. From this finding of the study, it can be concluded that the testosterone hormone is more harmful to the body when used with exercise. Taşgın et al (30) in their study of testosterone and nandrolone combined with the increase in LDH level and the difference was reported to be statistically significant.

Muscle damage markers as blood viewed creatine kinase (CK) enzyme derived from creatine is necessary for muscle contraction and body is an enzyme used to produce energy quickly (Kanda et al 2013). In the event of any damage, muscle cells may cause CK to be mixed. Elevated CK levels may be a marker of muscle damage (3). A high level of CK in the blood may be a sign of muscle damage. A person exercising regularly may experience less muscle damage than a person starting a new exercise. While severe exercises lead to significant increases in CK level, the increase in lighter exercises is not so much (19). In the present study, testosterone given T and TE groups showed higher levels of CK enzyme in the blood than exercise and control groups. The highest muscle damage was seen in the TE group, who received both testosterone and swimming exercises. From this finding of the study, it can be concluded that the testosterone hormone is more harmful to the body when used with exercise. In the study of Taşgın et al (30), testosterone and nandrolone were reported to be elevated in CK level and the difference was statistically significant.

## CONCLUSIONS

In the study conducted to investigate the effect of testosterone supplementation on heart and muscle damage in swimming rats. It is seen that young people tend to use banned substances in order to improve their physical appearance and to gain more performance in competitions by increasing their muscle mass and strength. In general, when the use of prohibited substances raises many problems in the organism and all the negative results of this study are taken into consideration; It can be said that it causes mainly heart and muscle damage in the body and these results can make a significant contribution to the awareness of athletes.

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# Researching of university students sport consumption

Mahmut ELMAS [1] Velittin BALCI

[1]*Ankara University, Faculty of Sport Sciences, Ankara, Turkey*
*Address Correspondence to M. Elmas, e-mail: mahmutelmas06@gmail.com*

**Abstract**

The study determines the rank of consuming sport and sporting goods behavior of university students and presents ideas to develop this behaviour. Sport marketing and sport consuming litarature has been scanned in content of the research. The research has been applied by using a scale developed by Elmas et al. (8) which consist three dimensions as event consuming, media consuming and sporting goods consuming. After verifiying the scales reliabilitys and validity, normal distrubituon checked and one sample t-test for bileteral variables, one way anova test for multi variables applied. The study's scale has been applied by using random expample medhod on sophomore and further class students of university students in Ankara/Turkey to collect data. University students sport consuming status according to their demographic values are reported at end of the research. The scale has two parts, demographic informations as a first and sport consuming scale as second part. SPSS 20 has used to evaluate to collected data. It seems that male students consumes more sport than female students end of the research. Moreover according to results, while younger students attends sport related events more than older ones, students consumes more sporting goods who has middle income than high or low ones. Students who does any kind of sport or follows it consumes more sport in all three dimentions.

**Key words:**Marketing mix, Service marketing, Sport consuming, Student and sport

## INTRODUCTION

There are a number of actions that we carry out in order to meet our basic needs and secondary needs such as drinking water, dressing, having fun and exercising. Consumption products sources can be ourselves, nature or other persons. According to İlter et al. (10) in the progress of reaching to end user to those products which are provided by 3rd persons, in convenient place and stuations and by authorized people, there is a trading movement which can be valued by money, product, service, idea or experience. Consuming is a series of inevitable actions that every living creature has to do in order to survive. Based on this, considering the fact that people will consume throughout their lifes and young people are the consumers of both today and tomorrow, canalizing their current consumption habits is important for both the healthy society and future sports market.

Sports is an important consumption and trading product human life for personal and social health. While sporting organizations contribute directly to the country's economy as job opportunities and production elements, they play an important role in the construction sector with their employees such as architects, engineers and workers in the construction fields where sporting events take place and also play an important role in both domestic and foreign tourism as a free time activity (16). In addition to being a consumption product on its own, sports has been massively used as a tool of propaganda, education and economic development of governments or organizations and still continues to be used. Words of Salazar who is former Prime Minister of Portuguese 'I have managed the country forty years of 3F (Fiesta, Fadima and Football)' (15), supports this sentence. Therefore, the consumption of sports combines many facts which are related to each other or not. Volleyball, The increasing interest in sports has brought along the economic growth of the sports sector. The sport product is combination of a physical product, a service product or combination of them to provide benefit to the sport spectators, to athletes or to the companies that generate income through sports (2). While an exercise hall itself and the equipment in it represent the sport products, the instructor's work in the hall exemplifies the dimension of the sport's service. Not

only sport related products but also other unrelated ones being marketed by using sports popularity. The sports industry is an important industry branch where companies can effectively promote their products and make brands their names (1).

structure Consumption choices of young people are in various ways such as food, clothing, communication, health, sports equipment, cosmetics and so on. Especially university students takes place in a large expenditure group by buying books, clothing and spending money on leisure time activities (7). With the help of these statistics, it is observed that university students are an age and status group suitable for sports in terms of self-desire, resources and time. According to Loudon et al. (11), the brand preferences accepted in the youth period significantly affect the brand preferences of these people in the future. Therefore, the current consumption behavior of the students may turn into habit, and even after the end of their student years, they can maintain their consumption status.In this context, investment in these age groups in sports marketing is an investment not only for today but also for the future market. As stated in the "Sport Consumption Scale" developed by Elmas at al. (8), sports consumption is examined in 3 sub-dimensions;

**1. Sporting Goods Consumption**

Direct or indirectly related to sport (whether or not taken to participate in sport activity), the purchase of items such as balls, nets, jerseys, mascots, scarves and so on are covered by the consumption of sporting goods. Some of the sporting products offered by some of the major teams which their logo is printed on and credit cards with their names on, various virtual football games or virtual car races, a sneaker and a tennis racket are only a little part of sporting goods.

**2. Sports Media Consumption**

Following sport organizations on media because of stiations such as shortage of time, transportation problems, financial difficulties, has advantages to spectators who watches where the sport event take place. They can view replays from various angles and listen detailed comments (9). Not only on television and radio programs, but also on the internet, consumers can reach the goods or services they want 24/7 regardless of time and place. In particular, social media is increasing its popularity day by day in sports tracking because spectators can communicate with others while wathcing the event or later.

**3. Sports Events Consumption**

Professional-amateur persons who does sport or leisure time evaluators are considered as sports participants (2). Coaches, managers, statisticians, followers etc. who are currently taking part in the sports event are the subject of event consumption. So sports; In addition to being a professional or amateur activity area, it is a product of recreational activities in which leisure time is evaluated.

**MATERIAL & METHOD**

The research was conducted with a cross-sectional approach and a relational survey model. This study was carried out with the voluntary participation in the randomly selected students (students of the sports sciences faculty were not included in the study) in Gazi University and Ankara University. In the simple random sampling method, each element constituting the universe has the chance to enter the sample. Therefore, the value to be given to each element in calculations is the same (3). Once the unconditional surveys has not included a total of 703 survey questionnaires were proccessed by IBM SPSS 20 (Statistical Package for the Social Sciences) and has been the source of the content of the thesis. The minimum number of samples determined from total number of the students by the formula (3) and 0,05 error rate used for it purpose.

Table 1. Demographic values of applicants

| Variables | Group | Numbers | **Percentages** |
|---|---|---|---|
| Age | 20 or less | 229 | 32.6 |
| | between 21-25 | 390 | 55.5 |
| | 26 or more | 84 | 11.9 |
| Gender | Male | 339 | 48.2 |
| | Female | 364 | 51.8 |
| Income (Monthly) TL | 500 or less | 249 | 35.4 |
| | 501-1300 | 232 | 33.0 |
| | 1301-2000 | 101 | 14.4 |
| | 2001 or more | 121 | 17.2 |
| TOTAL | | 703 | 100 |

The sample of the study was consisted of 703 students which are 339 male and 364 female aged %32 twenty or less, %55,5 between twenty one and twenty five, %11,9 twenty six and more. 35,4 percent of them has 500 or less Turkish Liras per month income, 33 percent of them has 501-1300 TL, 14,4 percent of them has between 1301 and 2000 Turkish Liras income while 17,2 percent of them has more then 2001 Turkish liras per month.

The scale which is used in the research and developed by Elmas et al. (8) titled 'Sport Consuming Scale' consists two parts, 7 questions about demographic informations as first and 13 questions about sport consumption as second part. The items were formed according to the 5's Likert scale. The Cronbach Alpha test was used to measure the internal reliability of the data. According to Kayış (2006); the reliability of the scales Cronbach Alpha ($\alpha$) coefficient is interpreted as follows:

- $0,00 \leq a < 0,40$ is not reliable
- $0,40 \leq a < 0,60$ is low reliable
- $0,60 \leq a < 0,80$ is reliable
- $0,80 \leq a < 1,00$ is high reliable

Table 2. Sport Consuming Scale Reliabilty Test

| Dimension | Cronbach'a Alpha |
|---|---|
| Sporting Goods | .701 |
| Media | .772 |
| Events | .852 |
| General | ,885 |

According to Devellis (2003) in all dimensions, it was found to be consistent over 0.700, which is the acceptable value. Frequency, percentage, arithmetic mean and standard deviation values were used in the evaluation of demographic characteristics. Independent Sample T Test was used to test consumption differences according to gender and One Way ANOVA was used to find consumption differences between other multiple variables. The LSD Post Hoc test was used to determine the statistical differences between the groups.

## RESULTS

Table 3. Independent t-test wich shows sport consumption rates related to gender

| SUB DIMENTIONS | Gender | N | Ort. | Mean Difference | S | sd | t | P* |
|---|---|---|---|---|---|---|---|---|
| Sporting Goods | Female | 339 | 3.0639 | .20161 | .65547 | 701 | 2.904 | .004 |
| | Male | 364 | 3.2655 | | | | | |
| Media | Female | 339 | 2.8242 | .5143 | .51432 | 701 | 6.820 | .000 |
| | Male | 364 | 3.3385 | | | | | |
| Events | Female | 339 | 2.1231 | .48577 | .48577 | 701 | 6.315 | .000 |
| | Male | 364 | 2.6088 | | | | | |
| General | Female | 339 | 2.6704 | .40057 | .40057 | 701 | 6.804 | .000 |
| | Male | 364 | 3,0709 | | | | | |

T-test analysis results displayed on table 3 which measures if there are differences of sport consumption according to gender [t(701)= 2,904; p<,05] indicates that sporting goods consumption of university students doesnt have any differences. Mean differences of females (X=30639) less than males (X=3,2655) so seems that males consumes more sporting goods than females.

Media consumption rates according to relations between gender and following sports media as sub dimention analysed by t-test [t(701)= 6,820; p<,05] and found that there is no differences. As a result of mean differences females media consumption are (X=2,8242) less than male's ones (X=3,3385) so as a result males consumes more sports media than females.

Events consumption rates according to relations between gender and attending to sport events as sub dimention analysed by t-test [t(701)= 6,315; p<,05] and found that there are differences between them. As a result of mean differences, females consumes sport events less than (X=2,1231) males (X=2,6088).

In general according to t-test [t(701)= 6,804; p<,05] there is difference between gender and sport consumption in relation. Females consumes sport less than (X=2,6704) males (X=3,0709). So according to this results males consumes sports more than females in general.

Table 4. One way anova tests of sport consumptions according to age.

| SUB DIMENTIONS | Age | X | df | Sum of Squares | Mean of Squares | F | P* | Dif. (LSD) |
|---|---|---|---|---|---|---|---|---|
| Sporting Goods | (a) 20 or less | 3.1845 | 2 | .878 | .439 | .514 | .598 | |
| | (b) 21-25 | 3.1321 | 700 | 598.315 | .855 | | | |
| | (c) 26 or more | 3.2321 | 702 | 599.193 | | | | |
| Media | (a) 20 or less | 3.0622 | 2 | 2.374 | 1.187 | 1.122 | .326 | |
| | (b) 21-25 | 3.1096 | 700 | 740.525 | 1.058 | | | |
| | (c) 26 or more | 2.9256 | 702 | 742.899 | | | | |
| Events | (a) 20 or less | 2.4576 | 2 | 5.215 | 2.607 | 2.410 | .034 | **c<a** |
| | (b) 21-25 | 2.3374 | 700 | 757.345 | 1.082 | | | |
| | (c) 26 or more | 2.1762 | 702 | 762.560 | | | | |
| General | (a) 20 or less | 2.9015 | 2 | .950 | .475 | .736 | .480 | |
| | (b) 21-25 | 2.8597 | 700 | 451.953 | .646 | | | |
| | (c) 26 or more | 2.7780 | 702 | 452.953 | | | | |

*(p<0,05)

One way anova analysis results displayed on table 4 which measures if there are differences of sport consumption according to age [t(701)= 2,904; p<,05] indicates that sporting goods, sport media and general sport consumption of university students doesnt have any differences according to gender.

University students sportive events consumption according to age has differences as a result of one wa anova analysis [F(2,700)=2,410; p< 0,05]. LSD test has been appiled to find out the group which makes the difference and resulted as ages 20 or less consumes more sport ( = 2,4576) compared to ages 21 or over ( = 2,1762).

Table 5. One way anova to test monthly income's effect to sport consumption

| SUB DIMENTIONS | Income | X | df | Sum of Squares | Mean of Squares | F | P* | Diff. (LSD) |
|---|---|---|---|---|---|---|---|---|
| Sporting Goods | (a)500 or less | 3.0572 | 3<br>699<br>702 | 7.887<br>591.307<br>599.193 | 2.629<br>.846 | 3.108 | .026 | a.c<b |
| | (b) 501-1300 | 3.2802 | | | | | | |
| | (c)1301-2000 | 3.0520 | | | | | | |
| | (d)2001 or more | 3.2376 | | | | | | |
| Media | (a)500 or less | 2.9809 | 3<br>699<br>702 | 12.410<br>730.489<br>742.899 | 4.137<br>1.045 | 3.958 | .008 | a<b<br>b<c.d |
| | (b) 501-1300 | 3.2575 | | | | | | |
| | (c)1301-2000 | 2.9282 | | | | | | |
| | (d)2001 or more | 3.0248 | | | | | | |
| Events | (a)500 or less | 2.2530 | 3<br>699<br>702 | 7.657<br>754.903<br>762.560 | 2.552<br>1.080 | 2.363 | .026 | a<b |
| | (b) 501-1300 | 2.4647 | | | | | | |
| | (c)1301-2000 | 2.2515 | | | | | | |
| | (d)2001 or more | 2.4545 | | | | | | |
| General | (a)500 or less | 2.7637 | 3<br>699<br>702 | 8.512<br>444.391<br>452.903 | 2.837<br>.636 | 4.463 | .004 | a.c<b |
| | (b) 501-1300 | 3.0008 | | | | | | |
| | (c)1301-2000 | 2.7439 | | | | | | |
| | (d)2001 or more | 2.9056 | | | | | | |

*(p<0,05)

To find out sport consumption rates of university students according to their income levels, one-way analysis reported at Table 5. According to the income level of the university students, there was a significant difference between the means at the level of 0.05 (the distribution of the data was homogeneous) [F(3,699)=3,108; p< 0,05].

According to the results of the LSD test conducted to find the difference group. The consumption level of consuming sportive product ( = 3.0572) with students whose income level of 500 Turkish Liras or less is less than the income level of between 501-1300 Turkish Liras (= 3.2802). The income level of the students whose income level is between 1301-2000 Turkish Liras is lower in the sportive product consumption sub-dimension ( =3,0520) compared to the income level of 501-1300 Turkish Liras ( =3,2802).

There was a significant difference between the means at the level of 0.05 as a result of the one-way analysis to sports media consumption according to the income level of the university students [F(3,699)= 3,958; p< 0,05]. According to the results of the LSD test conducted to find the difference group. The level of consumption of consuming sport media between students with income of 500 Turkish Liras or less is lower than those with income level of 501-1300 Turkish Liras ( = 3,2575). The students who have income between 501 and 1300 Turkish Liras in the sub-dimension of consumption of sports media ( =3,2575) is lower than those with income of 1301-2000 Turkish Liras ( =2,9282). The income level of the students who have income between 501 and 1300 Turkish Liras in the sub-dimension of consumption of sports media ( = 3,2575) is less than the income level of 2001 or more Turkish Liras ( =3,0248). There was a significant difference between the means at the level of 0.05 as a result of the one-way analysis to sportive events consumption according to the income level of the university students [F(3,699)= 3,958; p< 0,05]. According to the results of the LSD test conducted to find the difference group. The level of consumption of sports activities in the sub dimension ( = 2,9809) of the sports activities of the students with income less than 500 Turkish Liras or less is less than the income level of 501-1300 Turkish Liras ( = 3,2575).

The income level of the students between 501 and 1300 Turkish Liras in general have higher sports consumption ( =2,7439) according to the income level of between 1301-2000 Turkish Liras ( =3,0008).

## DISCUSSION

According to Özbey and Güzel (13) in Turkey, despite the International Olympic Committee and the TMOK to encourage female to sport the initiative, compared to the many countries in the world's supporting the projects, the value given to

female sports and sportsmen in Turkey has not yet reached the desired level. The findings shown in Table 2 support this study.

In another study, 118 males and 164 females from the Faculty of Education of Mehmet Akif Ersoy University replied that 63% of males active in sports, while the rate of 30% in females and males devoted more time to sporting activities than girls (14). The reasons for the fact that the females consumed sport less than males may have limitations due to the socio-cultural structure. In their study Balcı and İlhan (4) found that female students had less active participation in activities than male students and less time in their activities.

According to the research conducted by the General Directorate on the Status and Problems of Women in 2000, the ratio of the females who follows sports programs were 5% . This is similar to the conclusion that the females mentioned in Table 3 consume less sports media than males. Considering that the females consumed less sport products as shown in the same chart, the fact that they consume less sports media of course, being parallel to this situation.

Considering the fact that university students ages are mostly close to each other (Table 1), the difference between the consumption of sporting media and sporting products does not show a significant difference compared to their age. In the literature search, we did not find any study examining the sports consumption differences of the students in the age range mentioned in the table. However, the ratio between the consumption of the two extremes, which are the two endpoints we take as demographic information who are 26 or more consumes less than that of the youth. Supporting our findings, Voigt (18) studied that depending on the increasing age results as decrease in the rate of doing sports. It can be said that the factors such as the dynamism of being younger, the responsibilities that take over the individuals as the age progresses and the lack of time may have been effective in looking at their age.

According to Mullin et al. (12), the target audience of sports promotions in the last century is the young people whish leads more number of young athletes. This situation supports the findings of our study. In addition, another study supporting our study was carried out by Tetik (17) and 56.2% of the members who attended the sports facilities were found to be 35 or less.

According to Cemalcılar (6), the income situation is an important factor affecting the consumption behavior of individuals. Our study is parallel to the explanation. However, Yalçın et al. (19) found that income level is not a significant factor in active sports consumption, it has resulted in the opposite of our findings and researches of Cemalcılar.

Bayraktar and Sunay's (5) study shows that time loss occurs because of so much human labor in Turkey's facilities. This reduces the income level of the employed people, requires additional work and eliminates the free time that should be reserved for sports. This study may be one of the reasons for the decrease in sport consumption in Table 4.

It is observed that university students are an age and status group suitable for sports in terms of self-desire, resources and time. According to Loudon et al. (11), the brand preferences accepted in the youth period significantly affect the brand preferences of these people in the future. Considering the directive effects of media on human sub-consciousness, it will be inevitable that people will increase their consumption in both sportive product and efficiency consumption sub-dimensions as sports media consumption rates increase. This is possible by using various social media channels as a more effective dissemination tool. As a new trend, sports dances, clothes, box openings, exercise movement sugestions, sports events can be created to provide significant increase in sports consumption.

It can be another research topic to examine whether the sporty products sold by a sporting provider are more or less consumed by people who are engaged in sports or who are not interested in sports, but who are more interested in the effects of such elements as comfort or fashion.

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# The relationship of wrist and shoulder joint isokinetic strength and service and spike velocity in elite female volleyball players

Hasan AKA [1], Cengiz AKARÇEŞME[2], Zait Burak AKTUĞ[3], Ali ZORLULAR[4], Nevin Aysel GÜZEL[4], Tamer SÖKMEN[2]

[1] *Gazi University, Institute of Health Sciences, Ankara, Turkey*
[2] *Gazi University, Faculty of Sports Sciences, Ankara, Turkey*
[3] *School of Physical Education and Sports, Niğde Ömer Halisdemir University, Niğde, Turkey*
[4] *Gazi University, Faculty of Health Sciences, Ankara, Turkey*
*Address Correspondence to Z BAktu, mail: zaitburak@gmail.com*

**Abstract**

The purpose of the study was to examine the relationship between isokinetic wrist and shoulder strength and service and spike velocity of the female volleyball players. Totally 34 female volleyball players participated into the study voluntarily. Wrist (60°s-1 and 90°s-1) and shoulder strength (60°s-1 and 180°s-1) of the volleyball players were determined with isokinetic dynamometer; and service and spike velocity was determined with radar device. Pearson Correlation Analysis was performed for determining the relationship between isokinetic wrist and shoulder strength and service and spike velocity of the volleyball players. As result of the statistical analysis, whereas no significant relationship was determined between wrist and shoulder isokinetic strength and service and spike velocities of the female volleyball players ($p<0,05$), positive significant relationship was found between wrist and shoulder isokinetic strengths ($p<0,05$). Considering these results, it was possible to mention that although service and spike velocities of the volleyball players were correlational with the upper extremity strength, only wrist or only shoulder strength did not increase the velocity of service and spike, and this appeared by the effect of all upper extremity and bodily muscles. Regarding this, it was considered that volleyball players should develop other variables (strengthening all upper extremity and bodily muscles, improving the technique of spiking, etc.) besides wrist and shoulder strength in order to improve their service and spike velocity.

**Key words:**Voleyball, spike speed, serve speed, wrist strenght, shoulder strenght, isokinetic strength

## INTRODUCTION

One of the recent common targets in all branches of sports is to increase performance levels of the athletes to the highest ranks and to sustain at this level. The volleyball with a long history has been in a permanent change and development. A high level volleyball player makes vigorous efforts to bring technical skills to an excellent level starting from early ages. Elite level players aim to maintain their technical skills and physical fitness parameters they have at a high level during the session.

In volleyball, strength is a remarkable physical fitness parameter during the trainings and matches. Assessing the muscular force of the players carefully is important in terms of the reasons such as both increasing their individual performances and eliminating the possible of injury. The tests performed with isokinetic systems are frequently used for assessing the different muscle groups, providing reliable and objective digital results, and measuring the performance of the players (1). The muscles contracted during the isokinetic assessment meet with a resistance equal to the strength applied throughout all movement depth. Accordingly, this provides the opportunity for a reliable measurement without the risk of muscle, tendon and ligament injuries keeping in physiological loading limits.

Upper extremity is heavily used in volleyball. Shoulder joint is the most complex joint of the body providing the connection of upper extremity to the body and shoulder's taking numerous positions. The complex motions of hand appear as result of the correct operating of the harmony between balanced muscular system of the hand and central nervous system (2).

Service throwing technique in volleyball is a fundamental technique that is recurrently used by all players except from libero during the matches and trainings. The first attack of the teams in volleyball is regarded as the service (3). And spike, in volleyball, is significantly relational with the matching performance of the teams and the instrument for taking the highest score during the match (4,5). Success of the spike technique depends upon velocity and direction of the ball (6).

Elite level players aim to use technical skills they have as the most efficiently during the trainings and matches. In volleyball, service and spike techniques are remarkable in terms of the attack force of the teams. It has been considered that upper extremity strength of the players should be improved besides other variables in order to increase the velocity of ball while implementing these techniques. It has been noticed that there are limited number of studies carried out on shoulder joint isokinetic strength and ball velocity in volleyball (7,8). However, there have been no studies in the literature investigating the wrist joint and service and spike velocities.

The purpose of this study was to investigate the relationship between service velocity and spike velocity that had a remarkable significance in performance of the players and teams in volleyball, and to make contributions for the literature, trainers and players.

## MATERIALS & METHODS

Into the study, 34 volunteer female volleyball players playing volleyball as licensed in Halk Bank female volleyball team and Halk Bank young female volleyball team as the members of 2017-2018 Vestel Venüs Sultans League participated. Demographical properties of the players were presented in Table 1. The players who had no injuries on wrist and shoulder joint within the last three months were included into the research. The tests were performed in off-days of the volleyball players, and the players were asked not to attend in any sportive activities 24 hours ago before the tests and the measurements for each player were performed at the same hours of the day. The approval for carrying out the research was taken from Gazi University Clinical Researches Ethical Committee.

### Isokinetic strength measurements

Isokinetic strength measurements of the players who participated into the study were asministered with Cybex Humac Norm branded isokinetic dynamometer by the experienced physiotherapists of Gazi University, Faculty of Health Sciences. Before starting to the tests, the volleyball players did stretching exercises for 4-5 minutes for wrist and shoulder joints and warm-up exercises at low tempo for 5 minutes optionally on cycle ergometer or treadmill. After the warm-up program, the participants were taken to the device of the measurement one by one, and the device was adjusted according to the individual anthropometric properties of the experimental subjects. The body of the participant to be measured was fastened to the seat with the bands from leg femur medium sections, and the measurement was administered for the shoulder joint on dominant side and wrist on dominant side. Two different test protocols were administered for the wrist joint of the players who participated into the research. Concentric isokinetic strength at 90°s-1 angular velocity and eccentric isokinetic strength at 60°s-1 angular velocity was analyzed in dominant wrist joint of the volleyball players. The measurements were performed on wrist flexor and extensor direction. The tests were administered in 3 trials and 5 repetitions. One-minute breaks were taken between the tests, and 30-second resting period was taken while passing to the real test after the trial repetitions. Moreover, visual feedback was also provided to the participants. The measurement device was adjusted according to the individual anthropometric properties of the experiments for shoulder joint isokinetic strength measurement. The dynamometer axis was adjusted according to the dominant-side shoulder diagonal pattern. The gravity correction was provided for the players, and maximal isokinetic strengths on diagonal pattern at concentric 60°s-1 and 180°s-1 angular velocities were recorded.

### Ball velocity measurements

Service and spike velocities of the players who participated into the study were measured

with pocket radar speed gun (USA) branded velocity measurement device. The velocity measurement device had ±1mph/sec sensitivity, and had radar property that could measure at 25/130 mph/sec. While administering the measurements, the players were asked to strike the ball with their maximum force in order to obtain the best results in service and spikes. Furthermore, the players were informed that the balls that did not fall into the playground would be included into the measurement, so that the anxiety towards throwing the ball out of the playground was tried to be revealed.

**Anthropometric measurements**

The height measurement was performed with standard steel stadiotmeter as barefoot with 0.1cm sensitivity; and the bodyweight was measured with Tanita Body Analysis System as barefoot having no metals on the body.

**Data Analysis**

The data obtained at the end of the research were analyzed using SPSS (Statistical Package for Social Sciences) for Windows 22,0 statistical software. For assessing the data, maximum value, minimum value, arithmetic average and standard deviation were used as the descriptive statistics. Pearson correlation test was performed for all variables in the research. In terms of the level of significance, the results at the level of $p<0,05$ were accepted to be significant, and the ones at the level of $p<0,05$ were regarded to be insignifant.

**RESULTS**

Table 1. Demographical and anthropometric properties of the players

| Physical properties | Mean | Sd |
|---|---|---|
| Age (year) | 19.76 | 4.76 |
| Height (cm) | 181,76 | 8.59 |
| Body weight (kg) | 67.70 | 9.13 |

Table 2. Wrist and shoulder joint isokinetic strength values of the female volleyball players

| | Wrist E. 60°s$^{-1}$ (BW%) | Wrist F. 60°s$^{-1}$ (BW%) | Wrist E. 90°s$^{-1}$ (BW%) | Wrist F. 90°s$^{-1}$ (BW%) | D. away 60°s$^{-1}$ (BW%) | D. toward 60°s$^{-1}$ (BW%) | D. away 180°s$^{-1}$ (BW%) | D. toward 180°s$^{-1}$ (BW%) |
|---|---|---|---|---|---|---|---|---|
| Mean | 28.55 | 38.89 | 11.40 | 18.90 | 83.97 | 109.38 | 73.29 | 94.80 |
| Sd | 8.84 | 11.43 | 4.27 | 5.74 | 31.69 | 26.72 | 21.57 | 28.10 |

E. E. = Eccentric Extension E. F. = Eccentric Flexion C. E. = Concentric Extension C. F. = Concentric Flexion D. Away = Diagonal away. D.Toward = Diagonal toward %BW = Mean Peak Torque.

Table 3. Service and spike velocity values of the volleyball players

| (mph/h) | Min | Max | Mean ± Sd |
|---|---|---|---|
| Dservice V | 30.00 | 50.00 | 42.14±4.25 |
| Dspike V | 31.00 | 50.00 | 43.58±4.07 |

Dservice V: Dominant service velocity Dspike V: Dominant spike velocity

Table 4. The values of relationship between service velocity and spike velocity of the female volleyball players

| Variables | | Wrist Conc. PTE | Wrist Conc. PTF | Wrist Ext. PTE | Wrist Ext. PTF | Shoulder 60°s$^{-1}$ PTA | Shoulder 60°s$^{-1}$ PTT | Shoulder 180°s$^{-1}$ PTA | Shoulder 180°s$^{-1}$ PTT |
|---|---|---|---|---|---|---|---|---|---|
| Service | r | .,154 | -.082 | -.063 | .050 | -.246 | -.105 | -.265 | -.041 |
| Velocity | p | .417 | .666 | .745 | .796 | .174 | .566 | .143 | .826 |
| Spike | r | -.321 | -.330 | -.089 | .012 | -.248 | .006 | -.262 | -.007 |
| Velocity | p | .084 | .075 | .644 | .953 | .171 | .975 | .148 | .971 |

$p<0.05$

No significant relationship value was determined between wrist concentric and eccentric isokinetic strengths and service and spike velocities of the female volleyball players (p<0,05). And a significant relationship value could not be determined between service and spike velocities and diagonal shoulder isokinetic strengths of the players (p<0,05).

Table 5. The values of relationship between wrist concentric isokinetic strength and shoulder joint isokinetic strength

| Variables | | Shoulder 60°s-1 PT Away | Shoulder 60°s-1 PT Toward | Shoulder 180°s-1 PT Away | Shoulder 180°s-1 PT Toward |
|---|---|---|---|---|---|
| Hand Conc. | r | .705** | .311 | .668** | .167 |
| PTE | p | .000 | .107 | .000 | .395 |
| Hand Conc. | r | .480** | .104 | .633 | .014 |
| PTF | p | .010 | .597 | .000 | .945 |
| p<0.05 | | | | | |

## DISCUSSION

In this research, no significant relationship was determined between wrist and shoulder muscles' isokinetic strength, separately, in female volleyball players and service and spike velocities. However, a positive significant relationship was found between wrist and shoulder muscles' isokinetic strengths.

When the relationship between service velocity and wrist isokinetic strength values of the high-level players was analyzed, no significant relationship (p<0,05) was determined between service velocity (90°s-1) concentric extension and flexion strength and eccentric extension and flexion strength (60°s-1). This result did not prove the hypothesis that a player with high wrist isokinetic strength could make a service faster. It was possible to mention as the reason for this that service velocity did not only arisen from the wrist joint but also from shoulder arc, body and lower extremity muscles.

When the relationship between service velocity and shoulder isokinetic strength values of the players was analyzed, no significant relationship was found between diagonal shoulder isokinetic strength at 60°s-1 angular velocity and diagonal shoulder isokinetic strength at 180°s-1 angular velocity (p<0,05). We considered that such a result could be arisen from several reasons. These could be listed as the diagonal pattern with which the isokinetic strengths of the players were measured, administering the measurements at a sitting position, and therefore limiting all other joint and muscular functions during the measurements. Due to the linking of the lower extremity and bodily muscles to the shoulder complex, more than 50% of the energy during the service and spike is produced by lower extremity ad bodily muscles. Therefore, considering all components of the kinetic chain is necessary for performing severe overhead activities successfully and returning to sports (9).

When the relationship between spike velocity and wrist isokinetic strength of the elite female volleyball players was analyzed, no significant relationship was determined between concentric (90°s-1) extension and flexion strength and eccentric (60°s-1) extension and flexion strength (p<0,05). When the literature was revised, no study was noticed on wrist joint isokinetic strength and ball velocity in volleyball. It was also noticed that the studies carried out on the wrist were generally related to the patients and post-operation implementations. For that reason, it was possible to mention that this research on wrist isokinetic strength and service and spike velocities would fill an important void in the literature and shed a light on subsequent studies to be carried out on this.

Some interesting results were noticed to be obtained in some studies investigating other factors apart from strength that affected the spike velocity. In one of these researches, Newell and Lauder (10) expressed that hand and wrist motion in spike was one of the important factors affecting the ball velocity. It was remarkable in this research that the factors that affected ball velocity during the spike were hand and wrist motions rather than the strength.

When the relationship between spike velocities and shoulder isokinetic strength of the players was analyzed, no statistically significant relationship was determined between diagonal shoulder isokinetic strength at 60°s-1 angular velocity and diagonal shoulder isokinetic strength at 180°s-1 angular

velocity (p<0,05). The primary target of the shoulder complex is the positioning of the hand loosely in daily living activities. In overhead sportive activities such as spike or service, the secondary function of the shoulder was to transfer the power of body and leg's big and strong muscles to the leg, forearm and hand muscles (11). Spike in volleyball not only actualized with the functioning of the muscles surrounding the shoulder but also with muscle-joint activation covering all upper extremity, body and lower extremity. Accordingly, its not being relational only with the shoulder joint could be explained with these reasons.

In their study with the football players, Forthomme et al (12) could not find a significant relationship between concentric dominant shoulder internal rotation isokinetic strength and spike velocity at 240°s-1 and 400°s-1 angular velocities as a fact proving our result. However, they also indicated a significant relationship between dominant shoulder internal rotation concentric isokinetic strength and spike velocity at 60°s-1 angular velocity in the same study. In another study, Valades et al (13) investigated the relationship between ball velocity, anthropometric properties and strengths of the volleyball players during a session. The results obtained at the end of this research supported the results of our study; it was determined that although there was increase at strength in the players, this increase could not reflect the velocity of throwing the ball. While measuring the strength with isokinetic dynamometer, the angular velocity could mostly be measured up to 500 degrees (14). However, in his study, Baudin (15) mentioned that dominant leg angular velocity was found to be 975.99±155.78°s-1 as average during the spike.

There was a positive relationship (p<0,05) between wrist (90°s-1) concentric isokinetic strength extension and flexion values and shoulder isokinetic strength (60°s-1 and 180°s-1) on diagonal away direction in elite female volleyball players. Positive significant values were obtained at different angular velocities and directions between wrist and shoulder isokinetic strengths of the players; so that it was noticed that a player with high wrist isokinetic strength value had similarly high shoulder isokinetic strength value. In branch of volleyball, a strong upper extremity has a key role in success. The increase at the strength of elbow and wrist muscles has been expected when the strength appears in shoulder muscles as result of the strength trainings. The positive relationships determined in this research indicated this fact. In reference to this result, strong proximal structures in players could be considered as providing a basis for the strength of distal segments.

The strength as one of the important components of sportive performance has been implemented commonly in training programs by the trainers due to different reasons such as improving the performance quality of the player and decreasing the possible sports injuries. It was possible to mention that the trainers in volleyball should consider the other factors affecting these techniques instead of focusing only on strength trainings for improving the service and spike velocities of the players. In fact, it was concluded in some studies in the literature that the factors such as missing technical components, anxiety, motivation, and sports age affected the ball velocity (16,17). Jones and Hardly (18) argued that sportive performance did not only depend on physiologic and biomechanic factors such as technique but also depended on the psychological factors. In another study, it was concluded that increase at ball velocity appeared as result of the increase at movement in upper extremity depending upon the increase in pelvis, body and shoulder rotation in arm grip and acceleration stages (19).

Considering these results, it was recommended that not only wrist and shoulder muscles should be focused in order to improve the spike and service velocity performances of the female volleyball players, but also all other factors possible to affect the performance should be regarded.

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