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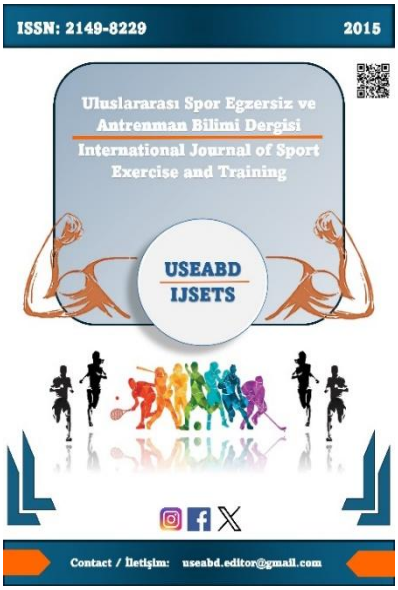

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The Effects of Six Weeks of Core Training on Service Speed and Certain Motor Characteristics in Tennis Players

Serkan KIZILCA[1], Sedat OKUT[2]

Abstract

Aim: This study was conducted to determine the effects of six weeks of core training on service speed, vertical jump, 5m,10m, and 20m sprint speeds in young tennis players.

Method: A total of 20 tennis players aged 13-15 years, 10 male and 10 female, voluntarily participated in the study, which employed a pre-test/post-test experimental model with no control group. In addition to the routine tennis training, the participating athletes engaged in core training three days per week for six weeks. Measurements and tests were made to determine the service speed and certain biomotor characteristics of the athletes before and after the training. Statistical analyses of the data were performed using the SPSS program.

Results: The paired samples t-test was used for normally distributed data. According to the study findings, the post-test values were higher for the service speed and vertical jump tests of the young tennis players than the pre-test values ($p<.05$). For the 5m, 10m, and 20m speed tests, the post-test values were significantly lower compared to the pre-test values ($p<.05$).

Conclusion: As a result, the six-week core training program carried out by the young tennis players was found to improve service speed along with motor characteristics pertaining to jumping and speed. Therefore, core training programs may be recommended for improving overall sports performance as they yielded increased service speed in young tennis players within a very brief period of just six weeks.

Key words: *Biomotor Characteristics, Core Training, Service Speed, Tennis.*

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INTRODUCTION

Nowadays, racquet sports can be enjoyed by almost anyone, both as athletic and leisure activities. They can be learned and played comfortably and easily both indoors and outdoors, regardless of age or gender Arı and Çolakoğlu, 2021). Tennis, one of the most popular sports in the world, is played by over 75 million people (Pluim et al., 2007) and is a competitive sport that attracts millions of fans worldwide (Fernandez-Fernandez et al., 2013). In this sport, since there is no time limit, matches can last less than 1 hour or more than 5 hours (Kilit & Arslan, 2017). Tennis is a racquet sport that contributes to the health of players of all ages while also helping to manage anxiety and stress, improve coordination, support bone health, enhance cardiovascular functions, and strengthen mental and physical development (Groppel & Dinubile, 2009). In tennis, the serve can be considered the most important stroke technique, as it initiates the game, provides an advantage to the player, and is the only stroke unaffected by the opponent (Crespo & Miley, 2009). In tennis, serving the ball requires very complex coordination between the torso and lower extremities in order to strike it during the tossing and subsequent falling of the ball. The speed of the racket during contact in a successful service as well as the speed of the ball following contact are of critical importance (Başköy, 2018). The sport of tennis requires strength in the upper and lower extremities in addition to all-over physical strength (Joseph et al., 2005). The proportional strengths of the lower and upper extremities directly affect performance (Okut, 2023). Motor characteristics play a crucial role in tennis, as they do in other facets of life and all branches of sports. A successful tennis player skillfully combines components such as strength, speed, quickness, and flexibility (Clark, 2007). One of the important parameters in tennis is the serve. During the serve, force is transferred from the ground, starting from the ankle to the knees, then to the legs, followed by the hips, torso, shoulder, arm, wrist, and finally to the racket. In elite tennis players, part of their success is attributed to high accuracy and speed in powerful serves, known as power serves or flat serves (Girard et al., 2005).

The core region is comprised of different muscle groups, including the hips, waist, and abdomen, and encompasses the center of gravity of the human body (Samson, 2005). Core training has been shown to

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yield significant changes in strength, balance, and other performance factors (Myer et al., 2006). The successful execution of sports relies on the effective development of an athlete's physiological and biomotor characteristics. From a physiological perspective, factors such as endurance, cardiovascular health, muscle mass, muscle strength, and energy metabolism play a crucial role. Additionally, biomotor skills, including balance, flexibility, speed, agility, and coordination, significantly impact sports performance (Kızılca, 2023). Therefore, training programs are generally designed to focus on these physiological and biomotor attributes to enhance the overall performance of athletes. Training is comprised of activities carried out with the goal of improving athletic performance by fatiguing the body at specific time intervals, thus creating changes in the organism leading to more efficient movement. The total time allocated to training increases with greater intensity and frequency of training (Kahraman & Arslan, 2023). Tennis involves rapid changes in direction by making sudden decisions, allowing for maximal speed of movement. Tennis players must be in control of their whole body and maintain excellent physical fitness in order to achieve a high level of success. Regularly taking part in varied training programs aimed at improving physical, physiological, and biomotor characteristics has been found to positively affect the performance of tennis players (Türkay & Gökbel, 2020). Hence, lower extremity strength, power, speed, acceleration, and endurance represent critical elements for tennis players. The pace of play can be adjusted according to the age group of the players, allowing people of all ages to participate. In racquet sports, anaerobic energy systems are the most important parameter affecting the performance level, as striking the ball and player posture positions occur within the space of just a few moments (Orsolic et al., 2018).

Core training is mainly employed to improve balance, strength, and anatomical function flexibility. It positively affects muscles, while simultaneously improving neural adaptation and proprioceptive senses, and strengthening muscular recovery and body control (Hibbs et al., 2011). Due to the rapid changes in direction, acceleration, and rotations in tennis, core training supports the development of optimal strength in regard to sports performance (Eren, 2019). Sever et al. (2017) found that core training interventions had a positive effect on accurate service speed in young tennis players. When the current literature is examined, the effect of core training on strength, balance, and other performance factors has been studied in many different sports (Myer et al., 2006). Gür & Ersöz (2017) stated that core training applied to tennis players has a positive effect on body strength and stability in terms of sports performance. They also emphasized that training targeting the core muscles is an important factor that can affect physical fitness and mobility components on the court. This study will provide a new perspective to the literature, as it has been observed that the number of studies in the field of tennis is quite limited (Samson et al., 2007).

The objective of this study was to determine the effect of core training on certain performance parameters in tennis, a very popular sport requiring uptake at an early age to achieve success. Specifically, the impact of the core training program on service speeds, vertical jumping heights, and sprint speeds (for distances of 5m, 10m, and 20m), all of which greatly affect overall performance in tennis, was examined. Core training aims to strengthen the center of the body, enhancing balance and mobility. This study demonstrates how such training can improve the performance of players in a sport like tennis, which requires speed and agility. As a result, it can contribute to the technical and physical development of tennis players and provide the opportunity to optimize training programs. Additionally, it helps us understand how effective core training at an early age can be in increasing athletes' success in the long term. In this context, the study provides valuable insights for both athletes and coaches.

METHOD

Research model

This study was designed using an experimental model, a type of quantitative research method; specifically, a pre-test/post-test design without a control group was employed. In this design, the participants were tested, and measurements were taken in relation to the dependent variables prior to and following implementation of the experimental protocol (Büyüköztürk et al., 2012). In this study, the effect of six weeks of core training applied to tennis players in accordance with the study model on the serve speed of tennis players was examined.

Training Protokol: In addition to routine tennis training, the participating athletes completed core training exercises three days per week for a total of six weeks. Prior to and following the core training, measurements and tests were made of the athletes' service speeds and certain biomotor characteristics. The core training program performed by the athletes is presented in detail in Table 1.

Table 1. Core training program completed by the participating tennis players

Movement	Number of Sets (Weeks 1-2)	Number of Sets (Weeks 3-4)	Number of Sets (Weeks 5-6)	Duration	Rest Between Sets	Rest Between Movements
Plank	2	3	4	25 sec	30 sec	60 sec
Side Plank	2	3	4	25 sec	30 sec	60 sec
Crunch	2	3	4	25 sec	30 sec	60 sec
Reverse Crunch	2	3	4	25 sec	30 sec	60 sec
Superman	2	3	4	25 sec	30 sec	60 sec
Squat	2	3	4	25 sec	30 sec	60 sec

Population and sample

The research group consisted of a total of 20 active tennis players (10 male and 10 female) from the province of Muş, Turkey, aged 13-15 years, with at least one year of experience playing tennis.

Data collection tools

This study was carried out on a voluntary basis. The tennis players participating in the study were provided with general information regarding the study, including the purpose of the research, before proceeding with testing and measurements. Prior to the start of the study, the subjects read and signed voluntary consent forms. In addition, since the subjects were under the age of 18, parental consent forms were also obtained from the families of the subjects.

Personal Information Form: In our study, a questionnaire containing questions on gender, age, and years of tennis experience was used to collect demographic data on the participating athletes.

Vertical Jump Test: The participating tennis players' vertical jump performances were measured using the Fusion brand Smart Jump mat, which takes electronic measurements. After positioning themselves on the mat, the participants were asked to jump as high as they could with their hands on their waists as soon as they were ready. The athletes performed the jump and their heights were recorded upon landing back on the mat. The jump values of the participants were measured in cm and each athlete performed two jumps, with the best value being recorded (Atan, 2019).

5m, 10m, and 20m Speed Tests: The Fusion brand Smart Speed electronic measuring photocell device was placed at the start and end points of the distances to be run. The participants started the sprint 50 cm behind the starting point and the measurements were carried out using the photocell to record the times. Each participant was allowed two attempts and their best time was recorded (Özdemir, 2013).

Measurement of Ball Speed on Serve: To prevent weather conditions from affecting service speed, measurements were taken on an indoor tennis court. Prior to the training, the athletes were given sufficient time to warm up their muscles, thus minimizing the potential for injury. Following the warm-up, the participants waited for their pulse rates to return to their resting state before starting the test. Each participant performed five serves and the best values were recorded. A radar (Sports Radar, Power Madd) device was used to measure the speed of the tennis ball. The radar was placed in the center (net) line service reception area during measurement. Serves were made in accordance with official tennis rules; only balls landing within the service box on the opposite side of the court were considered valid, and the speed of balls that hit the net was not recorded. For actual data analysis, only the fastest of the five serves performed by each athlete, with maximum power at maximum speed (km/h), was recorded (Kaya et al., 2020).

Data analysis

The SPSS (Statistical Package for the Social Sciences) program version 26.0 was employed in the statistical analysis of the data obtained in the study. The normality of the data was established using the Shapiro-Wilk test (Shapiro & Wilk, 1965). According to the normality test findings, it was determined that the data had a normal distribution ($p > .05$). In analyzing the data, the paired samples t-test was

performed to determine the differences between pre-test and post-test values. A value of $p < .05$ was accepted as statistically significant.

RESULTS

Data pertaining to the demographic characteristics of the participating tennis players are presented in Table 2. The results of the statistical analyses on service speed, sprint speed, and vertical jump performance are shown in Tables 3, 4, and 5, respectively.

Table 2. Demographic characteristics of the athletes participating in the study

Variable	Group	n	%
Gender	Male	10	50.0
	Female	10	50.0
Age	13 Years	6	30.0
	14 Years	8	40.0
	15 Years	6	30.0
Number of years playing tennis	1 year	5	25.0
	2 years	9	45.0
	3 years	6	30.0
Total		20	100

As seen in Table 2, there were equal numbers of male and female participants. With regard to age, 40% were 14 years old, 30.0% were 13 and the other 30.0% were 15. A total of nine participants (45.0%) had been playing tennis for two years, 30.0% for three years, and 25.0% had been playing for only one year.

Table 3. Comparison of the participants' pre-test and post-test service speeds

Parameter	n	Tests	$\bar{X}$	S.D.	t	p
Speed of Serve	20	Pre-Test	86.80	6.39	-.518	.000*
		Post-Test	88.30	6.57		

**p<.05*

According to the results given in Table 3, a comparison of the pre-test and post-test service speeds of the athletes participating in the study revealed a significant difference in favor of the post-test values (p<.05).

Table 4. Comparison of the participants' pre-test and post-test 5m, 10m and 20m sprint speeds

Parameter	n	Test	$\bar{X}$	S.D.	t	p
5 m Speed	20	Pre-Test	1.32	.18	1.951	.018*
		Post-Test	1.17	.15		
10 m Speed	20	Pre-Test	2.13	.13	2.266	.035*
		Post-Test	2.09	.11		
20 m Speed	20	Pre-Test	4.14	.37	3.890	.018*
		Post-Test	4.04	.30		

**p<.05*

According to Table 4, a comparison of the pre-test and post-test sprint speeds in the 5m, 10m, and 20m distances showed significant differences in favor of the post-test results (p<.05).

Table 5. Comparison of the participants' pre-test and post-test vertical jump heights

Parameter	t	Test	$\bar{X}$	S.D.	t	p
Vertical Jump	20	Pre-Test	37.14	.43	-4.520	.001*
		Post-Test	39.04	.40		

**p<.05*

Based on the data presented in Table 5 comparing pre-test and post-test vertical jump heights, a significant difference was observed in favor of the latter (p<.05).

DISCUSSION

The present study sought to determine the effects of a six-week program of core training on service speed and certain motor characteristics in tennis players. A review of the literature discovered studies in which athletes in numerous branches of sport, including tennis, engaged in core training. In our study, the six-week core training was found to have increased vertical jump performance. Ütünbaş et al. (2023) found improvements in vertical jump values as a result of the 6-week core exercises applied to young

football players. Arslan & Ergin (2022) examined the effects of an 8-week core training program on agility, strength performance, and tennis skills in tennis players aged 10-14. As a result of the study, improvements were found in jump skills and tennis skills. In their study, Fernandez et al. (2013) applied a 6-week core strength exercise program to 13-year-old tennis players and found improvements in the players' serve speed at the end of the study. Sannicandro et al. (2020) observed significant differences in the jump heights of 42 young basketball players after four weeks of core training. In their study, Aslan & Kahraman (2023) reported that a six-week core training program improved the vertical jump performances of star soccer players. In a study by Behringer et al. (2013), they investigated the effects of different strength exercises on serve speed in 36 tennis players aged 15. After 8 weeks, the experimental group that performed strength exercises showed improvements in tennis speed. Eren (2019) found significant differences in the vertical jump heights of tennis players in favor of the post-test results following eight weeks of core training. In their study involving female tennis players aged 10-14, Kıvrak & Zorlu (2019) observed significant increases in vertical jump heights. Aktaş et al. (2011) observed a significant difference in the vertical jump performances of male tennis players aged 12-14 in favor of the post-test results of the experimental group compared to those of the control group. A study conducted by Demirkan (2016) involving 9-year-old female tennis players found a significant difference between pre-test and post-test vertical jump heights in favor of the latter. A study involving elite tennis players aged 12-14 conducted by Tunç (2018) also reported a significant difference in vertical jump heights in favor of the post-test values. The results of these studies are consistent with the findings obtained in the present study.

In this study, implementation of the six-week core training program resulted in increased service speed. Eren (2019), examining the effects of eight weeks of core training on groundstroke speed and selected motor characteristics in tennis players aged 12-14, found significant differences in the service speeds in favor of the post-test results. In a study by Sever et al. (2017), the service speeds of the core training group were determined to have increased by 6.6% at the end of the study. Fernandez et al. (2013) conducted a study incorporating core training on a total of 30 male athletes with an average age of 13, observing significant differences in the service speeds measured at the end of six weeks. Begringer et al. (2013), researching the effects of various eight-week strength training programs on the 15-year-old study participants, found increases in the service speeds of all groups. Ferrauti & Bastiaens (2007), who also studied the acute effects of different types of strength training, reported that service speeds increased as heavier weights used in training were replaced with lighter weights. Overall, the results of these studies on pre- and post-training service speeds are similar to the results obtained in our study.

The findings of the present study indicated that the six-week core training program improved 5m, 10m, and 20m sprint performances. According to Aktaş et al. (2011), there were no significant differences in the 5m and 30m sprint speeds of tennis players following an 8-week strength training program, whereas a significant difference was found for the 10m sprint speeds. Yıldız et al., (2018), examining the relationship between explosive strength and speed in child tennis players, observed significant differences for 5m, 10m, and 20m sprint speeds, consistent with our findings. Kramer et al. (2017) also reported significant differences in the 5m and 10m sprint performances of child tennis players. In a study with female tennis players aged 10-14, Kıvrak & Zorlu (2019) noted significant improvement in their 20m sprints. The results of these studies are thus in line with our findings.

CONCLUSION

In this study, conducted to determine the effect of six weeks of core training on service speed and certain motor characteristics in tennis players, core training was found to improve service speed, vertical jump performance, and 5m, 10m, and 20m sprint speeds. Additionally, core training was observed to contribute positively to overall movement efficiency by enhancing balance, stability, and muscle activation, which are fundamental components of athletic performance. These findings highlight the importance of core training in sports like tennis, which require a high level of coordination and explosive strength. In this context, incorporating core exercises into a portion of individual training programs and annual training planning, in addition to routine tennis training programs, can significantly enhance athlete performance.

SUGGESTIONS

- Core training should be included in training programs to improve service speed, vertical jump performance, and sprint speeds in tennis players. Core strengthening can significantly enhance performance in sports like tennis, which require explosive movements.
- Since six weeks of core training resulted in improvements in these motor characteristics, extending the training period could lead to more lasting improvements. Training programs can be planned for a longer duration to increase physical endurance in tennis players.
- It should be emphasized that core training should aim not only to improve service speed but also motor characteristics such as speed and jumping ability. The training can be enriched with exercises specifically targeting these attributes.
- Personalized core training programs should be designed based on the physical levels and needs of tennis players. This could make training more effective for each player to achieve the best results.
- More research should be conducted to understand how core training affects different athletes and age groups. Additionally, studies on the long-term effects of such training will increase its applicability in tennis and similar sports.

Etical Approval and Permission Information

Ethics Committee: Muş Alparslan University, Scientific Research and Publication Ethics Board
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Futbolda Atletik Performans Antrenmanına Bütünsel Yaklaşım: Taktiksel Periyotlama

Ali Enver KAPELMAN[1]

Özet

Amaç: Futbolda atletik performans antrenmanının farklı bileşenleri vardır. Atletik gelişim için, her motorik özelliğin ayrı ayrı periyotlanması ve geliştirilmesi gerekmektedir. Ancak, futbolda başarıyı sağlayan faktör sadece atletik performans değildir. Oyun planı ve taktik, futbolda baskın boyut olarak göze çarpmaktadır. Bu bilgilere dayalı olarak, futbolda antrenman planlamasını oluşturan tüm bileşenlerin taktiğe bağlı planlamasına taktiksel periyotlama denmektedir. Bu doğrultuda bu çalışmanın amacı, futbolda atletik performans antrenmanının taktiksel periyotlama açısından incelenmesidir.
Yöntem: Çalışmada futbolda taktiksel periyotlama ile ilgili bilimsel makaleler ve kitaplar, tezler, programlama ve antrenman yöntemleri, deneysel çalışmalar, meta analiz araştırmaları ve sistematik derlemelerin tam metni detaylı bir şekilde incelenmiştir. "2000-2024" yılları arasında Web of Science, PubMed ve Google Scholar elektronik veri tabanları "futbolda taktiksel periyotlama", futbolda planlama ve periyodizasyon", "futbolda mikro ve makro siklüs", futbolun fiziksel talepleri", "futbolun fizyolojik talepleri", futbolun teknik bileşenleri", "futbolun bağlamsal ve taktik boyutları" futbolda mental enerji ve psikolojik beceriler", "futbolda fiziksel ve taktiksel performans" ve "futbolda blok periyotlama" anahtar kelimeleri kullanılarak taranmıştır. Literatür taraması yapılırken tüm kelimeler futbolda taktik ve strateji bileşenleri ile incelenerek analiz edilmiştir.
Sonuç: Sonuç olarak, taktiksel ve fiziksel verilerin analizi ile atletik performans antrenmanının oyun modelinin çıktılarına uygun planlanması, performansı optimize edeceği düşünülmektedir. Antrenörler, antrenman metodolojilerini strateji ile birleştirerek ve periyodik hale getirerek, temel fiziksel, teknik ve taktiksel yönlere odaklanarak oyuncu gelişimini ve takım başarısını artırabilir.

Anahtar Kelimeler: *Antrenman, Atletik performans, Futbol, Periyotlama, Taktik.*

Holistic Approach To Athletic Performance Training in Football: Tactical Periodization

Abstract

Aim: Football training consists of various athletic performance components, each requiring separate periodization and development. However, success in football is not solely dependent on athletic performance; game plans and tactics play a dominant role. The integration of all training components in alignment with tactics is termed tactical periodization. This study aims to examine athletic performance training in football from a tactical periodization perspective.
Methods: A comprehensive literature review was conducted on tactical periodization in football, analyzing scientific articles, books, theses, programming methodologies, experimental studies, meta-analyses, and systematic reviews. Electronic databases (Web of Science, PubMed, and Google Scholar) were searched for studies published between 2000 and 2024 using keywords such as: "Tactical periodization for football," "Planning and periodization in football," "Micro and macro cycle in football," "Physical and physiological demands in football," "Technical and tactical components of football," "Mental energy and psychological skills in football," and "Block periodization in football." All terms were evaluated in relation to tactical and strategic components.
Conclusion: Findings suggest that aligning athletic performance training with game model outputs and tactical-physical data analysis optimizes performance. Coaches can enhance player development and team success by combining training methodologies with strategy, structuring them periodically, and integrating fundamental physical, technical, and tactical aspects effectively.

Keywords: *Athletic performance, Periodization, Football, Tactics, Training.*

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GİRİŞ

Taktiksel periyotlama, futbol antrenmanının tüm bileşenlerini bir araya getiren bütünsel bir yaklaşım metodu olarak ortaya çıkmıştır (Gomes, 2008). Portekizli futbol bilim uzmanı Vitor Frade tarafından ortaya konulan bu yaklaşım, 2000'li yılların başından itibaren Portekizli futbol antrenörlerinin UEFA Şampiyonlar, Avrupa ve Ulusal liglerinde başarılı olmasının nedeni olarak görülmüştür (Greboggy & Silva, 2018). Bu modelin başarısının görülmesi akabinde, futbol haricinde diğer takım sporlarında da kullanılmaya başlanmıştır (Crespo, 2011; Robertson & Joyce, 2015). Antrenman biliminde planlama ve periyotlama sürecinde farklı modellerin arandığı günümüzde, bu model güncel yaklaşımlar ile

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kullanılmaya devam etmektedir. Taktiksel periyotlamanın en popüler kullanıcısı olarak Jose Mourinho bilinmesine rağmen, bu antrenman metodolojisi başarıyla André Villas-Boas, Brendan Rogers ve Nuno Espírito Santo, gibi birçok teknik direktör tarafından da benimsenmiştir (Bordonau & Villanueva, 2018). İsmi geçen antrenörlerin, bir dönem ulusal ve uluslararası başarıları bu antrenman metodolojisi ile bağdaştırılmıştır. Modeli ve bileşenlerini öne sürerek, bu sistem ile antrenman planlamasının yapılmasının başarıya götüreceği fikrini ortaya koymuştur. Modelin gelişimi, yaklaşımın ortaya konulması sonrasında elde edilen ikinci el bilgiler ile yapılan bilimsel araştırmaların sonucunda yayınlanan makaleler ile olmuştur.

Spor araştırmalarında kullanılan fiziksel sözcüğünün, antrenman veya müsabaka esnasında gerçekleştirilen tüm eylemlerin sadece fiziksel olarak düşünülmesi yanılgılara yol açabilir. Bir sportif aktivite esnasında gerçekleşen fiziksel eylemin, teknik, taktik ve psikolojik boyutu göz ardı edilmemelidir. Bu bağlamda taktiksel periyotlama, antrenman biliminde daha çok motorik özelliklere odaklanan periyotlama yöntemlerinden farklı bir noktaya dikkat çeker (Afonso ve ark., 2017). Bu metodolojide kullanılan "Taktiksel" kavramı oyunun sadece taktik boyutuna değil, bütünsel yaklaşımına atıfta bulunur. Bu sistemde, taktiksel, teknik, fiziksel, fizyolojik ve psikolojik tüm kavramlar bir arada bulunmaktadır. Bu nedenle, taktiksel periyotlamada, sadece taktiğin değil, taktiğe bağlı olarak tüm bileşenlerin planladığı bir sistem olarak düşünülmesi kavramın daha iyi anlaşılmasını sağlayacaktır. Futbolda müsabaka esnasında gerçekleşen her hareket, teknik, taktik, fizyolojik ve psikolojik bir çıktının ürünüdür (Oliveira, 2004). Oyun esnasında her hareket bir karar ile bağlantılı olduğundan taktik bileşen ile, motorik özellik içerdiği için de teknik ile bağlantılıdır. Aynı zamanda belirli bir hareket için sahaya bir efor konmasından dolayı fizyolojik parametreler ve bu esnada harekete duygu ve istek karıştığından dolayı psikoloji ile de doğru orantılıdır (McCormick ve ark., 2015; König & Memmert, 2023). Tüm bu bileşenler bir araya getirildiğinde futbolda antrenman planlamasını oluşturan tüm faktörlerin birbirinden bağımsız planlanamayacağı söylenebilir.

Taktiksel periyotlamada mikro ve makro antrenman döngüsü oyun modeline göre tasarlanır. Makro döngüde her zaman için takımın oyun modeli ve prensipleri ön plandadır ancak mikro döngüde, döngünün şartlarına göre planlamada değişiklikler yapılarak, haftalık plan uyarlanabilir (Afonso ve ark., 2020). Kısa vadeli tahminlere dayalı antrenman döngüsünde değişim diğer antrenman metodlarından ayıran özelliklerden biridir. Ancak, kısa vadeli planlamaya rağmen, bu modelin temel amacı, fiziksel uyaranı hafta içi ve haftalar arasında sabitlemektir (Frade in Oliveria, 2014). Yani, yükün hafta boyunca yatay dağılımını korumak ve stabilizasyonunu sağlamaktır. Bu periyotlama esnasında, her antrenman ve antrenman dışı faktör göz önünde bulundurulur. Mikro döngüde maçın iç saha veya deplasmanda olması, bir sonraki rakibin zorluk derecesi ve müsabaka döneminin hangi evresinde bulunulduğu gibi faktörlere dikkat edilmelidir. Ancak, yapılan araştırmada, bu tür yük yönetimine karşı ilginin artmasına rağmen, oyuncuların bu stratejilere gerçekten nasıl yanıt verdiği hala bilinmemektedir (Buchheit ve ark., 2018).

Literatürdeki bilgileri derleyip detaylı bir şekilde inceleyerek, fiziksel, teknik, taktik ve psikolojik bileşenleri birleştiren bütüncül yapısını ortaya koymak mevcut literatüre katkı sunacağından önemli bulunmuştur. Bu doğrultuda futbolda atletik performans antrenmanının, oyun modeline bağlı değerlendirilmesi ve planlanmasının, futbolcuların antrenman çıktılarını optimize edeceği düşülnülmektedir. Bu bağlamda, özellikle oyun modeli odaklı stratejik planlama ile antrenman yoğunluğu, karar verme süreçleri ve sakatlık önleme arasındaki ilişkilerin vurgulanması amaçlanmaktadır. Dolayısıyla bu çalışmanın amacı, futbolda atletik performans antrenmanının taktiksel periyotlama açısından incelenmesidir.

YÖNTEM

Bu derleme çalışmasında, futbolda taktiksel periyotlama ile ilgili programlama yöntemleri, antrenman modelleri ve periyotlama kavramlarıyla ilgili bilimsel makaleler, tezler ve kitaplar incelenmiştir. "2000-2024" yılları arasında Web of Science (Clarivate Analytics, ABD), PubMed (United States National Library of Medicine (NLM), ABD), Google Scholar (Google, ABD) elektronik veri tabanları "futbolda taktiksel periyotlama", futbolda planlama ve periyodizasyon", "futbolda mikro ve makro siklüs", futbolun fiziksel talepleri", "futbolun fizyolojik talepleri", futbolun teknik bileşenleri", "futbolun bağlamsal ve taktik boyutları" futbolda mental enerji ve psikolojik beceriler", "futbolda fiziksel ve taktiksel performans" ve "futbolda blok periyotlama" anahtar kelimeleri kullanılarak taranmıştır.

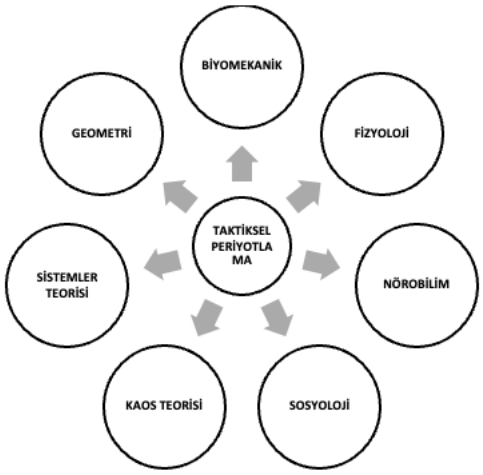
Aramalar hem Türkçe hem İngilizce olarak gerçekleştirilmiştir. Araştırmaya uygun olduğu belirlenen 127 kaynak incelenmiş ve 69 kaynak çalışmaya dahil edilmiştir. Literatür taraması yapılırken tüm kelimeler futbolda taktik ve strateji bileşenleri ile incelenerek analiz edilmiştir. Konu ile ilgili kitaplar, deneysel çalışmalar, metaanaliz araştırmaları ve sistematik derlemelerin tam metni detaylı bir şekilde incelenmiştir.

Tablo 1. Araştırmaya dahil edilme kriterleri

Kriter	Açıklama
Yayın Türü	Deneysel çalışmalar, meta-analiz, sistematik derlemeler, kitaplar
Yıllar	2000-2024 yılları arasındaki yayınlar
Dil	İngilizce
Konu	Futbolda taktiksel periyotlama, stratejik ve fiziksel talepler, blok periyotlama gibi alanlar
Dahil Edilen Yayın Sayısı	69

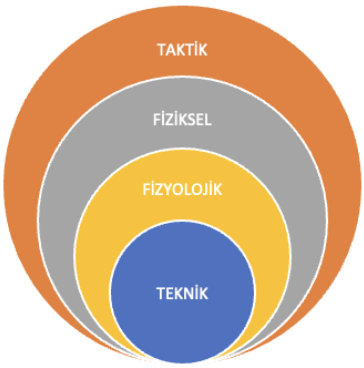
Taktiksel Periyotlama Nedir?

Taktiksel Periyotlama, farklı bilimler ve disiplinlerin incelenmesi sonucunda ortaya çıkan yaklaşımların futbola uyarlandığı bir antrenman metodolojisidir (bkz. Şekil 1). Bu metodoloji, futbol oyununu bütünsel bir perspektifle ele alırken, karmaşık kimliğini de korumaktadır. Yani, teknik, taktik, fiziksel ve psikolojik boyutu antrenman periyotlamasında ayrı ayrı ele alırken, her bir bileşene aynı seviyede önem vererek genel planlamada eşit önem göstermektir (Savolainen ve ark., 2023). Haggard & Libet'in (2001) çalışması, beynin, kişi bir hareketin meydana geleceğini fark etmeden çok önce hareket tepkilerini hazırladığını göstermiştir. Günlük olarak bilinçli ve anlık gibi görünen eylem ve kararlar aslında beyindeki bilinçaltı süreçlerin sonucudur. Böylece bu alışkanlıklar sayesinde karar ve reaksiyon süreleri önemli ölçüde azaltılabilmektedir (McCrone, 2002). Taktiksel periyotlama, hareketin bu perspektifi ile orantılı olarak oyuncuyu olası her oyun durumunu anlamaya ve bunlara daha hızlı tepki vermeye hazırlamayı amaçlamaktadır.



Şekil 1. Taktiksel periyotlamanın diğer bilimler ile etkileşimi (Oliveira G. in Farias, 2016)

Futbolda taktik boyutun ön planda olması bu metodolojiye adını vermiştir. Fiziksel, teknik ve psikolojik boyutlar da taktik boyutun içinde var olurlar. Bu sistemde anlatılmak istenen sadece taktiğin periyotlanması değil, taktiğe bağlı olarak diğer bileşenlerin planlanmasıdır (bkz. Şekil 2). Bu nedenle bu metot, prensipler, alt prensipler ve alt prensiplerin alt prensipleri olarak üç ayrı gruba ayrılır (Tavares, 2003). Ancak, prensiplerin ve buna bağlı alt prensipler belirlenmeden önce futbolun yapısal analizinin yapılması daha uygun olacaktır. Tüm bu bilgiler ışığında, yapısal analizin doğru bir şekilde yapılması doğru bir periyotlamanın yapılmasını sağlayacaktır.



Şekil 2. Taktiksel periyotlamanın kavram kümesi (Oliveira G. in Farias, 2016)

Futbolun Yapısal Analizi

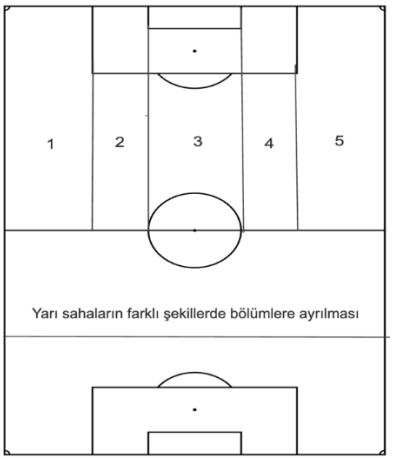
Taktiksel periyotlama, antrenman öğelerinin birbirinden ayrılmasına karşı ortaya atılmış bir tezdir. Özetle, oyunun fiziksel, fizyolojik, teknik, taktik ve diğer unsurlarını birleştiren bir antrenman yaklaşımıdır (Savolainen ve ark., 2023). Aristotales'in holizm anlayışından yola çıkarak *"Bütün, parçaların toplamından daha büyüktür"* yaklaşımı taktiksel periyotlamayı en iyi özetleyen kavramlardan biridir (Mallo, 2015). Aynı zamanda, bu yöntemin fikir babası Vitor Frade'nin *"Bir şişe suyumuz varsa ve suyu bir bardağa dökersek, suyun içeriğinde hiçbir değişiklik olmaz, sadece bardakta daha az miktarda kalır."* benzetmesi, yapısal analizin yapılmasının getireceği avantajları vurgulamaktadır (Frade in Borges, 2015). Özetle, futbol büyük resmi küçük parçalara ayırmak, bu küçük parçaları belirlenen stratejiye göre antrene etmenin avantajlarından bahsedilmektedir. Bu aşamadan sonra, tümevarım yöntemiyle küçük parçalardan büyük parçalara geçmek hem taktiksel hem de fiziksel açıdan performans anlamında verimin artmasından bahsedilebilir.

Yapısal analiz geometri ile ilişkilidir. Geometri, antrenman sırasında oyuncuların sahada pozisyon alma, alan daraltma ya da genişletme gibi stratejik hareketleriyle ilişkilidir. Birim antrenmanda geometrik düzenlemeler, özellikle dar alan oyunlarında, takımın formasyonunu ve stratejik hedeflerini koruyarak daha az sayıda oyuncu ile daha sınırlı bir alanda uygulanır. Bu yöntem, oyunun temel bileşenlerini küçük ölçekli durumlar üzerinden geliştirir (Dellal ve ark., 2011). Futbol oyunu, 11v11 oynanan bir oyun olmasına rağmen, futbolda performansı oluşturan bileşenlerin tüm saha ve 11v11 formatta geliştirilmeye çalışılması, antrenman verimini düşmesine neden olabilir. Takım stratejisinin ve oyunun temelini bozmadan bazı şeyleri azaltmak, öğrenme ve gelişimi artıracağı düşünülebilir. Yani, bir birim antrenmanda oyunu sayısını azaltmak, alanı küçültmek, aralıklı dinlenme metodu kullanmak ya da yüklenme-dinlenme sıklığını azaltmak veya artırmak bu yönteme örnek olarak verilebilir. Ancak, tüm bu bilgilere rağmen, oyunun karmaşık yapısını, amacı, karar verme mekanizması ve oyun stratejisi ile ilişkisi her zaman korunmalıdır. Ek olarak, yapısal analiz ve sahayı bölümlere ayırmak ile burada anlatılmak istenen, futbolda çok bilinen ve kullanılan savunma, orta saha ve hücum gibi futbol sahasının üç temel bölgeye ayrılması değildir. Taktiğe özgü olarak, daha fazla ve farklı alanlar kullanmaktır. Örneğin, ceza sahası ve ceza sahası ön bölgesini boylamasına parçalara ayırarak, kanat ve merkez hücum etkinliği geliştirecek sonuçlandırma çalışmaları yapılması buna bir örnek olarak kullanılabilir.

Tablo 2. Oyuncu sayılarına göre dar alan oyunları (Hill-Haas ve ark., 2010)

Oyuncu Sayısı	Alan Ölçüleri (m^2)	Hedef	Antrenman Amacı
2v2	15x15	Çabuk karar verme, birebir mücadele	Dar alanda bireysel teknik ve hızlı karar verme becerileri
3v3	20x20	Küçük grup oyunu, hızlı paslaşma	Hızlı paslaşma ve takım içi koordinasyon
4v4	25x25	Alan kullanımı ve genişleme	Alan kontrolü ve genişleyerek oyun kurma
6v6	30x40	Takım savunması ve hücum organizasyonu	Takım savunması ve hücumda pozisyon alma, geçiş oyunları

Futbolda sınırlı alan oyunlarının alan ve oyuncu sayısına göre amaçları ve hedefleri değişebilir. Bu tabloda, alan boyutu ve alan içerisinde bulunan oyuncu sayısına göre antrenmanın amacı ve hedefleri anlatılmaktadur.



Şekil 3. Futbol sahasının bölümlere ayrılması

Futbol sahası savunma, orta saha ve hücum olarak üç bölgeye ayrılır. Ancak bu şekilde, taktiksel periyotlamaya özgü olarak, sahanın bu uygulama dışında farklı bölümlere ayrılması ve buna bağlı olarak antrenmanın planlanması hangi bölümlere özgü yapıldığının bir örneği verilmiştir.

Oyun Modeli Oluşturmak

Futbol oyunu modelleme ve strateji geliştirme, taktiksel karar verme, oyuncu performansı ve oyun sonuçlarının anlaşılmasını geliştirmek için kapsamlı araştırmalar yapılmıştır. Odaklanılan önemli alanlardan biri, takım sporlarında taktiksel karar almaya yönelik teorik modeller geliştirmek için büyük veri ve modern makine öğrenimi teknolojilerinin kullanılması olmuştur (Rein & Memmert, 2016). Bu gelişmeler, futbol stratejilerinin karmaşıklığını daha derinlemesine inceleme fırsatları sunar ve sahadaki takım performansının optimize edilmesine yardımcı olur. Araştırmacılar, profesyonel futbolcuların koşu performansını ve oyun performansı göstergelerini analiz ederek, antrenmanları belirli konumsal talepleri karşılayacak şekilde uyarlamanın ve böylece oyuncuların oyun gereksinimlerine etkili bir şekilde yanıt vermesini sağlamanın önemini vurguladılar (Modrić ve ark., 2019). Elit genç futbol takımlarında bağlamsal ve taktiksel boyutların gol atma fırsatları üzerindeki etkilerini analiz etmek, antrenörlere oyuncu gelişimi için hayati önem taşıyan temel taktik ilkelere odaklanan etkili antrenman seansları tasarlamaları için değerli bilgiler sağlayabilir (González-Ródenas ve ark., 2022). Futbolda başarı için oluşturulan tüm taktik ve stratejik hedeflere karşılık gelen atletik performans talepleri vardır. Örneğin, baskıya dayalı ve baskı sonucu kazanılan toplar ile hızlı geçiş hücumları ile planlanan bir stratejinin güç çıktısı ile ilgisi olabileceği düşünülebilir. Bu doğrultuda, reaktif kuvvet indeksi antrenman planlaması öncesinden bir veri olarak kullanılabilir. Reaktif kuvvet indeksi, pliometrik antrenman etkilerini optimize etmek için değerli bir değişken olarak tanımlanmış olup, spesifik performans sonuçları için özel antrenman müdahalelerinin öneminin altını çizmektedir (Ramírez-Campillo ve ark., 2018). Yapılandırılmış mikro döngüler ve taktiksel dönemlendirme gibi metodolojiler, futbolda antrenman programlarının yapılandırılması için temel çerçevelerdir ve sistematik planlama ve yük yönetimi ihtiyacını vurgulamaktadır (Romero-Caballero ve ark., 2021). Tüm bu veriler ışığında, taktik, strateji ve fiziksel taleplerin birlikte planlanması gerçeği bir kez daha vurgulanabilir.

Futbolda taktik ve strateji, bir takımın sahadaki performansını ve başarısını belirlemede önemli rol oynar. Taktikler, bir takımın maç sırasında gol atmak veya rakibin atağına karşı savunma yapmak gibi kısa vadeli hedeflere ulaşmak için uyguladığı özel plan ve eylemleri ifade eder. Öte yandan strateji, bir takımın oyuna genel yaklaşımını yönlendiren daha geniş, uzun vadeli planları ve kapsayıcı ilkeleri içerir (Chena ve ark., 2022). Futbolda taktiksel optimizasyon, oyuncu hareketlerini analiz etmek, takım stratejilerini optimize etmek ve genel performansı artırmak için gelişmiş hesaplama tekniklerinin kullanılmasını içerir (Wang, 2024). Ayrıca elit futbolun fiziksel talepleri, maç oyununun taktiksel gereksinimleriyle uyumlu olacak en uygun antrenman ve hazırlık stratejilerine duyulan ihtiyacı vurgulamaktadır (Carling & Bloomfield, 2010). Taktiksel değişiklikler, özellikle bir takımın oyun boyunca performans seviyelerini korumak için stratejide ayarlamalar gerektiren bir oyuncunun oyundan çıkarılması gibi değişikliklerle karşılaştığı durumlarda gerekli olabilir (Carling & Bloomfield, 2010). Taktik bileşenleri ve psikolojik yönleri birleştiren etkili antrenman programlarının, elit futbolcuların müsabakalar sırasında taktiksel davranışlarını geliştirdiği gösterilmiştir (Tassi, 2024). Bu bütünsel yaklaşımlar, takım stratejilerini geliştirmeyi, performansı artırmayı ve maçlar sırasında karşılaşılan

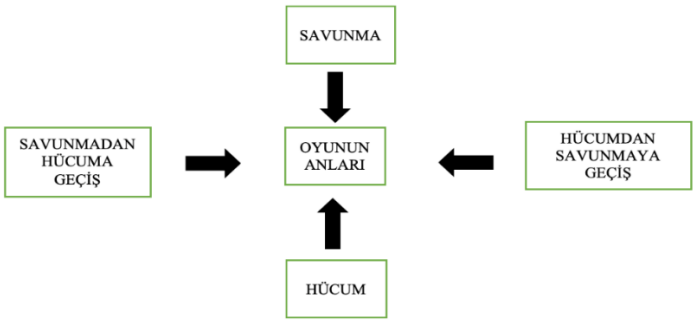
değişen taktiksel durumlara uyum sağlamayı amaçlamaktadır. Özetle futbolda taktik ve strateji, takımların oyun planlarına nasıl yaklaştığını ve yürüttüğünü etkileyen birbiriyle bağlantılı unsurlardır. Taktikler, bir maç sırasında anında yapılan eylemlere ve alınan kararlara odaklanırken, strateji, bir takımın oyuna genel yaklaşımını yönlendiren daha geniş ilkeleri ve uzun vadeli planları kapsar ve sahada başarıya ulaşmada her iki yönün de önemini vurgular.

Oyun Modeli, antrenörlerin oyuncuların oyunun her anında ve farklı durumlarda benimsemelerini istediği önceden belirlenmiş davranışların bir sonucu olarak takımın oyunda elde ettiği bir organizasyon düzeyidir. Sonuç olarak, futbolun öngörülemeyen doğasına daha fazla düzen ve öngörülebilirlik kazandırır, böylece takım oyunun sonucunu etkilemeye çalışabilir. İstenilen bu davranışların oyundan oyuna tutarlılığı ve sıklığı, takımın kimliğini belirleyen şeydir. Oyun Modeli asla bitmiş bir ürün değildir; oyun ve takım analizi yoluyla sürekli gelişen ve iyileşen, hiç bitmeyen bir süreçtir (Tamarit, 2015). Ancak net bir oyun modelinin tanımlanması ve oluşturulmasının, oyuncuların önceden belirlenmiş bir plan doğrultusunda "robot" gibi hareket etmesini gerektirecek bir şey olarak algılanmaması gerektiğini anlamak önemlidir. Aksine, net bir oyun modeline sahip olmanın temel amacı oyuncuların belirsizliğini azaltmaktır, bu da oyunculara yaratıcılıklarını kullanmaları için daha fazla zaman tanımalıdır. Oyun Modelini organize bir şekilde yapılandırmamıza yardımcı olan 3 kategori vardır: Oyunun anları, takımın ölçekleri ve Oyun Modelinin ilkeleri (Oliveira G. in Farias, 2016).

Futbol Oyununun Dört Fazı

Oyunun dört anı şunlardır; hücum organizasyonu, savunma organizasyonu, savunmadan hücuma geçiş ve hücumdan savunmaya geçiş olarak dört farklı gruptadır (Oliveira G. in Farias, 2016).

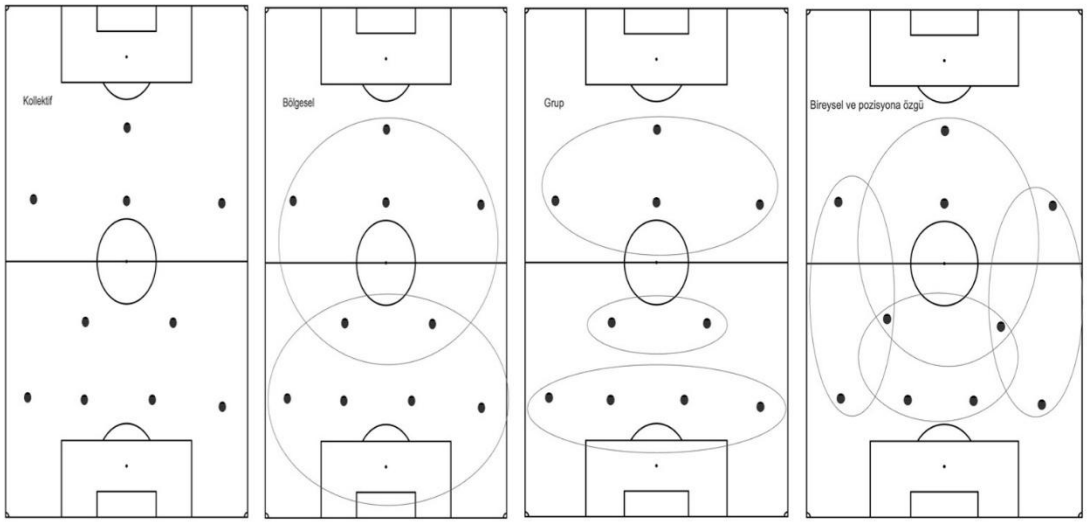
- Hücum Organizasyonu: Takımın topa sahip olduğu andır. Oyunun bu fazı sahanın herhangi bir anında başlayabilir. Top kaybedildiği anda bu faz sona erer (Barquero – Ruiz, 2023; Silva ve ark., 2014).
- Savunma Organizasyonu: Bir takımın topa sahip olmadığı ve organize bir şekilde topun arkasında kalarak savunma yaptığı andır. Bu faz sahanın herhangi bir yerinde başlayabilir, topun kazanılması ile sona erer (Ferreira ve ark., 2021).
- Hücumdan Savunmaya Geçiş: Savunma organizasyonundan farklıdır. Bu fazda, bir takım topa sahipken topu kaybeder ve organize olmadan savunma yapmak zorunda kalır. Takım topu tekrar kazandığında bu faz sona erer (García-Ceberino ve ark., 2020).
- Savunmadan Hücuma Geçiş: Hücum organizasyonundan farklıdır. Takım savunma yaparken topu kazanır ve rakibi hazırlıksız ve organize savunma yapamayacağı bir anda yakalar. Takım topu kaybettiğinde bu faz sona erer (García-Ceberino ve ark., 2020).



Şekil 4. Oyunun anları şeması

Ölçeklendirme

Futbol sahasının farklı bölümlerinin ölçeklendirilmesi, antrenmanın çeşitlenidirilmesini sağlar. Buna bağlı olarak, farklı yöntemler uygulanmasını ve taktiğin sahanın farklı bölümlerde uygulanmasını sağlar (Andrzejewski ve ark., 2015; Boronczyk ve ark., 2021). Bir birim antrenman planlanırken, oyun modelinin ilkelerinin oyunculara ve mevkilere yönelik uygulanmasını sağlar. Taktiksel periyotlama özgü, futbol sahasını ölçeklendirme yöntemleri şu şekildedir; kolektif, bölgesel, grup ve bireysel olarak dörde ayrılır (Oliveira G. in Farias, 2016).



Şekil 5. Ölçeklendirme

Taktiksel periyotlamaya özgü, futbol sahasının ölçeklendirilmmesi gösterilmiştir. Burada amaç, sahanın oyuncuların bölgelerine ya da mevkisine özgü bölünmesi ve buna bağlı olarak antrenman planlamasının hangi ölçeklerde yapıldığının gösterilmesidir.

Oyun Planına Özgü Prensiplerin Belirlenmesi

Taktiksel periyotlamaya ait olan prensipler, futbolun temel prensipleri olan savunma ve hücum prensiplerinden farklılık göstermektedir. Taktiksel periyotlamaya göre oyun planının prensiplerinin belirlenmesi, futbolun temel prensiplerine bağlı kalarak, belirlenen oyun planının kendi içerisinde alt bileşenlerine ayrılmasıdır. Oyunun fazlarına ve ölçeklendirmeye göre oluşturulur. Bu sıralamayı takip ederek belirli bir düzen oluşturmak, özellikle mikro planlama yaparken avantaj sağlayacaktır. Prensipler; temel prensipler, alt prensipler ve alt-alt prensipler olarak üç farklı gruba ayrılır (Oliveira, 2014).

- Temel prensipler; bu parça kolektif veya sektörler arası ölçeği içerir. Fazla sayıda (11v11, 10v10, 10v9, 9v9 v.b) ve geniş alanda yapılan antrenmanları işaret eder. Amaç, takımın temel oyun yapısı ve planını korumak ve geliştirmektir. Bu prensipler, oyundan oyuna değişmez, takımın oyun modeli ile ilişkilidir. Örnek olarak, eğer bir takım üçüncü ve ikinci bölgede baskı ile kazanılan toplar ile hızlı geçiş hücumları üzerine bir strateji kurduysa, bu yaklaşımı korumalıdır.

- Alt prensipler; takımın sektörel, sektörler arası ve gruplar arası etkileşimini gösterir. Bu prensiplerin, mikro planlamada aynı kalması beklenebilir. Ancak, haftadan haftaya oynanacak rakibe göre veya takımın form durumuna göre değişkenlik gösterebilir. Topa sahip olma oyunu oynayan bir takımın, geriden oyun kurma düzeni maça göre değişiklik gösterebilir. Örneğin, farklı bir taktik olarak, orta saha oyuncularından birinin stoperlerin arasına girerek savunma hattına hücumda genişlik kazandırması ve bu sayede beklerin orta saha çizgisine kadar çıkarak çizgiye basması takımın hücumda genişlik kazanmasına neden olur. Bu durum, takımın temel prensiplerinde geriden oyun kurarak ve topa sahip olarak oynama yaklaşımını değiştirmez. Ancak, rakibe veya takımın güncel durumuna göre yeni bir metot ile güncelleme yapmış olmasını gösterir.

- Alt-alt prensipler; bu prensip sadece tek bir oyuncu veya kısıtlı bir oyuncu grubunun kapsar. Örneğin, stoperleri, bekleri ya da sadece forvet oyuncularını kapsayabilir. Bu prensip mikro döngüde daha fazla değişkenlik gösterebilir. Örneğin, rakibin savunma arkasına koşu yapan forveti varsa iki stoper veya sadece bir stopere savunma arkasında boşluk kalmaması için birinin mutlaka derinlik vererek oynaması veya forvet oyuncularının rakibin önde baskısı sonucu savunma arkasında değerlendirebilecekleri boşlukları kullanma fırsatı yaratma şansını kullanmaları bu prensibe örneklerdendir.

Taktiksel Periyotlamaya Özgü Antrenman Planlama

Taktiksel periyotlamaya göre antrenman planı yapılırken, genel olarak bilinen ve kullanılan periyotlama sistemlerinden farklı bir şey kullanılmaz. Ancak, aynı döngüler farklı bir sistem ve plan doğrultusunda yapılır. Oyun planı ve alt bileşenleri belirlendikten sonra bu yönteme bağlı ilkeler kullanılarak mikro döngü planlanması yapılır. Bu yöntemde; özgüllük, karmaşık ilerleme, yatay değişim ve taktiksel eğilim ilkeleri kullanılır (Mallo, 2015).

- Özgüllük; bileşeni antrenman ile oyun modeli arasındaki bağlantı noktasıdır (Oliveira, 2014). Bir birim antrenmanda planlanan tüm bölümlerin futbol oyunun gereksinimi ile ilgisi olmalıdır. Ek olarak, sadece oyunun talepleri ile değil oyun modeli ile de ilişkili olmalıdır. Antrenman tasarlanırken bir bütün olarak düşünülmeli, teknik, taktik ve fiziksel boyut bir araya getirilerek hazırlanmalıdır. Yani, oyunun anlarından en az birini içermeli, uygun saha boyutlarında ve uygun oyuncu sayısında planlanmalı, şiddet ve karar verme mekanizması oyuna ve oyun modeline özgü olmalıdır. Taktiksel periyotlamada şiddet, oyun modelinin ilkeleri ve performansın ilişkisidir. Mourinho, antrenman şiddetini konsatrasyon yoğunluğu ile açıklamaktadır (Mourinho in Amierio ve ark., 2006). İki farklı kuvvet antrenmanı düşünelim. Bir antrenman modelinde, futbol topunun olmadığı güç antrenmanı planlaması, diğer antrenman planında ise oyun modeline özgü akselerasyon, deselerasyon ve sıçramalar içeren bir sınırlı alan oyun planlaması yapılmış olduğunu varsayalım. Mourinho'ya göre ikinci antrenman planında top, teknik ve taktik bileşenler olduğu için oyuncular zihinsel olarak da efor sarf edecek ve şiddet daha yüksek olacaktır. Taktik, oyuncular ve antrenörler arasında etkileşim olarak da tanımlanabilir (Öztürk & Soytürk, 2019). Antrenör, oyuncuları, sınırlı alan oyunu oynanıyor olsa bile, gerçek pozisyonlarına göre konumlandırabilir ve bu doğrultuda oyun modeline özgü çıktılar elde etmek isteyebilir (Sabah ve ark., 2023). Örneğin, bir sınırlı alan baskıya ve baskı sonucu kazanılan toplar ile sonuçlandırmaya dayalı planlanabilir. Başka bir oyun modeli uygulanıyor ise, oyuncular savunmaya derinlik vererek (yani baskı yapmayıp geri çekilerek), hedef bölgede baskı yapabilir ve kazandıkları topla hızlı hücuma çıkabilir. Eğer oyun modeli topa sahip olma olan bir takıma yukarıda anlatılan hedeflere yönelik sınırlı alan oyun oynatılırsa fiziksel olarak benzer performanslar elde edilebilir ancak antrenman oyun modeli ve taktiğe yönelik olmayacaktır. Taktiksel periyotlamanın tam olarak antrenman planlamanın bu aşamasında devreye girmesi istenmektedir. Ek olarak, her antrenmanda top kullanmak taktiksel periyotlama uygulandığı anlamına geleceği düşünülmemelidir. Toplu antrenmanların mutlaka oyun modeline özgü planlanması gerektiği gibi, topsuz antrenmanlarda taktiğe özgü planlanabilir. Eğer taktiksel beklentinin fiziksel çıktısı akselerasyon, deselerasyon, sıçrama ve yön değiştirmeler ise, antrenmanın ısınma aşamasından sonra top olmadan bu antrenmanların uygulanması, taktiksel periyotlamanın bir parçası olarak görülmelidir.
- Karmaşık ilerleme; Karmaşık ilerleme aslında oyun modelini parçalara ayırarak basitleştirmektir (Mallo, 2015). Kısaca, periyotlamanın periyotlaması ya da planlaması denilebilir. Sezon başlangıcında, oyun modelini karmaşık yapıdan çıkarılması önerilmektedir. Genel yapıyı, alt parçalara bölerek, basitten karmaşığa doğru ilerlemek hem modelin anlaşılması hem de buna bağlı antrenman planlamasını kolaylaştıracaktır. Tüm bu karmaşıklığın içinde olan ilerlemenin, kısa vade, haftadan haftaya, aydan aya ve sezonluk olarak bileşenlere ayrılarak planlanmalıdır (Oliveira G. in Farias, 2016). Basitten karmaşığa doğru ilerleme yapılırken, oyunun doğal karmaşıklığını kısıtlamamak gerekir. Bu durum, özgüllük ilkesinin kaybolmasına neden olur. Bu nedenle, doğrusal olmayan ilerleme metotunu kullanılması, periyotlamanın başarısını ve oyuna özgülüğünü artıracaktır.
- Yatay değişim; Fizyolojik, fiziksel ve taktiksel yükün haftalık planlamada günlük olarak doğru bir şekilde planlanmasıdır (Oliveira G. in Farias, 2016). Bu süreçte, toparlanma ve zihinsel yük faktörleri unutulmamalıdır (Guerrero-Calderón ve ark., 2022). Bu ilkede amaç, haftalık planlamayı yapmaktır. Futbolda haftalık antrenman döngüsünde, kuvvet, dayanıklılık ve hız bileşenlerinin planlamasıdır (Buchheit ve ark., 2018). Örneğin bir sınırlı alan oyunu, az sayıda oyuncu ve boyutta oynanıyorsa ve buna bağlı akselerasyon, deselerasyon ve sıçrama sayısı fazla ise kuvvet bileşeni ön plandadır (Barreira ve ark., 2024). Fazla sayıda oyuncu ve büyük ebatta oynanıyor ise dayanıklılık ile ilişkilidir (Gómez-Piqueras ve ark., 2024). Eğer, hızlı karar alma, yön değiştirme ve sprint ile ilişkili ise hız bileşeninden bahsediliyordur (Villereal ve ark., 2015). Bu temel üç bileşen haricinde, müsabaka sonrası toparlanma ve maça zihinsel ve fiziksel hazırlık (aktivasyon) da plana dahil edilmelidir (Kelly ve ark., 2019). Bu döngü, bir haftada oynanan maç sayısı ya da iki maç arasındaki süreye bağlı olarak değişebilir. Temel amaç, tüm faktörlerin oyun modeli bileşenleri ile bağlantılı olması ile ilişkilidir.
- Taktiksel eğilim ilkesi; Bir birim antrenmanda oyun modeline özgü senaryolar oluşturulmasıdır. Oyun modelini sonucu olarak, maç esnasında gerçekleşebilecek pozitif veya negatif pozisyonların bir antrenman seansı içerisinde oluşturulmasıdır. Oyuncular, bu durumlara kendi çözüm üreterek sonuca ulaşmanın yolunu arayacaktır. Bu sayede, oyuncular sistematik tekrar ve çözüm bulma ile öğrenme fırsatı yakalarlar (Mourinho in Amieiro ve ark., 2006). Bu ilkede doğru anlaşılması gereken, senaryo üretiminin gerçekçi olmasıdır. Oyun modeli ve futbol oyununa özgü olmayan senaryolar amacın çıkılmasına neden olabilir. Örneğin, hücumdan savunmaya geçiş çalışması yapılması isteniyor ise, çalışan takımın sayıca en azından 1 kişi olacağı, hücum ederken kolay top kaybedebileceği ve bunun sonucunda savunmaya geçiş yapacağı bir senaryoya dayalı antrenman üretilmesinden bahsedilmektedir. Bu sayede oyunculara sürekli

komut vererek öğretme yerine, oyunun doğal akışında futbolcunun kendi duygu ve düşüncelere dayalı karar vererek öğrenme metotu kullanılmış olur (Mourinho in Amieiro ve ark., 2006).

Mikro Döngünün Planlanması

Futbolda mikro döngünün planlaması, haftalık antrenman periyotlaması ile ilişkilidir. Haftalık antrenman döngüsü, taktiksel periyotlama modelini takip eder (Kelly, 2019). Mikro döngü, antrenman, maç ve dinlenme günlerinin koordineli bir şekilde planlamasını içerir (Androja & Terzic, 2020). Planlamada, antrenman yükü önemli noktalardan biridir (Vardakis ve ark., 2023). Dış yük, antrenmanın şiddetini ve yoğunluğunu belirlemek için katkıda bulunur. Bu doğrultuda, yeterli yüklenme ve dinlenme aralıkları ayarlanarak hem yorgunluğu hem de sakatlık riskini düşürmek için optimizasyon yapılabilir (Oliva-Lozano ve ark., 2020). Taktiksel periyotlama, daha önce anlatıldığı gibi taktiğin periyotlaması değildir. Taktiğe bağlı olarak, makro ve mikro döngü içerisindeki bileşenlerin planlanması ve uygulanmasıdır. Maça ve taktiğe özgü taleplere göre fiziksel, teknik ve taktik unsurların antrenman planlamasına yerleştirilmesi maç hazırlığı ve başarısı açısından önem taşımaktadır (Castillo ve ark., 2021). Bu doğrultuda, hedeflenen antrenman yükü hafta başına hesaplanır ve birim antrenmanlara dağıtılır. GPS ve polar gibi teknolojik ekipmanlar ile antrenman iç ve dış yükü takip edilir. Daha önce anlatıldığı gibi mikro döngüde, kuvvet, dayanıklılık ve hız bileşenleri planlanmaktadır. Bu üç bileşen ile futbolcuların maç sonrası toparlanma ve bir sonraki maç öncesi aktivasyonlarının sağlanması da göz önünde bulundurulmalıdır. Taktiksel periyotlama ile, tüm bu bileşenler taktiğe özgü planlanmaktadır.

MD+1 ve MD+2: Her iki günde toparlanma günü olarak tanımlanmaktadır (Buchheit ve ark., 2024). Bazı takımlar maçtan 1 gün sonraki günü izin günü olarak kullanırken, bazı takımlar maçtan 2 gün sonraki günü izin günü olarak kullanmaktadır. Bu durum, takımın deplasman ve iç saha maçları göre değişiklik gösterebileceği gibi, antrenörlerin genel yaklaşımına göre de değişiklik gösterebilir. Toparlanma antrenmanında, oynayan oyuncular için düşük hızda, az sayıda yüksek şiddetli koşunun olduğu, sprint ve ani yön değiştirmeler ile akselerasyon ve deselerasyondan kaçınılan bir antrenman modeli uygulanabilir (Owen, 2023). Müsabakada oynayan oyuncular için, üst ekstremiteye yönelik fonksiyonel kuvvet antrenmanı uygulanabilir.

Müsabakada oynamayan veya 30 dakikadan az süre alan oyuncular için ise farklı antrenman uygulanır. Burada amaç oynamayan oyuncuların maç yükünde antrenman yapması ve maçta oynamadıklarından dolayı oluşan eksikliklerini kapatmasıdır. Müsabakada oynamayan oyunculara 8v8 ve 4v4 sınırlı alan oyunları ile oyuncuların maksimum aerobik süratlerine (MAS) dayalı aralıklı interval koşuları uygulanabilir (Laursen ve Buchheit, 2019). Oynamayan oyuncular için antrenman planı yapılırken, bir sonraki maçın hangi gün olduğu da dikkate alınmalıdır. Antrenman yükü dengeli bir şekilde dağıtılmalıdır (Malone ve ark., 2015).

Mikro döngünün bugünü, taktiksel periyotlama ile çok ilişkili değildir. Temel amaç toparlanma olduğu için, planlama oyuncuların maç esnasında oluşan yorgunluğun etkisinden kurtulması ve bir sonraki maçın hazırlığına fiziksel olarak hazır bir şekilde başlamasıdır (Querido ve ark., 2021). Taktiksel periyotlamada, bedensel ve zihinsel faktörler bir arada tutulduğu için, iki faktör birbirinden ayrılmamalıdır. Zihinsel yorgunluk göz önünde bulundurularak, bugün de oyun modeline çok az değinilerek yeni haftaya hazırlanmak temel amaç olmalıdır. Ancak, 11v4 tam sahada düşük tempoda oynanan geriden oyun kurma çalışması bugün de kullanılabilir. Rakip sayısı az olduğundan hatta neredeyse çalışma rakipsiz yapıldığından, düşük tempoda ve kısa sürede topla toparlanmayı taktiksel boyutta sağlayacak bir antrenman modeli olarak kullanılabilir. Ancak, daha önce söylenildiği gibi, bugün de oyuncuların sadece fiziksel değil, mental yorgunluğu da düşünülmeli ve taktiksel boyutta yapılacak toparlanma antrenmanları, oyuncuların zihinsel yorgunluk durumları analiz edilerek gerçekleştirilmelidir.

MD-4: Kuvvet günü olarak tanımlanmaktadır (Owen, 2023). Bu kuvvet antrenmanın sadece bugün uygulanması gerektiği anlamına gelmemektedir. Kuvvet antrenmanı, şiddet ve yoğunlukları değiştirilerek tüm haftaya yayılabilir (Impellizzeri ve ark., 2019). Burada kuvvetten amaç tüm antrenmanın kuvvet ve bileşenlerine özgü planlanmasıdır. Antrenman içerikleri, akselerasyon ve deselerasyona dayalı, ani yön değiştirmeler ve sıçramalar içeren antrenmanlar planlanır (Buchheit ve ark., 2024). Yüklenme süreli kısa, dinlenme aralıklı uzundur. Bunun sebebi, oyuncuların tam toparlanma ile maksimum efor sarf etmesidir. Aynı zamanda, sınırlı alan oyunlarda oyuncu sayısı ve boyutu düşürülür. Kuvvet boyutunda alt ekstremiteye yönelik planlama yapılır. Teknik boyutta ise, oyuncuların

bireysel teknik gelişimine önem verilmelidir (Owen, 2023). Taktiksel periyotlama boyutunda ise, alt-alt prensipler uygulanır (Mallo, 2015). Burada amaç rakibe yönelik taktik uygulamasından çok takımın oyun modeline göre antrenman planlaması yapılmasıdır. 3v3, 4v4 ya da 5v5 gibi sınırlı alan oyunları kullanılması gerekmektedir. Taktik antrenman alt prensiplerin bir alt bileşeni olan prensipte çalışılmalı ve bu sayede hem taktiksel hem fiziksel boyut birleştirilmiş olur.

Örnek olarak, bir takımın oyun modeli hızlı geçiş oyununa dayalı olsun. Savunmadan hücuma geçiş prensibinin bir alt prensibi olarak, topun kazanıldığı anda hücuma genişlik vererek kısa ve az sayıda paslarla ama top dolaşımının hızlı bir şekilde gerçekleştirildiği bir hücum prensibi olsun. Bu durumda, 3v3, 4v4 veya 5v5 sayıda, alan boyutunun 20*20 metre veya 25*25 metre olacak şekilde bir sınırlı alan oyun formatı kullanılabilir. Oyun kuralı olarak da takımın sınırlı alanda savunma esnasında baskı uygulamasını ve bu baskı sonucunda daha önceden belirlenmiş bir pas sayısında (3,4 veya 5 pas) hücumu sonuçlandırması istenebilir. Ek olarak, hücuma geçişte top kaybı olması durumunda yine savunmaya geçişlerin de hızlı bir şekilde yapılması söylenebilir. Genel olarak, sınırlı alan oyunlarda kişi başına 100 veya 125 metre kare ve yine kişi başına 1 dakika yüklenme süresi kuralı uygulanır (Castellano ve ark, 2013). Bu antrenmanın, taktiksel periyotlama ile ilişkisi, oyuncular sınırlı alanda ani patlayıcı koşular, yön değiştirmeler, fazla sayıda ikili mücadele ve hızlanma – yavaşlamalar ile, taktiğe özgü atletik performans gelişimi sağlayacaktır.

MD-3: Dayanıklılık günü olarak tanımlanmaktadır (Buchheit,2024). Maç öncesi en yoğun antrenman günü olarak da açıklanabilir. Bu antrenman gününün doğru planlanması, performansın optimize edilmesi ve sakatlık riskinin azaltılması açısından büyük önem taşımaktadır. Antrenman yükünün fazla olması ile maç sırasında yoğun koşular (yüksek şiddetli koşu ve sprint) sakatlık riskini artırmaktadır (Moreno-Perez ve ark., 2022). Maçta gerçekleşen yüksek hızda koşuların toplanma mesafe ve sayısı antrenmanlara göre daha azdır (Alonso-Callejo ve ark., 2022). Bu doğrultuda, antrenörler maçtan 3 gün önce en yoğun antrenmanlarını gerçekleştirirler ve bugünden sonra antrenman yoğunluğunu azaltırlar. Bunun sebebi, futbolcuların zihinsel ve fiziksel olarak maça daha hazır hale gelmesi ve sakatlık riskini düşürmektir (Arcos ve ark., 2017). Yüklenme süresi daha uzun ve interval yüklenme tercih edilmektedir. Amaç oyunculara yüksek hızda antrenman yaptırmaktır. Bir gün öncesinde hızlanma, yavaşlama ve yön değiştirme açısından yükleme yapılan oyunculardan, yüksek şiddetli koşu mesafesinin artması istenir aynı zamanda oyuncuların sprint mesafesi de artar (Laursen & Buchheit, 2019). Maç gününe yakın performanslar sergilemesi istenir. Bu nedenle, kuvvet gününden farklı olarak oyunun oynanacağı alanlar büyür. Hızı artırmak için, 7v7, 8v8 ve 10v10 gibi geniş alanda ve fazla sayıda oyuncu ile oyun oynanır (Owen, 2023). Tekrarlı sprint ve tekrarlı yüksek koşu mesafesi önem taşımaktadır. Bunun nedeni, yüksek hızda devamlılığın yani dayanıklılığın geliştirilmesidir. Antrenman tasarlanırken, oyuncuların futbola özgü yüksek şiddetli aksiyon ve hareket üretme yeteneklerinin artması amaçlanır. Antrenman içeriğinde topun kullanılmadığı aşamalarda ise yüksek şiddetli aralıklı interval antrenmanlar bugün kullanılır. Sporcuların daha önce belirlenen MAS hızlarında yüksek şiddetlerde antrenmanlar tercih edilir. Oyuncuların bugün de maça yakın yüksek hızda mesafelerinin artması, müsabaka öncesi sakatlık riskini azaltıcı etkisi de vardır (Gabbett, 2016).

Taktiksel periyotlama açısından bugün değerlendirildiğinde, temel ve alt prensiplerin uygulandığı bir gün olarak değerlendirilebilir (Ammann ve Altmann,2023). Bugün de dün alt prensibin alt prensibi olan konu bir üst prensipte yani alt prensibinde işlenebilir. Örnek olarak, bir gün öncesinde savunmadan hücuma geçiş konusu 4v4, 5v5 çalışıldı. Bugün, daha geniş alanda bir üst prensibi, yani sadece savunmadan hücuma geçişi değil, hücumdan savunmaya geçişte kullanacağın strateji de belirleyerek çift yönlü çalışılmalıdır. Alanda 7v7, 8v8 ya da 10 v10 olacak şekilde daha geniş alan ve fazla sayıda oyuncu ile müsabakaya dönük çalışma yapılabilir. Bunun haricinde, savunmada baskıya dayalı bir strateji uygulanacaksa, bir gün öncesinde savunmaya dayalı bir alt prensip çalışıldıysa, bir gün sonra alan ve sayı genişletirilerek hücum konusu ile birleştirilebilir ve en sonunda 11v11 taktiksel oyun ile tamamlanabilir.

Haftalık periyotlamanın bu aşaması taktiksel ve fiziksel boyutu ile birleştirildiği düşünüldüğünde, alan boyutu ve sayı dayanıklılığa ve interval yapıya uygun tasarlanır (Akılveren ve ark., 2021). Yüklenme süreleri daha uzun, dinlenme süreleri kısadır. Şiddet bir önceki güne göre daha düşük ancak antrenman yoğunluğu daha yüksektir. Taktik ile bağlantısı ise, her taktik ve stratejinin bir fiziksel karşılığı vardır. Farklı stratejilerde oynayan takımların, yüksek şiddetli koşu ve sprint mesafelerinin toplam mesafeye oranı farklıdır (Kapelman ve ark., 2021). Bu yükler, iç ve dış yük hesaplama yöntemleri ile bulunabilir.

Örnek olarak, bir takım kontra atağa dayalı bir oyun oynadığında, bu stratejinin çıktısı olan iç ve dış yük farklı olacak, farklı bir takım 2.bölgede baskı ve kazanılan toplarla hızlı hücuma dayalı oyun oynadığına zaman bu stratejinin çıktısı farklı olacaktır. Antrenörler, özellikle yüksek şiddetli koşu mesafelerinin toplam kat edilen mesafeye oranını ve maçta beklenilen tahmini mesafeyi özellikle hafta başında belirler ise, antrenman yoğunluğunu stratejiye göre düzenlemek daha kolay olacaktır. Haftanın bu gününün, özellikle yüksek şiddetli koşu mesafesinde planlanması düşünüldüğünde, bu hesaplamalar ve beklentiye göre antrenmanı tasarlamak önem taşıyacaktır. Sonuç olarak, takımın benimsediği taktik ve stratejinin istediği oradan lokomotor yük ayarlaması yapılması verimi artıracaktır.

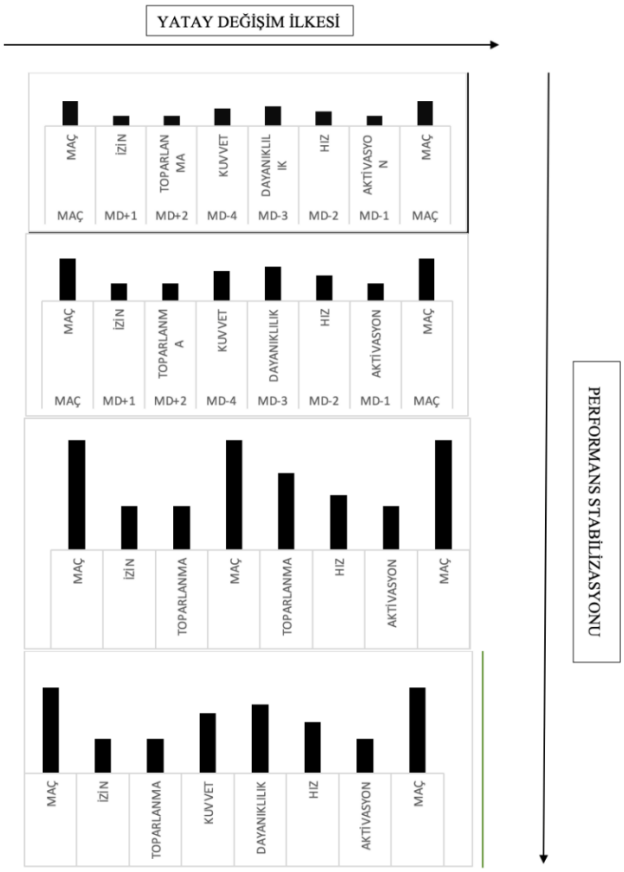
MD-2: Reaksiyon ve hız günü olarak tanımlanır (Clemente ve ark.,2019). Haftanın bugününde amaç, oyuncuları maksimum hızlarına ulaştırmaktır. Reaksiyon sürati de önem taşımaktadır. Yüklenme süreleri kısa, dinlenme süreleri ise uzundur. Kısa mesafede hızlanmalar ve yön değiştirmeler önemli yer tutar (Marin & Castellano, 2022). Doruklama döngüsünün başlangıcı olarak kabul edilir. Bugün de oyuncuların yüksek şiddet ve yoğunlukta 2 gün antrenman yaptığının ve bu antrenmandan 48 saat sonra maç oynayacağının farkında olmak gerekmektedir. Bu yüzden antrenman yoğunluğu düşük olmalıdır. Özetle, hız ve reaksiyon günü olduğundan antrenman yüksek şiddette aktiviteler içerebilir ancak düşük yoğunlukta ve uzun dinlenme aralıkları ile yapılmalıdır. Yüksek şiddetli olmayan patlayıcı kuvvet egzersizleri, PAP etkisi düşünülerek, düşük yoğunluk ve şiddette hız drillerinin önüne yerleştirilebilir (Villereal ve ark., 2015).

Taktiksel boyutta incelendiği zaman, haftanın bugününde bölgesel çalışmalar tercih edilmelidir (Owen, 2023). Savunma, orta saha ve forvet oyuncularının bölgesel çalışmaları teknik ve taktik çalışmalarda önem taşımaktadır. Örnek olarak, rakipsiz şut ve sonuçlandırma çalışmaları sprinte özgü yapılabilir. Aynı durum, rakipsiz taktiğe ve stratejiye özgü pas çalışmaları içinde geçerlidir. Sonrasında, 6v6 veya 7v7 olacak şekilde alan yaratma ve sonuçlandırma ile antrenman sürdürülebilir. Daha önce anlatıldığı gibi, taktiksel periyotlamada tüm taktiksel çalışmalar fiziksel yani atletik performans boyutu ile yapılmalıdır. Oyun modeli, baskıya dayalı ise, diğer oyun modellerinden daha fazla ikili mücadele olması beklenecektir. Bu nedenle, antrenmanda temas sayısı artırılmalı ve patlayıcı aksiyonlara daha fazla yer verilmelidir. Örnek olarak, bir takımın oyun modeline göre, sprint mesafesinin fazla olması gerekiyorsa, bundan önceki iki günde gerçekleştirilen antrenmanlarda eksik kalan sprint mesafesi bugün de tamamlanabilir. Ancak, maça iki gün kaldığı unutulmamalıdır. Bu nedenle, antrenman başında topsuz sprint drilleri sonrasında antrenman içerisinde taktiğe özgü özellikle bölgesel sonuçlandırma veya savunma drilleri ile devam edilebilir. Özellikle bugün de taktiksel periyotlamada kullanılan ölçeklendirme modeli ile sektörel ve grup çalışmaları yapılabilir (Oliveria in Farias,2016). Hücum oyuncularına yönelik sonuçlandırma çalışmaları, savunma oyuncularına özgü pozisyon alma ve top kesme çalışmaları ile birleştirilebilir. Aynı durum, kanat oyuncularının kanatlardan ortalara yönelik isabeti sağlama çalışmalarının, savunma oyuncularının topu uzaklaştırma ve hücum oyuncularının sonuçlandırma ile birleştireceği antrenman drilleri ile örneklendirilebilir. Burada genel amaç, fiziksel çıktı ve hedeflerin, bireysel, grup ve takım taktiği ve stratejisi ile birleştirilmesidir.

MD-1: Aktivasyon günü ve doruklama evresinin son günüdür (Guerrero-Calderón, ve ark., 2020). Amaç, oyuncuları maça fiziksel ve mental olarak hazırlamaktır. Yüksek hızda koşu ve sprintten kaçınılmalıdır (Martin-Garcia ve ark., 2018). Ancak, maçtan bir gün önce uyarıcı olarak reaksiyon ve nörömasküler aktivasyon yapılmalıdır (Thorpe ve ark., 2016). Bu nedenle, kısa mesafe yüksek şiddetli koşular ve reaksiyona bağlı hafif yön değiştirmeler kullanılabilir. Yüksek şiddetli egzersizler, bugünün içerisinde yoğunluk düşük olduğu için hedefi değiştirmeyecektir. Yüksek şiddetli egzersizlerin, sakatlık koruyucu etkisi olduğundan daha önce bahsetmiştik. Özellikle hamstring kasının eksantrik ve yüksek şiddetli egzersizler ile korunduğu bilinmektedir (Tsaklis ve ark., 2015). Güncel çalışmalar maçtan bir gün önce veya maç gününde yüksek şiddetli ancak çok düşük yoğunluklu kuvvet egzersizlerinin performansı artırdığını belirlemiştir (Valcarce-Merayo & Latella, 2022).

Taktiksel açıdan ise, özellikle oyuncuların zihinleri yenilemeleri açısından önemli bir gündür. Bu nedenle, 9v9, 10v10 taktik çalışmalar çok düşük yoğunlukta bugün yapılabilir (Martin-Garcia ve ark., 2018). Örnek olarak, toplamda 20-25 dakikayı geçmeyecek, setlere bölünmüş dinlenme aralıkları olan 11v11 çift kale antrenman bugün içerisinde uygulanabilir. Ya da geniş alanda 8v8 veya 9v9 taktik varyasyonlar çalışılabilir (Owen, 2023). Duran top organizasyonları bu çalışmanın içinde kullanılabilir. Taktiksel periyotlama açısından düşünüldüğünde, bugün oyun modeli ile doğrudan ilişkili olduğu için, bugünün periyotlaması diğer yöntemlerden ayrılmazlar. Şu ana kadar yatay değişim ilkesi açıklanmış

oldu. Kuvvet, dayanıklılık ve hız bileşenlerinin planlandığı ve bunun toparlanma ve aktivasyon ile olan ilişkisi anlatıldı. Yatay değişim de temel amaç, üç farklı bileşeni doğru şiddet ve yoğunlukta planlamaktır. Bu doğrultuda, toparlanma ve aktivasyon sağlanır ve sporcular yorgunluğa ve sakatlanma riskine karşı korunmuş olur (Malone ve ark., 2018). Her antrenman gününün taktiksel hedefleri değişebilir ancak fiziksel kondisyon bileşenleri aynı kalacaktır. Bu nedenle, taktiksel periyotlamanın fizyolojik boyutunun, futbola özgü antrenman ve toparlanma sürekliliğini sağladığı söylenebilir. Yatay değişim ilkesi haftalık planlama ile ilgilidir ancak futbolda performans stabilizasyonu için haftalık planlama yapmak yeterli olmayacaktır. Performans stabilizasyonu uzun vadede sağlanabilecek bir durumdur (bkz. Şekil 6). Bu nedenle, şekil 6'da gösterildiği gibi, dönemlemeye sadece yatay değil dikey olarak da bakmak gerekecektir. Futbolcuların etkili performans göstermeleri için iyi oynamaları gerekmektedir. İyi oynamaları için fiziksel olarak iyi durumda olmaları ile ilgili olacaktır. Ancak, iyi oyun sahada oyun modeline özgü verilen taktiksel görevleri yerine getirmektir. Bu doğrultuda, iyi oyunun önce fiziksel ancak fiziksel çıktının taktik ve oyun modeline uygun şekilde sergilenmesi ile mümkün olacağı söylenebilir. Bu durum, taktiksel periyotlamanın özetidir. Performans stabilizasyonunda amaç, her maç aynı verimde performans göstermek veya her maçı kazanmak değildir. Temel amaç, performansı stabil hale getirerek, ufak dalgalanmalara rağmen benzer performansları sahaya koyabilmektir (Garganta, 2009). Bu nedenle performans stabilizasyonu, haftalık planların sistematik bir şekilde sürdürülmesiyle olur. Genellikle, 4 haftalık planlamalar daha gerçekçi yaklaşımlardır. Bu doğrultuda, akut- kronik iş yükü hesaplanarak, futbolcuların haftalık antrenman yükü takibi de daha kolay yapılabilir (Alves ve ark., 2022). Fikstür değişkenliği, performans dalgalanmaları ve oyuncuların bireysel form durumlarına göre değişiklik yapılabilir. Bu doğrultuda, antrenman yükü de doğru oranda dağıtılabilir ve hem fiziksel hem taktiksel performans sürdürülebilir. Antrenman ve müsabakayı birbirinden ayırmadan metodolojik istikrar prensibine uyulur. Dönemleme sürecinin en önemli bileşenlerinden biri de konsantrasyondur. Oyuncular ne kadar konsantre olurlarsa, öğrenme ve gelişim süreçleri o kadar çabuk olur. Aynı zamanda, konsantrasyonu yüksek olan oyuncunun, hızlı düşünme ve karar verme becerisi de yüksek olacaktır (Hepler ve Chase, 2008). Bu nedenle, futbolcuların fiziksel yorgunluğu haricinde zihinsel yorgunluğu da hesaba katılmalıdır. Örnek olarak, MD+1 veya MD+2'de yüksek zihinsel yoğunluk gerektirecek antrenman planlamak ve oyunculardan yüksek konsantrasyon beklemek, diğer günlerde yapılacak olan yoğun antrenmanlarda zihinsel yorgunluğun artmasına neden olacaktır (Pelka ve ark., 2018). Bu nedenle, özellikle maçtan sonraki antrenman biriminin daha düşük zihinsel yoğunlukta olması sporcunun zihinsel toparlanmasını da artıracaktır.



Şekil 6. Dönemlemede yatay değişim ve performans stabilizasyon (Oliveira, 2014)

Mikro döngüde, haftalık ve haftalık periyotlamaya dayalı olarak 4 haftalık mikro döngünün planlaması anlatılmıştır. Her antrenman gününün amacı, haftalık maç sayısı ve maçlar arasındaki gün sayısına göre planlanmıştır.Haftalık planlamaya göre, performansın ne şekilde stabilize edilebileceği örneklendirilmiştir.

SONUÇ

Bu araştırmada, futbolda atletik performans antrenmanlarının taktiksel periyotlama perspektifinden nasıl ele alınması gerektiği incelenmiştir. Futbolda taktiksel periyotlama ve planlama ile ilgili yapılan literatür taraması sonucunda bulunan 127 kaynaktan, 69'u çalışmaya dahil edilmiştir. Yapılan literatür taraması, atletik performansın yalnızca fiziksel parametrelerle değil, aynı zamanda teknik, taktik ve psikolojik bileşenlerle bütünleşik olarak ele alınması gerektiğini ortaya koymaktadır. Taktiksel periyotlama metodolojisi, oyuncuların sahada karar verme süreçlerini hızlandırıdığı, fiziksel ve zihinsel uyumlarını da artırdığı düşünülmektedir.

Elde edilen bilgiler, yük yönetimi, antrenman yoğunluğu ve maç içi gereklilikler arasındaki dengeyi kurmanın, oyuncuların hem performanslarını hem de sakatlık risklerini etkileyen kritik faktörler olduğunu göstermektedir. Oyun modeline özgü antrenman tasarımı, antrenman verimini artırarak oyuncuların müsabaka temposuna daha iyi uyum sağlamalarını sağladığı tespit edilmiştir. Özellikle yük dağılımının optimize edilmesi ve antrenman senaryolarının oyun modeline uygun hale getirilmesi, takım içi uyumu güçlendiren önemli unsurlar olarak dikkat çektiği görülmüştür. Araştırmanın amacı doğrultusunda yapılan liteeratür taraması sonucunda, taktiksel periyotlamanın atletik performans antrenmanları açısından etkili bir yaklaşım sunduğunu göstermektedir. Ancak, bireysel oyuncu yük yönetimi, toparlanma süreçleri ve antrenman periyotlamasının uzun vadeli etkileri gibi konuların daha fazla araştırılması gerekmektedir. Bu bağlamda, taktiksel periyotlama modelinin farklı oyun tarzları ve lig seviyeleri üzerindeki etkileri gelecekteki çalışmalar için önemli araştırma alanları oluşturmaktadır. Ek olarak, metodolojinin farklı yaş grupları ve performans seviyelerindeki etkilerinin daha fazla araştırılması gerektiği görülmektedir. Ayrıca, taktiksel periyotlama uygulamalarının uzun vadeli performans stabilizasyonu ve sakatlık önleme üzerindeki etkilerinin detaylı incelenmesi önerilmektedir.

Sonuç olarak, bu çalışma atletik performans antrenmanlarının taktiksel periyotlama çerçevesinde bütüncül bir yaklaşımla ele alınmasının önemini vurgulamaktadır. Antrenman planlamasının, oyun modeline özgü stratejilerle uyumlu bir şekilde düzenlenmesi, oyuncuların fiziksel performanslarını maksimize ederken taktiksel bütünlüklerini de korumalarına yardımcı olacağı düşünülmektedir. Antrenörler ve performans analistleri için, bu metodoloji, takımın sürdürülebilir rekabet avantajı elde etmesini sağlamak açısından değerli bir rehber niteliği taşıdığı söylenebilir.

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The Impact of Circadian Rhythm and Running Training on The Agility and Lower Limb Performance of Pre-Adolescent Football Players

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Abstract

Aim: The objective of this study was to examine the impact of running training in accordance with the circadian rhythm on the agility and lower extremity muscles of football players.

Method: The subjects were divided into three groups according to the chronotype of the research: Runing group morning (10.52±0.51 years), Running group evening (11.09±0.67 years), and the control group (11.86±1.17 years). The study involved 75 volunteer football players. The subjects' age, height, body weight, functional performance tests and 505 agility tests were measured. The data obtained were analysed using SPSS 25 package programme. The significance level was set at $p>0.05$.

Results: According to the results obtained from the data, a significant difference was determined in the values of single-leg jump, triple jump, 6-meter single-leg jump, crossover jump, and 505 agility tests based on the ANOVA analysis ($p<0.05$). The greatest effect in the study was observed in the morning running group, where the single-leg jump value increased by 24.77%, the triple jump by 10.67%, and the crossover jump by 8.81%, while the 6-meter single-leg jump increased by 8.75% and the 505 agility test value decreased by 5.25%.

Conclusion: Consequently, following a 6-week running training programme synchronised with the circadian rhythm, it was determined that the performance of football players who ran in the morning was more effective. Running has a positive effect on the agility and leg strength of preadolescent football players. It is therefore recommended that this training be included in the training programmes to be implemented in terms of sportive performance.

Key words: *Agility, Football, Functional Performance Tests, Running Training.*

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INTRODUCTION

It has been determined that football training is important in terms of speed, agility and some anthropometric characteristics (Bayer, 1996). The game duration in football is long, the playing field is larger than in most branches, and there are continuous offensive and defensive actions throughout the match. Within the domain of football training, significant emphasis is placed on the cultivation of biomotor characteristics such as strength, speed, and endurance. The training model that will provide efficiency to the athlete is realised by considering the physical characteristics of the individual. The primary objective of the training programme applied to football players is to enhance their physical and physiological characteristics (Ateş et al., 2007). Football is characterised by high intensity, endurance, frequent sprints, coordination, rapid directional changes, the adept use of the ball, and precise in-game decisions (Agostini, 1994). Football is regarded by researchers and experts as a game, yet it is also recognised as a tool for education by various nations due to its favourable impact on the development of children and adolescents from a sociological and psychological standpoint, fostering mental and physical well-being (İnal, 2013). The importance of directing children in their developmental stage towards sporting activities cannot be overstated in terms of their physical and mental development. Football, a sport which continues to gain popularity on a daily basis, is a pastime in which a significant proportion of the global population engages. In this country, as well as in many others, it attracts a considerable following. In a sporting discipline with such widespread appeal, it is imperative to augment the infrastructure and sports schools to cater to the needs of all segments of the population. This necessitates the strategic development of athletes from an early age, with the ultimate goal of preparing them for future success (ibid.). Infrastructure and football schools have been identified as key contributors to the identification and development of talented athletes who meet the requirements of this discipline. A pivotal element in this process is the collaboration between school, family, and club. Education and training methods are of paramount importance in football (Kurban & Kaya, 2017).

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Football is a sport that requires a structured educational and training process. During this period, it is imperative that footballers receive training in the physical, tactical, technical and psycho-social aspects, and that they acquire these skills (Konter, 2004). The significant potential for growth exhibited by the young population in our country underscores the imperative for the establishment of robust infrastructure and the undertaking of rigorous research studies. Consequently, it is imperative that football training programmes for children and adolescents are scientifically designed and implemented (Eniseler, 2009). Specifically, fundamental biomotor characteristics encompass an individual's physical strength, aptitude, and multifaceted attributes. These characteristics encompass the capacity to execute movements with regard to strength, speed, endurance, mobility and coordination. It is acknowledged that these characteristics may be subject to variation in accordance with the adaptability and efficiency of the organism. While these characteristics are intrinsic to all humans, they can be cultivated through various exercises (Karaca, 2012). It is an established fact that anthropometric characteristics have a significant impact on the performance of athletes. However, the impact of anthropometry on biomotor characteristics remains a subject of considerable debate (Şentürk, 2006). In the developmental stage from childhood to adolescence (specifically between the ages of 8 and 13), the child's motor abilities undergo a period of rapid and significant growth. This developmental phase can be enhanced through the implementation of exercises and sporting activities (Muratlı, 2003). The period between the ages of 7 and 14 is the most significant in terms of performance development. In this age range, children rapidly acquire new movement forms and readily assimilate additional ones. Consequently, physical performance attains a level of distinction that is readily discernible at this age. Significant advancements in speed, aerobic endurance, and agility are observed during this period (Muratlı, 2003).

The development of biomotor characteristics in the period serves as a crucial support for the present study. The present study was conducted to determine the effect of morning and evening training on the lower extremity muscles of football players.

METHOD

Research model

In this study, a parallel two-group pre-test–post-test randomized controlled trial was conducted according to CONSORT guidelines (Moher et al, 2001). All participants and their parents were given detailed information about before the study, and written informed consent was obtained in accordance with the ethical principles described in the Declaration of Helsinki. Help was received from a 3rd-level athleticism coach for planning and implementing running exercises to be used in the project. The study was designed according to the rules of the Declaration of Helsinki (World Medical Association, 2013).

Population and sample

The aim of this study was to investigate the effects of morning and evening running training on lower extremity strength and agility performance in 10–12-year-old male soccer players who had been training regularly for at least 2 years. A power analysis was performed via the G. Power 3.1 program to determine the sample size of the study, and the d value was found to be 1.12 (α=0.05, 1-β=0.95, $\eta 2p$ = 0.8). As a result of the analysis, it was decided to include at least 20 participants for each group in the study. However, in order to circumvent potential complications, each group comprised 23 participants. The studies were divided into 3 groups: Running at morning group (RMG), Running at evening group (REG) and a control (CG) group.

Data collection tools

Chronotype

The HS-MEQ was used to assess the chronotype of each participant. On the basis of the scores obtained, individuals were classified into one of five chronotype categories: definite evening type (DET) (16--30), moderate evening type (MET) (31-41), no type (NT) (42--58), moderate morning type (MMT) (59--69) and definite morning type (DMT) (70--86) (Horne and Ostberg, 1976). As grouping athletes by chronotype results in significant diurnal variation and better performance data can be obtained when training and testing sessions are circadian in nature, the study grouped athletes by chronotype (Kusumoto et al., 2021). In our study, participants were grouped into 'moderate and definite morning

type' (MRG, n=25), 'no type' (CON, n=25) and 'moderate and definite evening type' (ERG, n=25) according to their responses to the questionnaire assessing morning/evening status. Participants who answered 'no type' were included in the control group (Roveda et al., 2020). The reason why extreme chronotypes were not found in the samples in this study was that such chronotypes were not included in the study.

Lower extremity strength tests

Dominant and nondominant foot measurements were taken for functional performance tests (FPTs), which were used to determine the subjects' lower extremity strength. Prior to each test, the subjects were instructed on how to perform the measurement. Three trials were performed for each test prior to the actual measurements. After the trial repetitions, the participant was subjected to 3 main tests, and the success criterion in the test was determined as the subject landing on one leg with full stabilization and staying there for three seconds. The subjects rested for 30 seconds between trials. Arm movement was allowed during the movement, and no restrictions were imposed (Munro & Herrington, 2011). For all the trials, a 30 cm strip was drawn on the ground as a starting point, a 6 m long and 15 cm wide strip was placed vertically on the ground from the center of this strip, and all the measurements were taken on this platform.

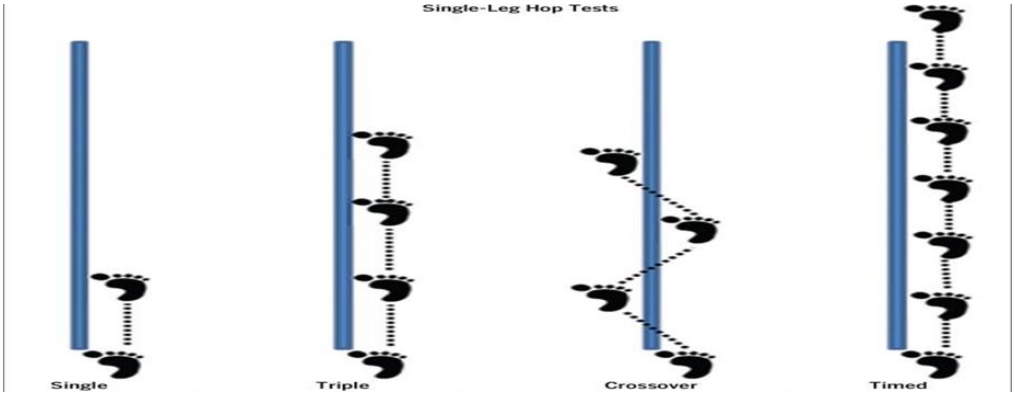

Figure 1. Application of Functional Performance Tests (Schmitt et al., 2012)

Single Leg Hop for Distance (SL)

In the SL test, subjects start standing on one leg at the marked starting line and, when ready, jump horizontally and as far as they can jump so that they fall on the same leg; the result is determined by the successful attempt between the starting line and the subject's heel and recorded in cm (Yılmaz & Kabadayı, 2020).

Triple jump for distance (THD)

In the THD test, the subject began by standing on one leg at the start line and, when ready, jumped horizontally as long as he could three times in succession without stopping. The distance between the starting line and the heel height of the subject's fall was recorded in cm (Yılmaz & Kabadayı, 2020).

Single Leg 6 m. Timed Hop Test (6mt THT)

The subject stands on one foot at the start line and finishes the 6-meter track in the fastest possible time. The test began at the start line and ended when the subject's heel touched the first point at which the subject crossed the finish line. All the subjects were tested three times, with a rest period of 2 minutes between each test. The test was timed in seconds using a standard stopwatch. The best time from the three trials was recorded in seconds. The use of arm movements during movement was allowed, and no restrictions were imposed (Schmitt et al., 2012).

Crossover Hop for Distance (CHD)

The subject stands on one foot at the starting line and performs 3 jumps forward, and the distance jumped is recorded in cm. The first jump starts diagonally opposite the foot used and continues laterally to the side of the fall. For each test, the subjects were given three repetitions. The criterion for success in the test was that the subject landed with full stabilization on the leg and remained standing for three seconds.

The best jump distance was recorded in cm. The subjects were given a 30 second rest interval between each trial (Schmitt et al., 2012).

505 Agility test: This test consists of measuring the time taken to complete the last 5 m of a 15 m track. The time within the first 10 m from the start of the test is not included in the test score. When the next 5 m distance is passed for the first time, the recording begins and stops when the same distance is returned (Nimphiu et al., 2016).

Measurement of height and weight: A Seca 769 electronic height measuring device (Seca Anonim Şirketi, Hamburg, Germany) was used. The device measures height with an accuracy of 0.1 cm and body weight with an accuracy of 0.01 kg. Body weight was measured in kilograms (kg) without shoes and wearing shorts and a T-shirt to avoid influencing the participants' weight. Height was measured in centimeters (cm) without shoes, with the body weight evenly distributed on both feet.

Running training

It was performed between 08:00 and 10:00 for morning running and between 18:00 and 20:00 for evening running (Bessot et al., 2014). The exercise intensity of each child in the running group was determined as the 50% heart rate (HR) according to the Karvonen formula (target pulse: (220-age-basal pulse) × intensity) + basal pulse) (Goldberg et al., 1988). HR was determined via a telemetric heart rate monitor (PolarM400, Finland) during the first week of running training. Environmental conditions are known to influence the degree of airway epithelial disruption during high-intensity exercise (Boukelia et al., 2017). Therefore, all the participants performed continuous running exercise on a football field in Centre / Elazığ /Turkey (altitude: 1067 m). It was performed for 50 minutes (including 10 min warm-up and cool-down), 3 days a week, for 8 weeks at the set target heart rate. Each session was supervised by trainers. Running included approximately 10 minutes of warm-up and cool-down with static stretching and light exercises of the relevant muscle groups. The coaches were responsible for monitoring the athletes' running technique and speed, ensuring safety and providing motivation. Both groups were provided sufficient water to avoid dehydration (Maresh et al., 2006).

Data analysis

The statistical software programme SPSS 25.0 was utilised for the analysis of the data obtained in the study. The variables were evaluated using the Kolmogorov-Smirnov test, following the establishment of the prerequisites of normality and homogeneity of variances. Upon examination of the normal distribution curves, deviations from normality were observed within the range of ±1.5. The researcher accepted that the data showed normal distribution and normal distribution tests were applied. The variables were expressed using mean ± standard deviation values. In the analysis of more than two groups, the one-way analysis of variance (ANOVA) test was applied by calculating the difference values (Post-Pre=Difference). The graphical representation of the findings was facilitated by the GraphPad Prism 10 programme.

RESULTS

In this section of the study, the obtained results are presented in tables and figures.

Table 1. Characteristics of participants.

Group	RMG (n:23)		REG (n:23)		CG (n:23)	
	X	S.D.	X	S.D.	X	S.D.
Age	10,52	0,51	11,09	0,67	11,86	1,17
Heigh	145,78	6,76	147,35	8,29	148,27	7,85
Weight	35,57	6,96	37,17	6,23	53,50	69,80

Table 1 summarizes the age, height, and weight characteristics of participants in three different groups (RMG, REG, and CG). When examining the groups, it is observed that the CG group has the highest average age (11.86 ± 1.17). Although the height averages are similar, the CG group has a slightly higher value. In terms of weight data, the CG group's average (53.50 ± 69.80) was found to be higher than the others.

Table 2. Groups' responses to the training

		RMG		%	REG		%	CG		%
		X	S.D.		X	S.D		X	S.D	
6mt THT	Pre	2,74	0,43	-8,75	2,74	0,55	-1,82	2,6	0,32	-3,46
	Post	2,5	0,46		2,69	0,55		2,51	0,32	
Agility	Pre	3,43	0,35	-5,25	3,27	0,38	-2,45	3,19	0,21	2,50
	Post	3,25	0,32		3,19	0,33		3,27	0,26	
SL	Pre	78,27	7,57	24,77	91,52	26,76	6,27	109,23	18,52	4,04
	Post	97,66	20,11		97,26	24,91		113,64	15,01	
CHD	Pre	289,09	63	8,81	295,22	71,92	5,54	344,73	49,5	0,96
	Post	314,57	61,83		311,57	73		348,05	50,07	
THD	Pre	307,35	54,92	10,67	319,83	68,74	-0,10	363,95	48,39	1,09
	Post	340,13	50,55		319,48	69,35		367,91	48,7	

**p<0,05; One Way ANOVA Test*

Upon analysis of Table 2, it was determined that the morning run group exhibited the most significant alterations. A decline of 8.75% was observed in the 6-metre timed single-foot jump, while a 5.25% decrease was noted in the agility test. Conversely, there was a 24.77% increase in single step jump, 8.81% increase in cross jump test and 10.67% increase in triple jump test.

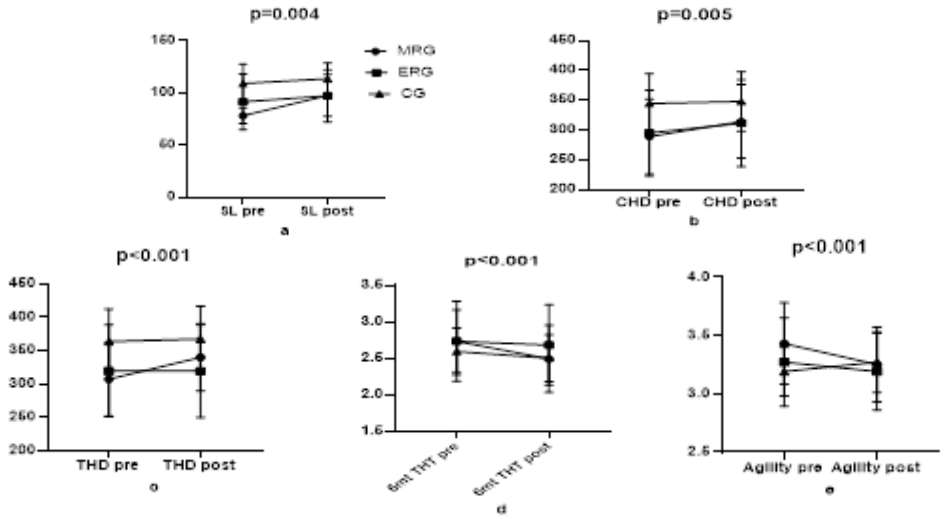

Figure 2. Comparison of the difference values of the lower extremity strength tests (dominant) a) Single leg (SL), b)Crossover (CHD), c) Triple leg hop for distance (THD) d)6 m timed-hop test (6 m THT), e) Agility.

Figure 2 presents a comparative analysis of the difference values in lower extremity strength tests performed with the dominant leg.

DISCUSSION

The objective of this study was to examine the impact of a 6-week exercise regime on the lower extremity musculature of football players. The investigation revealed that the morning running group exhibited an 8.75% decline in the 6-metre single foot jump measurement between the baseline assessments and the follow-up evaluations following a 6-week intervention. The findings of this study indicated that the 6-week training programme had a favourable impact on the 6-metre single foot jump test of the morning running group. Kurt et al., (2021) reported that there was a statistically significant difference in the 6 m single foot jump test in the study titled Investigation of the effect of strength exercises applied after anterior cruciate ligament surgery on the lower extremities in female athletes. Abrams et al., (2014) examined traditional jump tests in their study and determined that 6 m timed and single leg crossover jump tests were the best predictors for return to the field. The study further noted that 70% of the results fell within normal limits during the initial 6 months, with this figure remaining below 90% across the majority of categories within the subsequent 12 months. In the context of the agility assessment of football players, it was observed that there was a 5.25% decrease between the measurements taken 6 weeks before and after the morning run group. In a subsequent study, Şengür

(2018) utilised the Illinois agility test to evaluate the agility performance of 33 football players. The present study sought to analyse the agility performance of football players by comparing the pre-test and post-test values in the absence and presence of vibration training. The findings indicated a statistically significant enhancement in the agility performance of the football players. In a similar vein, Chin et al., (2016) reported that vibration training significantly improved agility, speed, and power performance in male volleyball players. A similar finding was reported in a study conducted on 21 male college football players, where it was found that acute vibration exercises improved speed and agility performance. In a separate study, Meylan & Malatesta (2009) reported a decrease in agility test time of -9.6% after eight weeks of plyometric training in a group of 14 boys with a mean age of 13.3 years (Jeffrey et al., 2013). In addition, a separate study involving 19 individuals reported that a 8-week whole body vibration training programme led to significant improvements in agility performance (Bayram, 2015). A 24.77% increase in the single step jump test of football players was determined between the measurements taken 6 weeks before and after the morning running group. In a separate study, forward and multidirectional single leg jump tests were applied to footballers, revealing very low level asymmetries and balanced strength development between dominant and non-dominant legs in the subject group. In this context, it was evaluated that the risk of injury was low in the pre-season measurements of football players (Akyuz, 2022). Sobido et al. (2017) determined that the training performed in the study increased statistically in the single step jump test. In a related study, Cankurtaran (2022) examined the impact of both static and dynamic core training on the performance responses of female taekwondo athletes in her master's thesis. The findings revealed a statistically significant difference in single step jump values between the dynamic and static core training groups. In the study by Reid et al. (2007), the affected side distance measured single step jump test of subjects with ACL surgery was 127.4 cm for the affected leg, while the second measurement was 129 cm. In a subsequent study, Kızılet (2011) examined the effect of coordination and plyometric exercises on running economy and other biomotor characteristics in young female football players. The study found that there was an improvement in single foot jump value. The findings indicated an 8.81% increase in the mean value of the single-foot jump test, as measured across the 6-week period following the incorporation of morning running sessions into the subjects' training regimens. The findings further demonstrated that the training programme led to a notable enhancement in the cross jump performance of 11-year-old footballers. Conversely, Bračič et al., (2022) reported that no statistically significant difference was observed in the cross jump test in a study conducted on elite football players at different league levels. Bračič et al. (2010) discovered greater asymmetries in runners, as measured by unilateral vertical countermovement jumps from each leg, which were associated with slower sprint starts. Hoffman (2007) demonstrated that asymmetries of approximately 10 per cent in power resulted in diminished change of direction velocity. In addition, Young & Farrow (2006) asserted that change of direction speed encompasses the ability to accelerate and decelerate quickly, as well as change of direction, which is a component of agility. It was further emphasised that leg strength constitutes a pivotal component of both linear acceleration and change of direction speed. The findings of the study revealed a 10.67% increase in the three-step jump test of football players following the training intervention. In a subsequent study by Reid et al., (2007), the affected side distance-measured three-step jump test of subjects with ACL surgery yielded a result of 363 cm for the affected leg, with a second measurement of 372 cm. For the contralateral side, the initial measurement was recorded at 440 cm, while the subsequent measurement registered at 452 cm. The cross jump test yielded a measurement of 328 cm for the affected side, with a second measurement of 331 cm. The unaffected side demonstrated a measurement of 387 cm, with a second measurement of 399 cm. In the study by Gözel (2023), the impact of a basic tennis training programme on motor skills in children aged 10-12 years was examined. The study found a statistically significant difference in three-step jump measurements.

CONCLUSION

As a result; It is seen that morning running affects the performance of football players as a result of 6 weeks of training. In line with the data obtained, we think that morning running affects the performance of athletes positively and that it will be important to include it in training programs to be implemented in terms of sports performance.

Etical Approval and Permission Information

Ethics Committee: Gümüşhane University Scientific Research and Publication Ethics Committee
Protocol/Number E-95674917-108.99-248173

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The Dark Tetrad Personality Traits and Communication Skills: A Study on Physical Education Teachers

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Abstract

Aim: This study aims to examine the relationship between physical education teachers' dark tetrad personality traids (machiavellianism, narcissism, psychopath and sadism) and their coaching communication skills.

Method: The study was conducted with 245 physical education teachers, consisting of 126 female and 119 men, with an average age of 23.4 years. Additionally, dark tetrad personality traids and communication skills were compared based on variables such as marital status, gender, years of experience, years of sports participation and type of sport branch. The research data were found to follow a normal distribution and a one-way analysis of varience (ANOVA) was applied for variable comparisons.

Results: The findings indicate that physical education teachers generally exhibit moderate levels of dark tetrad personality traits while possessing high levels of communication skills. No significant differences were observed between dark tetrad traids and communication skills based on demographic variables such as gender, marital status and type of sports branch. However, in the psychopathy sub-dimension, married teachers scored higher than unmarried teachers and male teachers had higher psychopathy levels and communication skills, indicating that as psychopathy levels decrease, communication skills improve. At the same time, a significant difference was found between the variables of years of professional experience and years of sports and the psychopathy sub-dimension in favor of those with lower levels of sports and professional experience.

Conclusion: These findings provide an important foundation for understanding how dark tetrad personality traits influence effective communication with athletes.

Key words: *Communication Skills, Dark Tetrad, Personality, Physical Education Teachers.*

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INTRODUCTION

Nowadays, the relationship between individuals' personality traits and communication skills is becoming increasingly important, especially in the fields of education and sports. These traits are particularly prominent in terms of professional and personal values for teachers, who are constantly engaged in social interactions. Physical education teachers are not only individuals who provide physical education in school settings but also professionals who coach team sports, individual sports, or other physical activities. These dual roles require teachers to develop both instructional and leadership skills. The personality traits of individuals who simultaneously undertake teaching and coaching responsibilities play a significant role in their relationships with students and athletes. Personality traits directly influence teachers' behaviors, leadership styles, and communication methods, which, in turn, shape the efficiency of the educational environment and student development (Griffiths, 2022). Research in personality psychology has shown that certain personality traits significantly impact social interactions, leadership, and group management. In this context, the "dark tetrad" personality traits machiavellianism, narcissism, psychopathy, and sadism refer to manipulative, self-centered, and emotionally indifferent tendencies in interpersonal relationships (Türkdoğan & Balkıs, 2024; Yavuz & Şahin, 2023). Given that physical education teachers also serve as coaches, these personality traits may play a crucial role in their interactions with students and athletes. Therefore, in order to better understand the relationship between dark personality traits and communication skills through this research, it is first necessary to define the concepts of dark tetrad, machiavellianism, narcissism, psychopathy, and sadism.

The dark tetrad personality model describes individuals who exhibit manipulative, self-serving, and emotionally detached attitudes in social interactions. This model comprises four primary traits: machiavellianism, narcissism, psychopathy, and sadism (Bonfá-Araujo et al., 2022; Neumann et al., 2022; Paulhus et al., 2021). The fact that physical education teachers also work as coaches may cause them to be influenced by these personality traits. Greitemeyer (2022) also suggested that each of the

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dark tetrad traits can directly affect teachers' communication styles, leadership strategies, and relationships with their athletes.

Machiavellianism is a multidimensional personality trait that encompasses interpersonal tactics, a cynical view of human nature, distrust of others, and a disregard for traditional values (Martin et al., 2012). Individuals exhibiting machiavellian traits tend to form hypocritical and superficial relationships, yet they are often perceived as charismatic and persuasive (Sabouri et al., 2016). Therefore, machiavellianism can be defined as the tendency to manipulate others, seek personal gain, and push ethical boundaries to achieve one's goals. A machiavellian teacher or coach is likely to establish strong authority within a team and use athletes to serve their own interests. These individuals may apply pressure solely for success and strategically manipulate those they interact with to reach their objectives (Jalilishishavan, 2024; Grover & Furnham, 2022).

In narcissism, rather than a conscious strategy of exploiting others in social environments, individuals tend to see themselves as superior and special. Meere & Egan (2017) associated narcissistic individuals with a grandiose sense of self and a strong desire for external validation. These individuals are characterized by megalomania, exaggerated self-love, dominance, a sense of superiority over others, egocentrism, and self-aggrandizement (Sabouri et al., 2016). In summary, these self-admiring individuals cannot focus on anything beyond themselves and their own interests. They always perceive themselves as the best, the most successful, and the most deserving (Zhang et al., 2024). A narcissistic physical education teacher and coach may constantly emphasize their achievements and view their athletes as mere tools for their personal glorification. Such personalities often exhibit a lack of empathy and may ignore the emotional needs of their athletes. Narcissistic teachers and coaches tend to expect constant admiration and approval, which can disrupt team dynamics and create an imbalanced leadership style. Additionally, they may position themselves as the central figure in their relationships with athletes, maintaining an authoritative presence in every situation (Peng & Huang, 2024). In addition, psychopathy is defined as a lack of empathy and emotional coldness. Psychopathic individuals show little concern for others and prioritize their own interests. A psychopathic teacher or coach may be indifferent to the emotional states of their athletes and focus solely on physical performance. They tend to evaluate athletes based only on results and disregard their psychological well-being. Additionally, they may exhibit impulsive decision-making, leading to a lack of control within the team, and adopt a rigid, emotionally distant communication style (Colangelo et al., 2023). Finally, sadism is, in its simplest definition, the tendency to derive pleasure from the pain of others. It can also be described as the tendency to enjoy one's own psychological or physical suffering, resorting to lies at the expense of others' harm, and attempting to manipulate others through fear to make them perform tasks (Paulhus et al., 2021). A sadistic teacher or coach may push athletes to their limits by causing them psychological or physical harm. These types of coaches can establish a fear-based leadership within the team. A sadistic approach generally undermines trust and motivation within the team because athletes may be forced to develop solely through pain and hardship. Sadistic attitudes lower athletes' morale, disrupt harmony within the team, and may negatively affect individual performance in the long run (Colangelo et al., 2023).

Physical education teaching and coaching require effective communication skills. A teacher or coach does not merely convey technical knowledge but also motivates, fosters trust, and provides psychological support. Effective communication is essential for guiding athletes' development, offering feedback, and managing team dynamics (Charlina et al., 2024). Teachers and coaches with dark tetrad traits often exhibit manipulative, harsh, and emotionally distant communication styles (Martens & Vealey, 2024; Pedersen et al., 2021). Machiavellian, narcissistic, and sadistic personalities may employ strategic, praise-seeking, and oppressive communication tactics, while psychopathic coaches display a lack of empathy and emotional detachment. Such communication styles hinder healthy relationships with athletes, reduce motivation, and decrease educational efficiency (Purnomo et al., 2021; Gharayegh Zandi, 2021). Therefore, through this study, it has been considered important for the literature to investigate and evaluate the communication skills and negative personality traits of teachers, who play an important role in shaping society.

The aim of this study is to examine the relationship between the dark tetrad personality traits and communication skills displayed by physical education teachers with coaching backgrounds. The following hypotheses have been evaluated in the research:

H_0: There is no statistically significant difference between the communication skills and dark tetrad traits of physical education teachers with coaching backgrounds and the variables of age, gender, marital status, professional experience, years of sport, and type of sport.

H_1: There is a statistically significant difference between the communication skills and dark tetrad traits of physical education teachers with coaching backgrounds and the variables of age, gender, marital status, professional experience, years of sport, and type of sport.

H_2: There is a statistically significant negative relationship between the communication skills and dark tetrad traits of physical education teachers with coaching backgrounds.

METHOD

Research model

This study employed a quantitative research design utilizing a relational survey model. The relational survey model is a method used to analyze the correlation and effects between quantitative variables using correlation coefficients (Fraenkel & Wallen, 2006). Therefore, this study adopted this model to understand the relationship between physical education teachers' dark tetrad personality traits and communication skills.

Population and sample

The study included a total of 245 physical education teachers, 126 (51.4%) female and 119 (48.6%) male, working in public schools in Aydın province in the spring and fall semester of 2024. After accessing the information about the universe in the province, (450) according to the G*power calculation made with a margin of error of a=0.05 and a confidence interval of 95% (Sullivan, 2020), their size was determined as 245. In determining the sample range, the model that can be easily learned was preferred because it is both faster and easier to access the data and economical in terms of time and money for the researchers (Benoot et al., 2016). The inclusion criteria for the study were determined as physical education and sports teachers working in public schools and those who do not want to ensure the participation of volunteers, private institutions and other branches were excluded from the research.

Table 1. Demographic characteristics of physical education teachers participating in the study

Variables	Groups	*f*	%
Age	21-25	99	40,4
	26-30	73	29.8
	31-35	47	19.2
	36+	26	10.6
Marital status	Married	113	46.1
	Single	132	53.9
Gender	Female	126	51.4
	Male	119	48.6
Years of experience	1-3 age	104	42.4
	4-6 age	55	22.4
	7-9 age	51	20.8
	10 age+	35	14.3
The year of sports	1-3 age	36	14.7
	4-6 age	36	14.7
	7-9 age	64	26.1
	10 age+	109	44.5
Type of branch	Teams Sports	165	67.3
	Individual Sports	80	32.7
Total		245	100.0

It was determined that 40.4% of the physical education teachers participating in the study were between the ages 21-25 and were generally between the ages of 21 and 36 and over, and 53.9%, that is, were single in marital status. 51.4% of physical education teachers were female and 48.6% were male. While 42.4% had 1-3 years of experience in the teaching profession, it is seen that the rest of the participant

group had more than 4 years of experience. Again, 44.5% of physical education and sports teachers reported that they have been doing sports for 10 or more years. When the type of branch they have done in the past is examined; 67.3% of them did team sports and 32.7% of them did individual sports.

Data collection tools

Demographic Information Form: Designed by the researchers, this form collected data on participants' age, gender, years of experience, marital status, years of sports participation, and type of sports branch.

Dark Tetrad Personality Scale: Originally developed by Paulhus et al., (2021) with 28 items covering machiavellianism, narcissism, psychopathy, and sadism, the scale was adapted into Turkish by Aytaç (2022). After factor analysis, the adapted scale consisted of 21 items, with Cronbach's alpha values of 0.90 for machiavellianism, 0.77 for narcissism, 0.77 for psychopathy, and 0.70 for sadism, indicating adequate reliability (Taber, 2018).

Coach Communication Skills Scale: Developed by Yılmaz et al. (2010), this 5-point Likert-type scale consists of 48 items and assesses coaches' communication skills based on athletes' perceptions. The original study reported a reliability coefficient of 0.95, while in this study, it was found to be 0.82, indicating high reliability (Taber, 2018).

Data analysis

Data were collected online from 245 physical education teachers with coaching experience. The SPSS 26 statistical software was used for data analysis. Skewness and kurtosis values were examined to check normality, revealing that all variables fell within the accepted range of -1.5 to +1.5 (Tabachnick & Fidell, 2013). Reliability analysis showed that Cronbach's alpha coefficients for all scales were above 0.70, indicating sufficient reliability (see. Table 2). Given the normal distribution of the data, one-way ANOVA was conducted to compare dark tetrad traits and communication skills across age, years of experience, and years of sports participation. For marital status, gender, and type of sports branch, an independent samples t-test was applied. Post-hoc Bonferroni tests were used to determine the source of significant differences. Additionally, Pearson correlation analysis was performed to examine the relationships between the scales.

Table 2. Skewness, kurtosis and Cronbach's alpha values of the scales used

Skale	Skewness	Kurtosis	α (Cronbach)
Machiavellianism	0.036	-0.499	0.905
Narcissism	-0.342	0.100	0.771
Psychopathy	0.106	-0.918	0.770
Sadism	0.258	-0.575	0.709
Coach Communication Skill	-0.492	0.771	0.823

RESULTS

In this part of the study, the findings of the dark quadruple and communication skill values obtained from physical education teachers with a coaching background were included.

Table 3. Physical education teachers' dark quadruple and communication skill levels

Skale	n	Min.	Max.	Mean	S.D.
Machiavellianism	245	1.00	5.00	2.78	0.89
Narcissism	245	1.00	5.00	3.13	0.81
Psychopathy	245	1.00	5.00	2.50	0.99
Sadism	245	1.00	5.00	2.64	0.96
Coach Communication Skill	245	2.88	5.00	4.22	0.39

The mean score of physical education teachers' coach communication skills was obtained as 4.22. In addition, machiavellianism scores were 2.78, narcissism scores were 3.13, psychopathy scores were 2.50, and sadism scores were 2.64, which are sub-dimensions of the dark quadruple scale. On the dark quadruple scale, the highest score of physical education teachers was in the narcissism sub-dimension, and the lowest score was in the psychopathy sub-dimension. When the table is examined, it is seen that physical education teachers with a coaching background have average dark quadruple personality traits and have a high level of communication skills.

Table 4. Comparison of physical education teachers' dark quadruple and communication skill levels according to age variable

Skale	Age	n	Mean	S.D.	F	p
Machiavellianism	21-25[1]	99	2.67	0.91	0.87	0.45
	26-30[2]	73	2.88	0.76		
	31-35[3]	47	2.81	0.90		
	36 ve üzeri[4]	26	2.83	1.10		
Narcissism	21-25[1]	99	3.11	0.92	0.69	0.55
	26-30[2]	73	3.20	0.71		
	31-35[3]	47	3.16	0.70		
	36 ve üzeri[4]	26	2.93	0.85		
Psychopathy	21-25[1]	99	2.33	1.08	1.95	0.12
	26-30[2]	73	2.65	0.92		
	31-35[3]	47	2.65	0.77		
	36 ve üzeri[4]	26	2.46	1.10		
Sadism	21-25[1]	99	2.61	1.08	1.48	0.22
	26-30[2]	73	2.65	0.84		
	31-35[3]	47	2.84	0.77		
	36 ve üzeri[4]	26	2.35	1.04		
Coach Communication Skill	21-25[1]	99	4.24	0.47	0.62	0.59
	26-30[2]	73	4.18	0.32		
	31-35[3]	47	4.18	0.31		
	36 ve üzeri[4]	26	4.27	0.39		

p<0.05

According to the results given in Table 4, it was determined that machiavellianism [F(3.241)=0.87; p>0.05], narcissism [F(3.241)=0.69; p>0.05], psychopathy [F(3.241)=1.95; p>0.05] and sadism [F(3.241)=1.48; p>0.05] and coach communication skills [F(3.241)=0.62; p>0.05] levels, which are sub-dimensions of the dark quadruple scale, did not differ significantly according to their age.

Table 5. Comparison of the dark quadruple and communication skill levels of physical education teachers according to the marital status variable

Skale	Marital Status	n	Mean	S.D.	t	p
Machiavellianism	Married	113	2.88	0.88	1.65	0.09
	Single	132	2.69	0.89		
Narcissism	Married	113	3.13	0.77	0.01	0.98
	Single	132	3.13	0.85		
Psychopathy	Married	113	2.72	0.91	3.29	0.00
	Single	132	2.31	1.01		
Sadism	Married	113	2.73	0.92	1.35	0.17
	Single	132	2.56	0.99		
Coach Communication Skill	Married	113	4.21	0.33	-0.41	0.67
	Single	132	4.23	0.44		

p<0.05

According to the results given in Table 5, there was no significant difference between the scores of machiavellianism, narcissism and sadism, which are the sub-dimensions of the dark quadruple scale, and the level of coach communication skills according to the marital status of physical education teachers (p>0.05); It was determined that the psychopathy sub-dimension scores differed significantly (p<0.05). When the averages were examined, it was determined that the psychopathy scores of married physical education teachers were higher than those of single physical education teachers.

Table 6. Comparison of physical education teachers' dark quadruple and communication skill levels according to gender variable

Skale	Gender	n	Mean	S.D.	t	p
Machiavellianism	Female	126	2.69	0.92	-1.60	0.11
	Male	119	2.87	0.84		
Narcissism	Female	126	3.03	0.88	-1.85	0.06
	Male	119	3.23	0.73		
Psychopathy	Female	126	2.34	1.01	-2.64	0.00
	Male	119	2.67	0.93		
Sadism	Female	126	2.44	1.01	-3.26	0.00
	Male	119	2.84	0.87		

Coach Communication Skill	Female	126	4.22	0.42	0.14	0.88
	Male	119	4.21	0.37		

p<0.05

According to the results given in Table 6, it was found that there was no significant difference between the machiavellianism and narcissism scores, which are the sub-dimensions of the dark quadruple scale, and the level of coach communication skills of physical education teachers according to their gender (p>0.05); It was determined that the sub-dimension scores of psychopathy and sadism showed significant differences (p<0.05). When the averages were examined, it was determined that the psychopathy and sadism scores of male physical education teachers were higher than those of female physical education teachers.

Table 7. Comparison of the dark quadruple and communication skill levels of physical education teachers according to the variable of years of experience

Skale	Years of experience	n	Mean	S.D.	F	p	Bonferroni
Machiavellianism	1-3[1]	104	2.66	0.93	1.07	0.36	
	4-6[2]	55	2.86	0.71			
	7-9[3]	51	2.93	0.78			
	10 ve üzeri[4]	35	2.91	1.12			
Narcissism	1-3[1]	104	3.09	0.93	0.22	0.88	
	4-6[2]	55	3.20	0.69			
	7-9[3]	51	3.12	0.67			
	10 ve üzeri[4]	35	3.11	0.84			
Psychopathy	1-3[1]	104	2.26	0.99	3.77	0.01	3>1
	4-6[2]	55	2.67	1.01			
	7-9[3]	51	2.72	0.85			
	10 ve üzeri[4]	35	2.62	1.02			
Sadism	1-3[1]	104	2.54	1.08	0.90	0.43	
	4-6[2]	55	2.62	0.77			
	7-9[3]	51	2.81	0.79			
	10 ve üzeri[4]	35	2.70	1.05			
Coach Communication Skill	1-3[1]	104	4.26	0.50	2.18	0.09	
	4-6[2]	55	4.14	0.33			
	7-9[3]	51	4.15	0.25			
	10 ve üzeri[4]	35	4.30	0.26			

p<0.05

According to the results given in Table 7, machiavellianism [F(3.241)=1.07; p>0.05], narcissism [F(3.241)=0.22; p>0.05] and sadism [F(3.241)=0.90; p>0.05] and coach communication skill [F(3.241)=2.18; p>0.05] levels, which are sub-dimensions of the dark quadruple scale, did not differ significantly according to the years of experience of physical education teachers; psychopathy [F(3.241)=3.77; p<0.05] sub-dimension scores were found to differ significantly. Bonferroni test was applied to determine which groups had differences in the psychopathy sub-dimension score. According to the results of the Bonferroni test, it was determined that the psychopathy scores of physical education teachers with 7-9 years of experience were higher than physical education teachers with 1-3 years of experience.

Table 8. Comparison of the dark quadruple and communication skill levels of physical education teachers according to the variable of sports year

Skale	The year of sports	n	Mean	S.D.	F	p	Bonferroni
Machiavellianism	1-3[1]	36	2.59	0.95	1.10	0.34	
	4-6[2]	36	2.68	0.95			
	7-9[3]	64	2.76	0.85			
	10 ve üzeri[4]	109	2.87	0.86			
Narcissism	1-3[1]	36	2.90	1.02	1.12	0.34	
	4-6[2]	36	3.11	0.92			
	7-9[3]	64	3.18	0.69			
	10 ve üzeri[4]	109	3.18	0.77			
Psychopathy	1-3[1]	36	2.19	1.08	3.11	0.02	3>1
	4-6[2]	36	2.26	1.04			
	7-9[3]	64	2.72	0.93			
	10 ve üzeri[4]	109	2.55	0.94			
Sadism	1-3[1]	36	2.54	1.15	0.60	0.61	

	4-6[2]	36	2.49	1.01		
	7-9[3]	64	2.66	0.89		
	10 ve üzeri[4]	109	2.71	0.92		
Coach Communication Skill	1-3[1]	36	4.19	0.55	2.20	0.08
	4-6[2]	36	4.37	0.31		
	7-9[3]	64	4.16	0.36		
	10 ve üzeri[4]	109	4.21	0.36		

p<0.05

According to the results given in Table 8, machiavellianism [F(3.241)=1.10; p>0.05], narcissism [F(3.241)=1.12; p>0.05] and sadism [F(3.241)=0.60; p>0.05] scores, which are the sub-dimensions of the dark quadruple scale of physical education teachers, and coach communication skills [F(3.241)=2.20; p>0.05] levels did not differ significantly according to their sports years; psychopathy [F(3.241)=3.11; p<0.05] sub-dimension scores were found to be significantly different. Bonferroni test was applied to determine which groups had differences in the psychopathy sub-dimension score. According to the results of the Bonferroni test, it was determined that the psychopathy scores of physical education teachers who did sports for 7-9 years were higher than physical education teachers who did sports for 1-3 years.

Table 9. Comparison of physical education teachers' dark quadruple and communication skill levels according to branch variable

Skale	Type of Sport	n	Mean	S.D.	t	p
Machiavellianism	Team sports	165	2.83	0.83	1.21	0.19
	Individual sports	80	2.67	0.98		
Narcissism	Team sports	165	3.15	0.78	0.73	0.46
	Individual sports	80	3.07	0.88		
Psychopathy	Team sports	165	2.58	0.96	1.89	0.06
	Individual sports	80	2.33	1.02		
Sadism	Team sports	165	2.72	0.91	1.86	0.06
	Individual sports	80	2.47	1.04		
Coach Communication Skill	Team sports	165	4.20	0.36	-0.83	0.40
	Individual sports	80	4.25	0.45		

p<0.05

According to the results given in Table 9, it was determined that the scores of machiavellianism, narcissism, psychopathy and sadism, which are the sub-dimensions of the dark quadruple scale, and the level of coach communication skills did not differ significantly according to the types of branches that physical education teachers had done in the past (p>0.05).

Table 10. Pearson correlation analysis between the dark quadruple scale and communication skill scales

Skale	Coach Communication Skill	Machiavellianism	Narcissism	Psychopathy
Machiavellianism	0.011	.	.	.
Narcissism	0.039	0.504**	.	.
Psychopathy	-0.134*	0.404**	0.285**	.
Sadism	-0.064	0.467**	0.407**	0.586**

**p<0.05; **p<0.01*

According to the results given in Table 10, it was determined that there was a negative and significant relationship between the communication skill levels of physical education teachers with a coaching background and psychopathy, which is a sub-dimension of the dark quadruple scale (r=-0.134; p<0.05). Accordingly, ıt can be said that as the psychopathy levels of physical education teachers decrease, their communication level increases. Again, it was determined that there was a moderate positive significant relationship between all sub-dimensions of the scale. In this case, when any undesirable personality trait increases, it leads to an increase in other undesirable personality traits.

DISCUSSION

This study focused on the dark tetrad personality traits and communication skills of physical education teachers with coaching experience, involving a total of 245 participants. The majority of the participants (40.4%) were between the ages of 21-25, while more than half (53.9%) were single, though the number of married participants was also significant. The sample consisted of 51.4% female and 48.6% male teachers. While 42.4% had 1-3 years of teaching experience, the remaining participants had more than

four years of experience. Additionally, 44.5% reported engaging in sports for over ten years, and 67.3% had a background in team sports, while 32.7% specialized in individual sports. These characteristics indicate that the sample group is composed of individuals with sufficient professional and athletic experience, making it a suitable representation for the study.

The study examined the relationship between dark tetrad traits, communication skills, and demographic variables such as age, marital status, gender, years of experience, years of sports participation, and type of sports branch. No statistically significant differences were found between age and communication skills, or between age and dark tetrad traits. This could be due to the homogeneous age distribution in the study, as well as potential limitations in the sample size and the sensitivity of the measurement tools used. Existing literature on dark tetrad traits among physical education teachers is limited, necessitating comparisons with research from other professional groups. Shen (2023) found a significant negative correlation between age and dark personality traits, indicating that older individuals exhibited lower levels of machiavellianism, narcissism, and psychopathy. Although this contrasts with our findings, it suggests a possible trend where dark personality traits diminish with age. However, our research indicates that negative personality traits may develop as age increases. Similarly, Birtürk & Biçer (2021) reported that communication skills improve with age among physical education teachers.

Furthermore, Onyedire et al., (2023) found that narcissism levels were higher in early adulthood, while Weidmann et al., (2023) reported lower levels of narcissism among older individuals. However, our findings did not indicate any statistically significant differences between years of experience and communication skills. On the contrary, a significant difference was found between years of experience and psychopathy, with teachers who had 7-9 years of experience scoring higher in psychopathy than those with 1-3 years of experience. This could suggest that prolonged exposure to competitive and leadership environments in sports may enhance authoritarian tendencies, manipulative behaviors, and emotional desensitization (Gonzalez-Hernandez et al., 2020; Leo et al., 2022; Yang et al., 2022). The fact that no statistically significant difference was found between communication skills and age or years of experience, which is another result of the study, was also reported in the research conducted by Uğur & Çolakoğlu (2019).

While a significant difference was found in the psychopathy subdimension of the dark tetrad scale concerning the marital status variable of physical education teachers with a coaching background where married individuals had higher scores no statistically significant difference was found in terms of communication skills. Similarly, statistically significant differences were found between gender and the psychopathy and sadism subdimensions of the dark tetrad scale; however, communication skills did not differ by gender. The literature contains both similar findings and studies reporting opposing results. Aluja et al., (2022) examined the relationship between marital status, gender, and dark personality traits in their study. While they found no significant differences in dark personality traits based on gender, they reported that single participants had higher levels of narcissism. Hussain et al., (2023) also found in their study that single individuals exhibited higher levels of narcissism. However, both findings contradict our research results. Other studies involving various sample groups have found that men tend to exhibit higher levels of narcissistic traits compared to women (Weidmann et al., 2023; Green et al., 2022; Chan & Chueng, 2022). Our research findings support the existing literature regarding male participants. This phenomenon may be attributed to societal roles and norms, where women are raised to be more empathetic and compliant, while men are encouraged to be more dominant and risk-taking. Additionally, personality traits and emotional regulation may also play a role. Similarly, Türkdoğan & Balkıs (2024) did not find a statistically significant difference between communication skills and the variables of gender and years of experience. Lastly, our study found no significant differences between the type of sports branch variable and both dark tetrad traits and communication skills. This could be due to the limited number of participants or the fact that they have already adapted to their profession as teachers. Considering that working individuals are in constant communication with others, their personality traits become particularly noteworthy (Szabo et al., 2021). The dark tetrad comprising machiavellianism, sadism, narcissism, and psychopathy is known as the social repulsiveness of personality (Ermiş et al., 2024) and is considered an undesirable trait among physical education teachers. Gharayegh Zandi (2021) explained in their study on the dark triad that even if an individual exhibits only moderate levels of these undesirable personality traits, they may still pose significant problems in

various contexts. It is important to acknowledge that the presence of such undesirable traits in individuals working in education can lead to various significant societal issues. Additionally, Türkdoğan & Balkıs (2024) found that social self-efficacy is a significant predictor variable in initiating and maintaining an effective communication process. Similarly, Alshaye (2024) identified that teachers' self-efficacy levels play a key role in their ability to establish effective communication. Therefore, it is unlikely for physical education teachers with high communication skills to develop undesirable personality traits. When examining the dark tetrad levels of the participant group, the mean scores were found to be as follows: Machiavellianism (X=2.78), narcissism (X=3.13), psychopathy (X=2.50), and sadism (X=2.64), all at moderate levels. Meanwhile, communication skills were determined to be at a high level (X=4.22). Similarly, Demchenko et al. (2021) and Charlina et al. (2024) also found that physical education teachers' communication skills were at a sufficient level.

Finally, a negative and significant relationship was found between the communication skill levels of physical education teachers with a coaching background and the psychopathy subdimension of the dark tetrad scale ($r=-0.134$; $p<0.05$). Accordingly, it can be stated that as the psychopathy levels of physical education teachers decrease, their communication levels increase. Voulgaris et al. (2024) explained psychopathic tendencies in interpersonal communication as being associated with high impulsivity or low anxiety. Additionally, a moderate and significant positive relationship was found among all subdimensions of the scale. This indicates that an increase in any undesirable personality trait leads to an increase in other undesirable personality traits. No similar national study was found that could be directly associated with this result, making the findings valuable for the literature. Previous studies in different fields have also explored the relationships between the dark tetrad and various variables. Research has shown significant associations between the dark tetrad and attachment style, self-esteem, and childhood trauma (Set & Çelik, 2023), motivation and burnout (Talak, 2022), social media addiction (Özmen & Kocakaya, 2024), and happiness (Filiz et al., 2023). As a result of the study, H_0 and H_1 were partially confirmed, while H_2 was fully confirmed.

CONCLUSION

The findings suggest that while physical education teachers with coaching experience possess moderate levels of dark tetrad personality traits, they exhibit high levels of communication skills. A significant negative correlation was found between psychopathy and communication skills, indicating that as psychopathy levels decrease, communication skills improve. Moreover, a positive correlation was observed among all dark tetrad traits, suggesting that an increase in one undesirable trait may contribute to the elevation of others. These findings highlight the importance of effective communication in mitigating the potential negative effects of dark tetrad traits among physical education teachers. The results suggest that developing strong interpersonal communication skills could serve as a protective factor against undesirable personality tendencies.

Future research should aim to expand the sample size and include a more diverse group of physical education teachers to enhance the generalizability of findings. Additionally, longitudinal studies could provide further insights into how personality traits and communication skills evolve over time. The study contributes to the literature by offering new perspectives on how personality traits influence professional interactions in sports education and coaching contexts.

Etical Approval and Permission Information

Ethics Committee:	Aydın Adnan Menderes Üniversitesi Sosyal ve Beşeri Bilimler Araştırmaları Etik Kurulu
Protocol/Number	10/03

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The Effect of Soccer Specific and Traditional Warm-up Protocols on Endurance Performance

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Abstract

Aim: The aim of this study was to investigate the effects of 3 different warm-up phases on endurance performance.

Method: The subjects in U-15 and U-17 soccer players participated in the study. Athletes were made to perform 3 different warm-up phases including traditional, 1x5 minutes 5:5 SSG and 1x5 minutes SSG plus 40+40 m sprint lasting 20 minutes in total. After each warm-up phase, the intensity of the warm-up was recorded with the degree of rate of perceived exertion (RPE) with a Borg scale of 20, and endurance performances of the athletes were determined by applying 30-15 intermittent fitness test (30-15$_{IFT}$). RPE, maximal aerobic running speed (MAS) and maximum oxygen consumption capacity (VO_{2max}) were determined after 30-15$_{IFT}$.

Results: While there was a significant difference between the RPE values after warm-up, MAS and VO_{2max} values after 30-15$_{IFT}$ ($p<0.05$), there was no significant difference between the RPE values obtained after 30-15$_{IFT}$ ($p>0.05$). In U-17 team athletes, statistical significance was obtained between RPE after 3 different warm-ups, RPE after 30-15$_{IFT}$, MAS and VO_{2max} values ($p<0.05$). Statistically, although SSG and SSG+sprint warm-ups were more difficult than traditional warm-ups, they were found to have a more positive effect on MAS and VO_{2max}. In addition, although the addition of 40+40 m sprint practice to the warm-ups applied with SSG caused the intensity of the warm-up to increase more, and positive effect on endurance performance.

Conclusion: The SSG game by adding 5 minutes of sprint practice in traditional warm-ups may have a positive effect on endurance performance.

Key words: *Endurance, Soccer Specific Games, Warm-up.*

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INTRODUCTION

In a soccer match, footballers cover a distance of approximately 10-12 km (Stølen et al., 2005). Athletes use both aerobic and anaerobic energy systems within these distances (Bangsbo, 1994). It is seen that the aerobic capacity utilization of athletes is important in a soccer competition. However, for the athletes to reflect this skill on the field in the best way, they should have a warm-up phase before the competition or training. Warm-up phases increase metabolic reaction, muscle temperature, heart rate, blood circulation, nerve conduction velocity and oxygen levels of athletes (Bishop, 2003; García-Pinillos et al., 2020). In this respect, a suitable warm-up phase for athletes helps to make them more ready. In the literature, warm-up sessions are at different speeds, durations and with other interventions before endurance skills. Information indicates that high intensity of the warm-up phases before endurance activities increase the athlete's performance (Alves et al., 2023). Thanks to the high intensity warm-up phases, aerobic and anaerobic energy metabolism is activated, the oxygenation level of the muscles increases and the level of phospho-creatine hydrolysis increases (Bailey et al., 2009; Burnley et al., 2006; Wittekind et al., 2012). This type of warm-up phase is usually applied with certain intensities of the maximum oxygen level. For example, it is stated that after the warm-up phase is applied with 46% or 120% of the maximum oxygen uptake level, there are positive effects on the endurance skills of the athletes (Fujii et al., 2019). However, in team sports, it may be difficult to apply a separate warm-up phase to each athlete at an intensity corresponding to a certain amount of maximum oxygen consumption capacity before training. At this point, it is seen that small-sided games specific to soccer are applied as a warm-up phase. After the warm-up phase with the small-sided game applied in soccer players, it is not stated that the athletes' change of direction running and vertical jump performances are more effective than the traditional warm-up (Thapa et al., 2023). Similarly, it is stated that the reactive agility skills of athletes are better applied after the small-sided games warm-up phase compared to traditional warm-up (Zois et al., 2011). Researchers shows that small-sided games have a positive effect on performance after they are used in the warm-up phase. However, there is no research on the effects on endurance skills after the warm-up phase including small-sided games. The aim of this study was to investigate the effects on the results of 30-15$_{IFT}$ after a warm-up phase consisting of a traditional, 1 set of 5:5 small-

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sided and 5:5 small-sided lasting 5 minutes and 40+40 mt sprint practice applied for each minute. In this study, the research was designed by hypothesizing that after the warm-up phase including small-sided games and 40+40 mt sprint practice, there would be higher rate of perceived exertion and 30-15$_{IFT}$ results compared to than traditional warm-up. Therefore, the aim of this study was to investigate the effects of 3 different warm-up phases on endurance performance.

METHOD

Research model

For the research, the acute effects of different warm-up protocols on endurance skills were investigated by experimental measurement method. Before the research, all possible benefits and disadvantages were explained to the athletes in detail and the research was carried out on the subjects who volunteered to participate in the research.

Population and sample

A total of 16 athletes from the U-15 team (age: 15, height: 172.12±0.00, weight: 68.81±6.72, BMI: 23.13±1.40) and 21 athletes from the U-17 team (age: 17, height: 174.90±7.75, weight: 69.38±6.76, BMI: 22.64±1.23) who were healthy and did not have any muscle injury participated in the study. The athletes regularly trained 5 times a week and participated in one official competition. The athletes did not have any sports injury and did not receive ergogenic support.

Data collection tools

Traditional warm-up: In the first stage, the athletes both of U-15 and U-17 teams were made to perform running exercises in the same soccer field, lasting 5 to 7 minutes at a low paces and dynamic activation of different muscle groups. During this time, movements used in general warm-up such as running technique, knee pull, arm rotation were applied. Then, the athletes continued with soccer-specific warm-up movements at medium and higher paces for 5-7 minutes to increase muscle activation with 2 players across each other with a soccer ball. At the end of this period, dynamic stretching movements lasting approximately 3 minutes were applied and immediately afterward, 3-5 times 5-10 mt maximum speed sprinting was performed. 4 to 5 minutes after this application, the athletes were taken to 30-15$_{IFT}$. The athletes were asked about their rate of perceived exertion after the warm-up and 30-15$_{IFT}$ and their rate of perceived exertion (RPE) was recorded.

SSG warm-up, SSG Plus 40+40 m Sprint: The athletes both of U-15 and U-17 teams performed low intensity dynamic warm-up movements to activate different muscle groups for 5-7 minutes as in dynamic warm-up in the same soccer field. Then, a 3-minute dynamic stretching movements were applied to the athletes. Then, a small-sided game was played randomly 5:5 in a 40x25 m area (100 m^2 per person) with a single set of 5 min of free ball contact without a goalkeeper. In order for the game to be intense and continuous, many balls were kept ready, and coach motivation was provided continuously from outside. After the small-sided game, 3 minutes of dynamic stretching was applied to the athletes again and the warm-up session was terminated by performing 3-5 sprint applications with 5-10 m maximum effort and the RPE levels obtained from the warm-up session were recorded. After approximately 4-5 minutes, the athletes were taken to 30-15$_{IFT}$. At the end of the test, the athletes' RPE levels were asked and recorded. During the small-sided games, the 40+40 speed practice warm-up, was applied for every 1 minute as SSG warm-up. This warm-up phase was performed only during the game with extra speed application.

30-15 Intermittent Fitness Test: The 30-15$_{IFT}$ was applied to measure the endurance capacity of the athletes. In the test battery, a track was created with two parallel lines consisting of points A, B and C in a 40-meters area specific to soccer and drawn 3 meters apart before the A and C lines and 3 meters apart before the B line. A demo was shown to the athletes before the test. The test was started with a starting speed of 10 km/h. All athletes were warned that the test would be terminated when they failed to catch the warnings 3 times in a row during the test and 4 coaches controlled the athletes in equal numbers to carry out the tests in a healthy way. After this test, RPE levels, maximal aerobic running speed and maximum oxygen consumption capacity were recorded and included in the statistical analysis.

The maximal oxygen consumption capacities of the athletes obtained from the 30-15IFT final velocity were calculated by the following formula.

VO2max 30-15IFT (ml.-1min.kg-1) = 28.3 - 2.15 G - 0.741 A -0.0357 W + 0.0586 A x VIFT + 1.03 VIFT, where G stands for gender (female = 2; male = 1), A for age, and W for weight (Buchheit, 2010).

Data analysis

Statistical analyses were performed with SPSS software version 20, Chicago, USA, compatible with Windows 10. The conformity of the data to normal distribution was analyzed by the Shapiro-Wilk test. Repeated measures ANOVA test was used for comparison statistics after 3 different warm-ups and Bonferroni correction test was used. After 3 different warm-up phases, when it was determined that the data did not show normal distribution, the Friedman's statistical analysis was used as a comparison statistic. Wilcoxen signed-rank test and ANOVA test were used for pairwise comparison statistics. The significance level was accepted as $p<0.05$ for all analyses.

RESULTS

Table 1. Descriptive statistics of the athletes

Variables	U-15				U-17			
	n	Min.	Max.	Mean ± SD	n	Min.	Max.	Mean ± SD
Age (years)	16	15.00	15.00	15.00±.000	21	17.00	17.00	17.00±.00
Height (cm)	16	159.00	180.00	172.12±7.96	21	162.00	189.00	174.90±7.75
Body Weight (kg)	16	58.00	82.00	68.81±6.72	21	60.00	81.00	69.38±6.76
Bmi (kg/m^{-2})	16	20.60	25.30	23.13±1.40	21	20.70	25.50	22.64±1.23

Bmi: body mass index

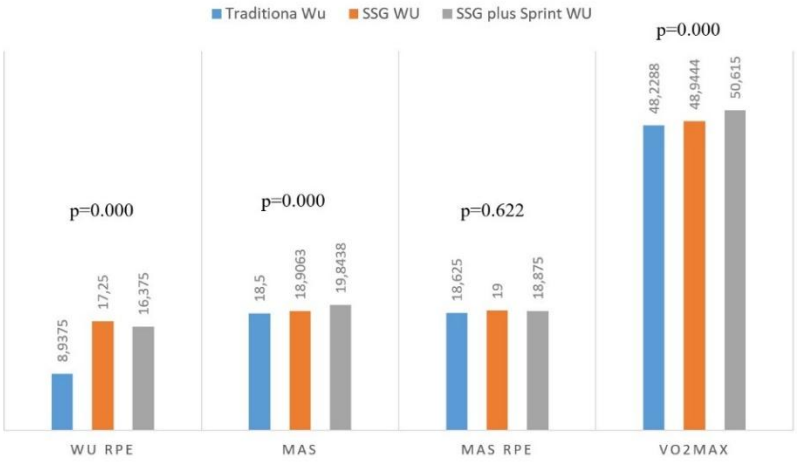
Descriptive statistics of U-15 and U-17 team athletes are shown in Table 1. The minimum, maximum, mean and standard deviation values of age (years), body height (cm), body weight (kg) and body mass index (kg/m^{-2}) of the athletes are presented.

Table 2. Descriptive analyses of RPE and 30-15$_{IFT}$ results of U-15 and U-17 teams.

		n	min	Max	Mean ± SD	n	min	Max	Mean ± SD
Wu RPE	Traditional	16	8.00	10.00	8.93±.57	21	4.00	10.00	7.76±1.44
	SSG	16	15.00	20.00	17.25±1.06	21	8.00	15.00	12.28±2.28
	SSG + Sprint	16	15.00	17.00	16.37±.61	21	10.00	17.00	13.66±2.03
MAS	Traditional	16	16.00	20.00	18.50±1.26	21	17.50	20.50	19.28±.83
	SSG	16	17.00	21.00	18.90±1.14	21	17.00	21.00	19.42±1.17
	SSG + Sprint	16	16.50	22.00	19.84±1.44	21	18.00	22.00	20.14±.96
MAS RPE	Traditional	16	17.00	20.00	18.62±1.20	21	17.00	19.00	18.28±.56
	SSG	16	18.00	20.00	19.00±.89	21	14.00	19.00	16.76±1.67
	SSG + Sprint	16	17.00	20.00	18.87±1.08	21	14.00	19.00	17.76±1.33
*V*O$_{2max}$	Traditional	16	42.65	50.89	48.22±2.21	21	46.08	52.87	50.08±1.92
	SSG	16	44.56	52.80	48.94±2.02	21	45.10	53.88	50.37±2.63
	SSG + Sprint	16	43.60	54.71	50.61±2.68	21	47.45	55.59	51.82±2.14

Wu: warm-up, MAS: maximal aerobic speed, RPE: rate of exertion perceived, VO$_{2max}$: maximal oxygen consumption capacity, SSG: small-sided games, SSG+Sprint: small-sided games plus 40+40 m sprint

Table 2 shows the descriptive analyses of RPE obtained after warm-up, MAS RPE, MAS and *V*O$_{2max}$ levels obtained after 30-15$_{IFT}$ from U-15 and U17 team athletes.



Graphic 1. RPE, MAS and VO_{2max} analyses of U-15 team after 3 different warm-up phases

In graphic 1, the results of the statistical analyses of Friedman and ANOVA tests of the mean values of RPE, MAS, MAS RPE and VO_{2max} obtained after 30-15$_{IFT}$ of the U-15 team after 3 different warm-ups are shown. It was found that the post-warm-up RPE, MAS and VO_{2max} levels except MAS RPE were statistically significant after 3 different warm-up phases (p=0.000). In pairwise comparison analyses, Wilcoxen signed test results showed that there were significant differences between the rate of perceived exertion after the warm-up phase of SSG and traditional warm-up (z=-3.559, p=0.000), SSG+sprint and traditional warm-up (z=-3.602, p=0.000) and SGG+sprint and RPE (z=-2.336, p=0.019). In the Wilcoxen signed ranks test analyses of the MAS values obtained after 30-15$_{IFT}$, no statistical significance was found between SSG and Traditional warm-up (z=-1.895, p=0.058), while statistically significant differences were found between SSG+Srint and Traditional warm-up (z=-3.541, p=0.000) and SSG+Sprint and SSG (z=-3.271, p=0.001). A one-way repeated measures ANOVA was conducted to determine whether there were statistically significant differences in VO_{2max} values across three different exercise protocols (traditional VO_{2max}, SSG VO_{2max}, and SSG+Sprint VO_{2max}). Values are mean ± standard deviation, unless otherwise stated. There were no outliers, and the data was normally distributed, as assessed by boxplot and Shapiro-Wilk test (p>.05), respectively. The assumption of sphericity was not violated, as assessed by Mauchly's test of sphericity, $\chi^2(2) = 2.11$, p = .348. Therefore, sphericity was assumed, and no correction was applied.

The warm-up protocols elicited statistically significant differences in VO_{2max} values, F(2, 30) = 23.69, p<.0005, partial η2 = 0.612. VO_{2max} values increased progressively across the protocols, from 48.23 ± 2.22 mL/kg/min in traditional warm-up VO_{2max} to 48.94 ± 2.02 mL/kg/min in SSG warm-up VO_{2max} and 50.62 ± 2.69 mL/kg/min in SSG plus Sprint VO_{2max}.

Planned contrasts showed that VO_{2max} statistically significantly increased from traditional warm-up VO_{2max} to SSG plus Spirnt VO_{2max}, with a mean difference of 2.39 mL/kg/min (95% CI, 1.36 to 3.41), p<.0005. Additionally, there was a statistically significant increase in VO_{2max} from SSG VO_{2max} to SSG plus sprint VO_{2max}, with a mean difference of 1.67 mL/kg/min (95% CI, 0.91 to 2.43), p<.0005. However, the difference between traditional warm-up VO_{2max} and SSG warm-up VO_{2max} was not statistically significant (p>.270).

These results suggest that the SSG plus sprint warm-up VO_{2max} protocol was the most effective in eliciting an increase in VO_{2max} values, indicating its potential for improving aerobic capacity.

Graphic 2. RPE, MAS and VO_{2max} analyses of U-17 team after 3 different warm-up phases

Graph 2 shows the Friedman statistical analyses of the RPE obtained after 3 different warm-up phases, and MAS, MAS RPE and VO_{2max} levels obtained after 30-15$_{IFT}$ of U-17 team athletes. According to the results of Friedman statistical analyzed of the obtained data, it was determined that there was statistical significance between MAS (p=0.000), MAS RPE (p=0.008), MAS and VO_{2max} (p=0.000) values obtained after 3 different warm-ups.

In the paired comparison analyses, there was a difference between SSG RPE and traditional warm-up (z=-4,026, p=0.000), RPE of SSG+Sprint and traditional warm-up (z=-4,041, p=0.000), but there was no statistical significance between RPE of SSG+Sprint and SSG of RPE (z=-1,813, p=0.070). In maximal aerobic running speeds, there was no statistical significance between SSG and traditional warm-up (z=-958, p=0.338), whereas there was a statistical significance level after SSG+Sprint warm-up compared to traditional (z=-3.316, p=0.001) and SSG warm-up (z=-3.128, p=0.002).

In the RPE values obtained after 3015$_{IFT}$, there was statistical significance between SSG and Traditional (z=-2.998, p=0.003), while no statistical significance was found between SSG+Sprint and Traditional (z=-1.424, p=0.154) and between SSG+Sprint and SSG (z=-1.935, p=0.053). In addition, no statistical significance was found between SSG and Traditional (z=-.917, p=0.359), while statistical significance was found between SSG+Sprint and Traditional (z=-3.418, p=0.001) and SSG (z=-3.223, p=0.001) in VO_{2max} levels.

DISCUSSION

In this study, the effects of traditional warm-up phase lasting 20 minutes, 5:5 small-sided game 1x5 min within the traditional warm-up phase and speed applications including 40 mt going and 40 mt return at the end of each 1 minute during the small-sided game on the rate of perceived exertion of the warm-up phases and endurance skills were analyzed. According to the statistical results of the study, SSG plus 40+40 mt warm-up phase and SSG warm-up phase are more intense than traditional warm-up and have a more positive effect on the endurance performance of the athletes acutely.

High-intensity pre-exercises performed before endurance exercises increase Vo2 kinetics and decrease oxygen debt levels (Hajoglou et al., 2005). In the literature, the warm-up phase, called pre-exercise in this respect, increases the metabolic functions of athletes, and increases their tolerance to exercise (Jones et al., 2003; Carter et al., 2005), and that their average power production increases (Burnley et al., 2005). However, it is seen that a warm-up phase applied at this intensity is generally controllable and is carried out by following a controlled load with a certain proportion of the maximal oxygen consumption capacity of the athletes (Fujii et al., 2023). In team sports such as soccer, it may require both equipment and an extended period of time to perform warm-up phases before endurance tests or exercises in a controlled manner or at certain rates of maximal oxygen consumption capacity. At this point, it is seen in the literature that there is research in which athletes perform warm-up phases with sport-specific small-sided games. They found that the rate of perceived exertion obtained from the warm-up phase of handball athletes after 3 sets of 2 minutes of 3 vs 3 player small-sided games and 8 minutes of general

warm-up was not different. The reason for this seems to be the game rules that cause small-sided games to be played at low intensity (Iacono et al., 2021). In the results of this study, it was found that the warm-up phase, which included 40+40 m sprint practice in every 1 minute of the small-sided games played for 5 minutes, revealed higher rate of perceived exertion levels compared to the small-sided games without sprint and traditional warm-up. The fact that it has a different result from the literature may have caused the rate of perceived exertion levels to have different results after including coach motivation and speed applications in the format of small-sided games specific to soccer in this study.

Research shows that performance is acutely enhanced following high intensity warm-up phases before anaerobic activities (Burnley et al., 2005; Mujika et al., 2012). In the literature, it is stated that after the traditional and small-sided games warm-up phases applied on a total of 10 athletes with an average age of 19.3 years, it is more effective on the countermovement jump abilities of the athletes with change of running after the small-sided games warm-up phase (Thapa et al., 2023). A different study shows, it is shown that amateur soccer players with an average age of 23.3 years have statistical results indicating that Countermovement jump height is a more effective warm-up method after the small-sided games warm-up phase with 5 repetitions of leg press (Zois et al., 2011). However, there is no research on the endurance skills of athletes after warm-up phases of high intensity or small-sided games. Nevertheless, studies show that small field games offer more positive effects on some motor skills. In this study, unlike the literature, the effects of traditional and small-sided games on the endurance skills of athletes after the warm-up phase were investigated. Like the literature, according to the statistical results of the study, it was determined that the endurance skills of the athletes were more positively affected after the small-sided games and the sprint skill applied during the small-sided games. At this point, the fact that the warm-ups were more intense after small-sided games due to the perceived difficulty levels had a more positive effect on the endurance test results and maximal oxygen consumption capacities of the athletes reveals similar results with the literature.

CONCLUSION

According to the results of the study, it is seen that endurance performances are positively affected after high intensity warm-up phases that increase the REP by athletes in the warm-up phase. In this respect, it was determined that the endurance performance was acutely affected more positively with the increase in the intensity of the warm-up thanks to the addition of 5:5 SSG to the warm-up phase of the athletes and the 40+40 m sprint application to be applied every 1 minute to the SSG applied for 5 minutes.

SUGGESTIONS

Coaches may be advised to implement small-sided games in the last part of a 20-minute warm-up phase prior to competition or endurance training, taking into consideration that small-sided games may positively affect athletes' acute endurance skills. In addition, by increasing the rate of perceived exertion in the warm-up before such activities, they may positively affect the endurance performances of the athletes.

Etical Approval and Permission Information

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Future Campus Recreation: The Use of Virtual Reality in Overcoming Constraints

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Abstract

Aim: This study aims to identify university students' perceived barriers to campus recreation activities and explore how virtual reality (VR) applications can facilitate overcoming these obstacles.

Method: A mixed-method approach was used. First, the Leisure Constraints Scale was administered to 154 students. Then, 12 students with the highest perceived barriers participated in a VR session. They engaged in games or 360° videos, preferably. After the session, a focus group discussion was conducted. Structured interview questions were derived deductively from the sub-dimensions of the Leisure Constraints Scale, and the data were analyzed thematically.

Results: In the quantitative part of the study, a significant difference was found based on the grade variable ($p<0.05$). In the qualitative part, 50 codes were identified under three themes: intrapersonal, interpersonal, and structural constraints/negotiations. Participants viewed VR as an alternative to activities inaccessible in real life. While most evaluated this positively, one participant highlighted the potential for dissatisfaction due to its inability to replicate real-life experiences. VR was highlighted as a preferable option over field-based activities due to its ability to address financial, facility, and time constraints, and its perceived advantage in time management.

Conclusion: The revealed key insights: (i)VR can serve as an alternative to inaccessible activities in daily life, (ii)campus recreation activities are limited and poorly advertised; VR provides broader access, (iii)the diversity and cost-free nature of VR is attractive, and (iv)VR may lack the interpersonal interactions inherent in face-to-face activities.

Key words: *Campus Recreation, Constraints Negotiation, Leisure Constraints, Virtual Reality.*

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INTRODUCTION

Recreational activities are considered a type of living space that provides individuals with many benefits in physical, psychological, and social areas. On university campuses, where students spend a significant part of their time, recreational activities offer opportunities for social interaction, focusing on goals, managing time effectively, and approaching problems with a solution-oriented mindset, supporting informal learning. In addition, these activities contribute to formal learning environments by enhancing academic success, as reflected in the increase in grade point averages (Forrester, 2014; Hoffman, 2016). Campus recreation, which positively impacts the lives of university students (Lindsey & Sessoms, 2006), includes various events such as spring festivals, student club activities, concerts, sports events, physical exercises, and artistic activities organized on campuses (Mercanoğlu et al., 2015). Campus recreation appears as a collection of activities that go beyond individual benefits. It is stated that participation in campus recreation activities can promote social harmony among students, create different environments, and strengthen a sense of belonging to the institution (Astin, 1998; Forrester, 2014). Through sports and physical activity, students' quality of life can improve, and benefits for sustainable public health can also be achieved (Warburton et al., 2006)

Students may face various constraints to accessing campus recreation activities and benefiting from their individual and social advantages. The restrictions students encounter during their free time on campus when participating in campus recreation activities are defined as constraints (Crawford & Godbey, 1987). These constraints are explained through the hierarchical leisure constraints theory as individual, interpersonal, and structural barriers. According to this theory, individuals first face individual constraints (such as lack of time, psychological factors, or lack of interest) when trying to participate in leisure activities. Those who overcome these constraints may then encounter interpersonal constraints

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(such as not having friends or friends not participating in the activity). Finally, individuals who overcome or do not experience these two constraints may face structural constraints (such as lack of facilities or equipment, transportation issues, or lack of information) before participation (Crawford et al., 1991). Identifying the constraints that may prevent participation in campus recreation, which offers benefits for students, their social environment, and institutions, and determining strategies to overcome these constraints are important. Recently, studies have focused not only on identifying leisure constraints but also on finding negotiations to address these constraints (Emir et al., 2022; Kono & Ito, 2023; Son et al., 2024; Yaşartürk et al., 2022).

Virtual reality offers individuals participating in leisure activities the opportunity to overcome physical boundaries and constraints independently of location. Virtual reality technology provides opportunities for physical activity, sports, cultural events, and travel in a virtual environment, enabling different leisure experiences (Ekinci & Özer, 2019). It aims to eliminate many accessibility constraints through the nature of the virtual environment. While studies have focused on the use of virtual reality in leisure activities (Güncan, 2021b; Siani & Marley, 2021), research on the use of such technological applications to remove constraints in campus recreation activities remains limited. Current studies mainly address the use of virtual reality for entertainment and personal leisure activities. However, the inclusion of virtual reality in campus recreation activities and its potential to eliminate existing constraints through this technology has not yet been explored. To fill this gap in the literature, the aim of this study is to identify the constraints perceived by university students in participating in campus recreation activities and to examine the use of virtual reality applications facilitate overcoming these constraints.

METHOD

Research model

The research was designed using a mixed-method approach, where both qualitative and quantitative methods were applied together. While quantitative studies provide generalizable data through large samples, qualitative data emphasize exploration, understanding, introspection, and theory development. Additionally, qualitative research offers a broad foundation for quantitative studies (Böke, 2009). In the study, the survey model, one of the quantitative research techniques, was used to identify students with the highest levels of perceived leisure constraints. To examine the experiences of these students with virtual reality applications and the effects on their perceived constraints in detail, phenomenological research, one of the qualitative research techniques, was used. Phenomenology, defined as describing the meaning of lived experiences of a few individuals regarding a phenomenon or concept (Creswell, 2013), allows for an in-depth examination of the participants' virtual reality experiences.

Population and sample

The research group consists of a total of 154 students studying in the 1st and 2nd grades of the Faculty of Sports Sciences. According to Morgan (1997), the interview group should include 6 to 12 people. Accordingly, 12 students with the highest perception of constraints among the participants took part in the virtual reality application and then in the focus group interview. The demographic information of the participants is presented in Table 2.

Data collection tools

The *Leisure Constraints Scale (LCS*): developed by Alexandris & Carroll (1997), adapted into Turkish by Karaküçük & Gürbüz (2006), and shortened by Gürbüz et al., (2020), was used. The scale consists of 18 items and 6 sub-dimensions. The sub-dimensions are: (a) Individual Psychology (3 items), (b) Social Environment and Lack of Information (3 items), (c) Facilities/Services and Transportation (3 items), (d) Lack of Friends (3 items), (e) Time (3 items), and (f) Lack of Interest (3 items). In their study, Alexandris & Carroll (1997) obtained reliability coefficients ranging from 0.64 (Time) to 0.85 (Lack of Friends) for the sub-dimensions, while Karaküçük & Gürbüz (2006) reported reliability coefficients ranging from 0.67 (Time) to 0.82 (Lack of Information) (Gürbüz et al., 2020).

Based on the total scale scores, 12 students with the highest perception of constraints participated in a single-session virtual reality application. In the application, participants either played a game or watched a 360° video according to their preferences. After the application, a 52-minute focus group interview

was conducted with the participants. The structured interview questions were categorized into themes using a deductive approach, based on the classification of leisure constraints defined by Crawford et al. (1991). Figure 1 presents the hierarchical model of leisure constraints (Crawford et al., 1991). In the sub-categories of the themes, the sub-dimensions of the Leisure Constraints Scale were used.

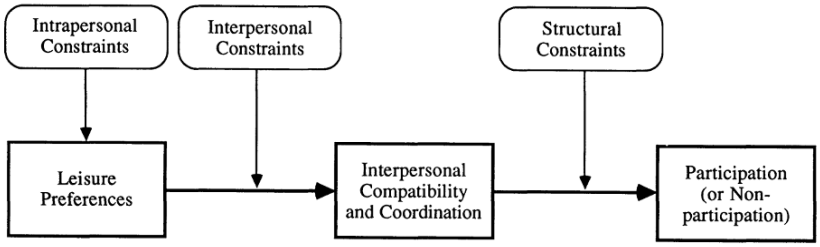

Figure 1. Hierarchical model of leisure constraints.

Data analysis

The total scale scores were calculated using the Jamovi statistical software program to identify the sample for inclusion in the qualitative research. The research data showed a normal distribution. To reveal differences based on participants' gender, department, and class variables, a t-test and one-way ANOVA test were applied. The scale's internal consistency coefficient was calculated as 0.83. The data transcribed after the focus group interview were analyzed using the thematic analysis method with the MAXQDA software program. Thematic analysis, defined by Braun & Clarke (2006) as "a method for identifying, analyzing, and reporting patterns (themes) within data," is considered both a fundamental and flexible qualitative method due to its theoretical freedom (Boyatzis, 1998). The stages of thematic analysis (Braun et al., 2019) are presented in Table 1.

Table 1. Stages of Thematic Analysis

Stage	***Description of the Process***
Familiarizing	Transcribing the data (if needed), reading the data, and noting initial ideas.
Generating Initial Codes	Systematically coding interesting features of the data across the entire dataset and gathering data for each code.
Creating Themes	Grouping codes under potential themes and organizing all data into possible relevant themes.
Reviewing Themes	Checking if themes relate to the coded extracts (Level 1) and the entire dataset (Level 2), creating a thematic "map" of the analysis.
Defining and Naming Themes	Refining the analysis to identify the features of each theme and summarizing the overall story of the dataset, clearly defining and naming each theme.
Reporting	The final opportunity for analysis. Selecting vivid, compelling examples, performing the final analysis of the data, connecting findings to research questions and literature, and creating a scientific report of the analysis.

Validity and Reliability

A validated and reliable scale was utilized for the quantitative data in the study. The triangulation analyst strategy was employed to enhance the internal validity or credibility of the qualitative data. This approach entails having two or three individuals independently in the data analysis process, which involves analyzing the same qualitative data independently and comparing the analysis (Patton, 2002). Detailed descriptions and purposeful sampling techniques were used to ensure external validity or transferability. In the findings section, themes and codes were presented in detail without adding any interpretation. Direct quotations were used as evidence to show how the themes and codes were formed during the analysis. The audit trail strategy was used to enhance reliability. This strategy involves explaining in detail the research design, data collection, analysis, interpretation, theme or category creation, and reporting of the findings (Merriam, 2013; Patton, 2014).

RESULTS

Demographic Findings

This section includes findings regarding the demographic data of the participants.

Table 2. Demographic Information of Participants

Variables	Group	f	%
Department	Sport Management	58	37.7
	Coaching Education	48	31.2
	Physical Education	21	13.6
	Recreation	27	17.5
Grade	1	104	67.5
	2	50	32.5
Gender	Female	76	49.4
	Male	78	50.6
Total		154	100

Table 2 shows the demographic data of the participants. It was found that 37.7% of the participants study sports management, 31.2% study coaching education, 13.6% study physical education, and 17.5% study recreation. According to the grade variable, 67.5% of the participants are 1st-year students, while 32.5% are 2nd-year students. Regarding gender, 49.4% of the participants are female, and 50.6% are male students.

Quantitative Findings

This section includes the distribution of participants' total scale scores according to variables and the results of statistical analysis.

Table 3. Comparison of scale scores according to gender variability

Scale	Gender	f	$\bar{X}$	S.D.	t	p
LCS	Female	76	3,03	0,363	-0,337	0,737
	Male	78	3,05	0,369		

**p>0,05 LCS: Leisure Constraints Scale*

The results of the t-test conducted to determine the differences in leisure constraints based on gender are presented in Table 3. It was found that there is no significant difference between genders.

Table 4. Comparison of scale scores according to grade level variable

Scale	Grade	f	$\bar{X}$	S.D.	t	p	*d*
LCS	1	104	3,00	0,361	-0,124	0,048*	-0,343
	2	50	3,12	0,363			

**p<0,05 LCS: Leisure Constraints Scale; d: Effect size*

Table 4 presents the analysis of leisure constraints based on grade level. It was observed that 1st-year students have a statistically lower perception of constraints compared to 2nd-year students ($p < 0.05$).

Table 5. Comparison of scale scores according to department variable

Scale	Department	f	$\bar{X}$	S.D.	t	p
LCS	Sport Management	58	2,98	0,369	1,91	0,138
	Coaching Education	48	3,12	0,320		
	Physcial Education	21	2,96	0,432		
	Recreation	27	3,10	0,357		

**p>0,05 LCS: Leisure Constraints Scale*

The results of the ANOVA test conducted to examine the differences in leisure constraints based on the academic department are presented in Table 5. It was determined that no significant differences were observed.

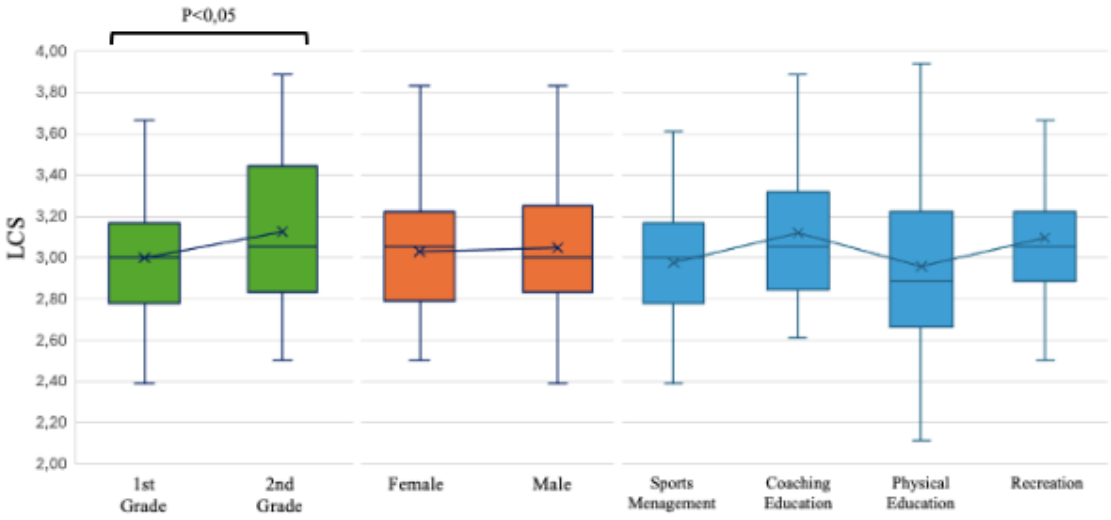

Figure 2. Comparison of LCS scores according to different variables

The analysis results of the Leisure Constraints Scale based on grade, gender, and department variables are shown in figure 2.

Table 6. Scale LCS scores of the participants included in the focus group interview

Groups	f	%	Min	Max	$\bar{X}$	S.D.
Qualitative Research Group	12	7,78	3,61	4	3,76	0,14
Total	154	100	1,88	4	3,04	0,365

The data comparing the total scale scores of the 12 participants included in the focus group interview with all participants are shown in Table 6. Accordingly, the average score of the Leisure Constraints Scale responses for the 12 participants in the qualitative study group was 3.76, representing 7.78% of the total sample.

Qualitative Findings

The codes identified after thematic analysis are presented in tables under their respective themes. Each dimension in the leisure constraints classification represents a theme, which has been reported under a separate heading.

Theme 1. Intrapersonal Constraints

Intrapersonal constraints include individual psychological states and characteristics that interact with preferences. These constraints involve stress, depression, anxiety, religiosity, attitudes of reference groups within and outside the family, prior socialization toward certain leisure activities, perceived personal skills, and subjective evaluations regarding the suitability and accessibility of various leisure activities (Crawford & Godbey, 1987).

Table 7. Codes for Intrapersonal Constraints

Code	***Category***
Strange (1), positive (6), desire (1), fun (4), stressful (2), exciting (3), beautiful (2), dizziness (3), uncomfortable onset (3), unreality (1), euphoric (1), mixed emotions (1), preference for reality (1), enjoyable (1), close to reality (1), detachment from reality (2), low risk of injury (2), lack of effect (1), safe (1), alternative (4), adverse effect (1), rehabilitation (1), relaxation (1)	Individual psychology
Limited announcement (4), limited information (3), limited activity (4), unattractive activities (1), limited support needs (5), without support (1)	Lack of knowledge
Variety (2), new experiences (1), discovery (1), open access (1), unrealistic (1), limitless (2)	Lack of interest

In the Leisure Constraints Scale, the "intrapersonal constraints" theme consists of three subdimensions: individual psychology, lack of information, and lack of interest (Gürbüz et al., 2020). These subdimensions form the categories of the intrapersonal constraints theme. The codes derived from the responses to these categories are presented in Table 7.

All participants stated that they did not feel any physical fatigue during the virtual reality (VR) activity. This situation may be related to the duration of the activity and its level of physical intensity.

- P2: After taking off the headset, I didn't want to remove it. I wanted to stay in that moment. There was no feeling of fatigue…
- P3: … I didn't feel physically tired because I was very focused, and it entertained me, so it was positive…

Some participants viewed virtual reality as an alternative to activities that cannot be done in real/daily life. While most of them evaluated this alternative positively, only one participant mentioned that this experience might make people unhappy because it cannot be replicated in real life.

- P3: For example, this is a bit impossible for individuals with disabilities to do in real life. But when they can perform these activities with VR headsets, they might feel very happy. This could be an advantage, but it could also be a disadvantage because they might think, 'I want to do this in real life,' and that might upset them…
- P4: The fatigue level in VR is lower, and the opportunities it offers are more, so within a certain time, we can do activities in VR that we want to do in real life. It is better in terms of time and fatigue.

Participants stated that the risk of injury in virtual reality applications is much lower than in field/real-life activities. Additionally, one participant mentioned that VR could be used for rehabilitation purposes for athletes after injuries.

- P2: … The risk of injury is definitely higher outside. I don't think there is any risk of injury in VR. There is none, zero.
- P4: … In VR, the danger is less, and the risk of injury is lower. It's higher in real-life settings. In terms of movement, in VR, the frequency of movement is lower. We can perform movements in a limited space, but that's not the case in real life. The frequency and intensity of movement are higher. For example, I have a fear of heights. I can't go to high places, but in VR, I can do it because I know I won't really fall. This gives me confidence.

All participants noted that the events organized on campus were limited and that the announcement and information processes for these events were insufficient. Most participants found VR applications positive because of their unlimited variety and openness to new experiences, while only one participant expressed that these applications could not create the same real feelings and impact.

- P1: … There aren't many activities. As sports sciences students, we actually need to do more diverse activities.
- P3: … They announce campus recreation activities on Instagram. For example, we went to the cinema the other day. It was at the Faculty of Science. But they complain that no one shows up. It doesn't attract students' attention. It's not appealing.
- P11: I don't see it on social media accounts, even if it's there. I follow the university's page, but I don't see it. Maybe it's there, but it doesn't show up for me.

Theme 2: Interpersonal Constraints

Table 8. Codes for Interpersonal Constraints

Code	Category
Pleasure to be together (1), preference for solitude (1), boring (1), not needing friends (3)	Lack of friends

Interpersonal constraints result from interactions or relationships between individuals. These constraints can be the outcome of intrapersonal constraints accompanying marital relationships. Such constraints may influence shared preferences for leisure activities or arise as a result of interactions between spouses. These types of constraints can interact with preferences for leisure activities and subsequent participation. Additionally, the concept of interpersonal constraints can generally apply to interpersonal relationships. If an individual cannot find a suitable partner for a specific activity, they may experience an interpersonal leisure constraint (Crawford & Godbey, 1987). In the Leisure Constraints Scale, there is a sub-dimension under the theme of 'interpersonal constraints': lack of friends (Gürbüz et al., 2020).

This sub-dimension constitutes the only category of the interpersonal constraints theme. The codes generated from responses to this category are presented in Table 8.

Some participants responded to the question, *"Do you need a friend to participate in field activities?"* by stating that they prefer joining with friends because it is more enjoyable. Others, however, considered not needing a friend in virtual reality as an advantage.

- P1: *Yes, because I enjoy it. I can also join an activity alone, but participating with a friend makes the activity feel more enjoyable.*
- P3: *VR allows us to play without needing anyone else.*
- P7: *In virtual settings, we can play tennis against the computer.*

Theme 3: Structural Constraints

Table 9. Codes for Structural Constraints

Code	Category
Free access (2), space access (1), material access (1), time restriction (1), waiting time (4), crowd (5)	Facility
Time management (5)	Time

Structural constraints represent the factors that intervene between leisure preferences and participation. Examples of structural constraints include the stage of the family life cycle, family financial resources, season, climate, work schedule, availability of opportunities, or suitability of activities (Crawford & Godbey, 1987). In the Leisure Constraints Scale, there are two sub-dimensions under the theme of 'structural constraints': facilities and time (Gürbüz et al., 2020). These sub-dimensions form the categories of the structural constraints theme. The codes generated from responses to these categories are presented in Table 9.

Most participants stated that crowds in field activities negatively affect waiting time and stress levels, while only one participant expressed that the crowd also serves as a motivating factor by offering support.

- P1: Crowds have both positive and negative aspects. The negative ones are the waiting time and getting bored while waiting in line. In VR, there is no such thing as getting bored. You just turn it on and play by yourself. However, playing with a friend would still be more enjoyable.
- P2: In real life, there are people in the crowd who support me, but not in VR. Waiting in a crowd is negative, yes, but a positive aspect is that having people who support me makes me perform better. It motivates me. Even if there are opposite reactions, it pushes me to do better.
- P4: Crowds make me stressed because I have anxiety. But in VR, since I'm alone, I can play more comfortably the way I want.
- P11: I'm not someone who can handle big crowds. In this sense, VR might be more beneficial.

Participants stated that virtual reality applications are more preferable than field activities because they eliminate financial and facility limitations as well as time constraints.

- P2: In VR, you can play whenever you want. You can't canoe in the dark at night, but in VR, you can go rafting at night.
- P4: VR becomes more economical over time. You only need one piece of equipment, but in real settings, more financial resources are necessary. For example, in VR, I use a paddle without paying for it, but in real life, a boat starts at 30,000 euros. So, VR is advantageous in this regard.

Participants also mentioned that virtual reality applications are more preferable in terms of time management.

- P2: In VR, I can play anything I want. But in real life, I also play because our gym is suitable. However, I can't play at any time I want in the gym because there are lessons.

- P7: For example, during an intense training period, we get bored. I'm a triathlete. I swim in the morning, bike at noon, and run in the evening. I might want to try other sports too. If I have VR

at home, I can do activities like rowing or canoeing without spending time traveling to another place or going to the seaside. This positively affects my time management.

DISCUSSION

In this study focusing on the perceived intrapersonal, interpersonal, and structural constraints on university students' participation in campus recreation activities, the facilitating effect of VR technology has been demonstrated. The findings of the study were evaluated in two sections. In the first section, the results of the Leisure Constraints Scale (LCS) applied to the participants were analyzed. In the second section, the data obtained from structured focus group interviews with 12 participants who had the highest constraint perception scores based on the scale results were examined.

In the quantitative part of the study, the Leisure Constraints Scale (LCS) results of 154 participants were analyzed. It was found that the scale scores differed based on the participants' grades. Students in their second year had a higher perception of constraints compared to first-year students. This difference may be due to more years spent on campus, allowing them to gain more experience and awareness of the facilities or limitations on campus. However, the scale scores did not differ according to the participants' gender or the department they were studying in.

It is known that many factors affect individuals' participation in recreational activities. Gender is one of the significant factors influencing participation in recreational activities (Torkildsen, 1999). When the total scores obtained from the Leisure Constraints Scale (LCS) were analyzed based on the participants' gender, it was found that male participants had a higher perception of constraints compared to female participants. However, the difference was not statistically significant. Serdar (2021), in his study with fitness center participants, concluded that there was no significant difference between the subdimensions of the Leisure Constraints Scale and the gender variable. This result supports this research findings. However, some studies suggest that leisure constraints vary based on gender. For instance, Kaçay et al. (2023), in their study with university students, found a significant difference in the individual psychology subdimension of the Leisure Constraints Scale based on gender. Similarly, Karadeniz et al. (2019), in their study with students at Muğla Sıtkı Koçman University, identified significant differences in the individual psychology and lack of information subdimensions of the Leisure Constraints Scale based on gender. Another study by Deniz (2020) with sports science students revealed significant differences in the lack of information, facilities/services, and time subdimensions based on gender. Additionally, Solakumur et al. (2019), in their study with university students, found significant differences in the facilities/services, time, lack of interest subdimensions, and the total scale score based on gender.

When the total scores obtained from the Leisure Constraints Scale (LCS) were analyzed based on the class variable, a significant difference with a medium effect size was identified. Supporting this study's findings, Bosna et al. (2017) found significant differences in the time, lack of interest, and individual psychology subdimensions of university students' constraint perceptions based on the class variable. On the other hand, results different from this study findings are also present in the literature. For instance, in Güler's (2017) study, the subdimensions and total scores of the LCS were examined based on class levels. Although second-year students had higher average scores than other classes, the differences were not statistically significant. Similarly, Tolukan (2010), in a study conducted with students admitted to universities through special talent exams, reported no significant differences between the LCS subdimensions and the class variable. Additionally, Solakumur et al. (2019) found no significant differences between the LCS scores and the class variable in their study on university students' leisure constraints. As highlighted above, varying results regarding grades and leisure constraint perceptions exist in the literature. These differences may be attributed to factors such as the student structure in the campuses where the studies were conducted, the perception of social support, and the availability of recreational facilities.

According to findings of this work, when the total scores obtained from the Leisure Constraints Scale (LCS) were analyzed based on the department variable, the highest average score was observed in the Coaching Education department, while the lowest average score was in the Sports Management department. However, no significant difference was identified. In Deniz's (2020) study, which analyzed

the subdimensions of leisure constraints among students in the Faculty of Sport Sciences based on the department variable, no significant difference was found. These results align with this study's findings. Similarly, Çebi et al., (2018) examined the subdimensions of the LCS among students from the Faculty of Sport Sciences and other faculties and found no significant differences based on the department variable. However, as with other demographic variables, some studies report results that differently from findings of this study regarding the department variable. For example, Tolukan (2010), in a study with university students enrolled in talent-based programs, found significant differences in the individual psychology, lack of friends, and lack of interest subdimensions of the LCS based on the department variable. Karadeniz et al., (2019) examined students from different faculties and identified a significant difference in the facilities/services subdimension of the LCS based on the department variable. Similarly, Solakumur et al., (2019) found statistically significant differences in the time and facilities/services subdimensions and the total LCS score in favor of the Recreation department. Uzun & İmamoğlu (2020), in their study with female university students, reported significant differences in all LCS subdimensions and total scores based on the department variable. It has been determined that findings regarding department-specific differences vary. Although these studies primarily included students from the Faculty of Sport Sciences, the differing results may be attributed to factors such as course intensity, content, and student structures, as the studies were conducted at different universities.

Intrapersonal constraints, one of the barriers to participation in campus recreation, can be associated with students' lack of motivation to engage in recreational activities. The insufficient variety of recreational activities offered and their inability to spark students' interest and curiosity may be among the reasons for this lack of motivation. In this study, it was found that VR applications, with their variety and ability to create curiosity, could serve as a tool to encourage students to participate in recreational activities. Warburton et al., (2007), in their study examining the effects of interactive video games on physical activity and health, reported findings similar to those of this study. They highlighted that such games provide both individual and structural advantages to users. The study evaluated the low cost and entertaining nature of interactive video games as advantages, making physical activity easily accessible for individuals experiencing motivation problems in participating in recreational activities. Additionally, the fact that VR activities are less risky compared to real-world activities and offer a fun environment (Schwartz et al., 2011) can be considered a factor encouraging individuals to engage in VR activities during their leisure time. Evidence also suggests that the use of VR, particularly with virtual characters, has a motivating effect on individuals and makes understanding activities easier (Kojić et al., 2024). Based on this study and previous research findings, VR can be used as a facilitator in recreational activities to overcome intrapersonal constraints such as psychology, lack of knowledge, and lack of interest.

In recreational activities, the social environment of students is considered a factor that encourages individuals to participate. According to the findings of this study, the role of VR applications in removing interpersonal barriers can be explained by their ability to provide new opportunities for social interaction. Parsons & Cobb (2011) stated that VR helps reduce individuals' social anxiety, strengthens social bonds, and creates a more comfortable environment for social communication. Another study examined the leisure experiences of university students in virtual reality and suggested that VR applications could increase levels of social participation (Alanazi, 2023). Güncan (2021a), in a study on the applicability of virtual reality in recreation, emphasized that VR users gain social and psychological benefits. He also noted that VR supports socialization by offering opportunities for interaction through digital platforms.

VR has the potential to enhance the participation of students with physical disabilities in sports and recreational activities. Through VR technology, students can engage in sports, meditation, or fitness activities at their convenience, facilitating greater accessibility. Moreover, traditional sports and recreational practices can be transformed into more engaging and enjoyable experiences. VR-based fitness applications provide students with entertaining and motivational training opportunities, while multiplayer VR games and sports contribute to the development of social connections among students. Advancements in haptic technology and artificial intelligence are expected to make VR experiences more immersive, particularly within virtual training stations implemented in campus fitness centers. Additionally, personalized programs tailored to individual fitness levels and health data can be

introduced. Furthermore, VR applications integrating education with extracurricular activities—such as virtual laboratories and museum tours—are likely to gain wider adoption in the future.

University campuses have differences in terms of facilities. These differences directly affect the recreational areas and variety offered to students. The lack of recreational facilities or weak variety in activities that match students' interests impacts their participation. For example, activities like golf, surfing, skiing, or parachuting, which require special areas and equipment, cannot be offered by many campuses. This research findings show that structural barriers such as facilities, equipment, and time management can be removed through campus recreation with VR. Studies (Özkeroğlu & Akyıldız Munusturlar, 2020; Schwartz et al., 2011) support findings this work, showing that individuals can experience activities with VR without being limited by time and space. According to Williams (2024), VR experiences can give university students access to recreational opportunities independent of location. Choi et al., (2019) studied the differences between virtual and real-world golf experiences as a leisure activity, focusing on leisure constraints. The study suggested that virtual experiences eliminate barriers like cost, weather, and facilities compared to real-world experiences. Another study highlighted the advantages of VR in sports activities, such as creating a sense of reality, not needing equipment or space, and avoiding weather-related constraints (Merians et al., 2002). Based on this information, VR technology can be used as a tool to provide students access to activities that are often unavailable on campuses due to limitations like facilities, equipment, and time. It allows students to have virtual experiences in line with their interests.

CONCLUSION

This study presents important findings supporting the potential of virtual reality (VR) technology to remove barriers in campus recreation. However, more research is needed on the long-term effects of VR and its applicability for different user groups. Since there are only a few studies on this topic in the literature, this research fills an important gap both theoretically and practically.

Etical Approval and Permission Information

Ethics Committee:	Çanakkale Onsekiz Mart University Rectorate, Institute of Graduate Studies Ethics Committee, and the Scientific Research and Publication Ethics Commission
Protocol/Number	03.33

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Examination of Exercise Addiction and Orthorexia Nervosa Symptoms of Individuals Engaged in Physical Exercise

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Abstract

Aim: The present study aimed to examine exercise addiction levels and orthorexia nervosa symptoms of individuals who engage in regular physical exercise in terms of various variables.

Method: A total of 350 individuals between the ages of 16 and 50 who exercised regularly in Samsun province participated in the present study. "Personal Information Form", "Exercise Addiction Scale" and "ORTO-11 Scale" were used as data collection tools. Normality test of independent sample t-test, ANOVA and Scheffe multiple comparison tests were conducted to analyze the results found in the study.

Results: A statistically significant difference was found among male participants and female participants in terms of Postponement of Individual Social Needs and Conflict, Tolerance Development and Passion and Exercise Addiction Scale scores ($p<0.05$). Participants who were not satisfied with their physical appearance had higher ORTO-11 scores. Participants who had 1-3 training sessions a week had higher ORTO-11 scores than participants who had 4-7 and 8 and higher training sessions a week, while participants who had 4-7 and 8 and higher training sessions a week had higher Excessive Focus and Emotion Change, Postponement of Individual Social Needs and Conflict, Tolerance Development and Passion and Exercise Addiction Scale scores than participants who had 1-3 training sessions a week ($p<0.05$).

Conclusion: A negative correlation was found between orthorexia nervosa and exercise addiction. It was concluded that the individuals who were engaged in regular physical exercise had low orthorexia nervosa levels and high exercise addiction levels.

Key words: *Eating Disorder, Exercise Addiction, Healthy Eating, Healthy Life, Orthorexia Nervosa.*

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INTRODUCTION

The importance of a balanced diet and regular exercise for a healthy life is frequently highlighted by health experts. A healthy balanced diet accompanied by regular exercise is essential in maintaining physical and mental health and well-being and the most important criteria for a healthy lifestyle are exercise and nutrition (Rudolph, 2018). Today, making efforts for a healthy diet continues to increase its effectiveness among individuals. In parallel with this, positive aspects of being in a regular exercise plan are known to improve and maintain the elements of physical fitness in the lives of individuals and this situation leads individuals to participate in regular and varied physical activities. However, habits related to healthy eating, duration, intensity and frequency of exercise participation may cause some negative consequences if they affect an individual's life planning more than necessary. Exerting too much effort to eat healthily can become an obsession and the desire to exercise can become addictive (Chen, 2016).

The benefits of physical exercise on health are well-known (Malm et al., 2019). Regular physical exercise in adults has been shown to be related to lower risk of various cancers, lower risk of cardiovascular and all-cause mortality, reduced risk of weight gain, better cognitive function, improved quality of life, and improved sleep (Powell et al., 2019). However, if regular exercise for physical and psychological health goes beyond its purpose and the duration of exercise continues to increase day by day, individuals may lose control (Yeltepe, 2005). Exercise addiction (EA) is a dysfunctional behaviour characterised by exaggerated training and loss of control over exercise behavior (Szabo & Demetrovics, 2022). Individuals who are unable to give up exercise are prone to behaviours such as not being able to spare time for their relatives and close environment, isolating themselves from social activities and adapting their lifestyle according to their exercise plan (Adams & Kirkby, 2002). The word exercise is often recognised as a useful concept because of its positive effects. The word addiction, on the other hand, generally connotes all situations that are negative. Previously, addiction was categorised into two: the use of alcohol and the use of drugs. However, it is now referred to in many other classifications,

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such as sexual behaviour, playing chance games, excessive exercise and computer or video games (Terry et al., 2004).

Orthorexia nervosa (ON) as a concept first began to appear in the late 1990s. Orthorexia nervosa is defined as a fixation on eating healthy food with the aim of achieving healthiness (and/or avoiding illness) by Bratman & Knight (2000). It is characterized by a strict avoidance of food which are impure or unhealthy by the individual (Strahler et al., 2018). The most common words used to describe orthorexia nervosa are obsession, fixation, and preoccupation (Cena et al., 2019). These words suggest excessive attention to food, which takes over one's cognition and leads to behaviour sustaining this fixation. Individuals with orthorexia nervosa prioritize all-natural, additive free food. If they consume something they perceive as unhealthy, they experience anxiety (Farchakh et al., 2019). Individuals with orthorexia nervosa think about food and drink at all times of the day and spend most of the day constantly thinking and preoccupying themselves with healthy eating. Orthorexia nervosa can be clearly indicated when this obsessive behaviour affects the individual's life negatively (Cartwright, 2004). Orthorectic individuals apply very strict principles to themselves in terms of nutrition by feeling themselves to be in a constant diet plan. As a result of these behavioural attitudes, they may experience significant health problems. It has been found that individuals with orthorexia nervosa have higher behaviors related to general eating pathological problems such as stress, depression, and life satisfaction compared to individuals without orthorexia nervosa (Strahler et al., 2018). It has been found that orthorexia nervosa is related to symptoms and concerns characteristics of eating disorders (McComb & Mills, 2019; Brytek-Matera et al., 2020; Mitrofanova, 2020). One of the groups with the highest risk of orthorexia nervosa is individuals who are engaged in sports (Brytek-Matera, 2012). Since they know the importance of physical fitness for individuals who are engaged in sports, they pay attention to their nutrition to have sufficient physical fitness. The fact that they are very sensitive to nutrition planning leads these individuals to investigate the ingredients in foods, to examine the nutrient content labels on the packages of the foods taken, and to try to calculate the calories of the foods. For this reason, people who engage in sports or regular physical exercise usually have a high level of desire to follow a diet or to be in a diet program (Üstündağ, 2020).

It is widely accepted that intense physical exercises are typically related to eating disorders, while the relationship between orthorexia nervosa (ON) and excessive physical exercise is still a subject of debate (Yao et al., 2023). In addition, the research in literature on factors related to orthorexia nervosa is still insufficient and there are few studies examining the variables of exercise addiction and orthorexia nervosa together (Rudolph, 2018). Therefore, the present study aims to fill this gap in the literature by addressing these two important issues together and determining the exercise addiction levels of individuals who engage in regular physical exercise in terms of their sociodemographic characteristics and determining the prevalence of orthorexia nervosa.

METHOD

Research model

Since the study was conducted to reveal the status of individuals in different age groups at a certain point in time, the present study was modelled as a cross-sectional study. In cross-sectional studies, participants' opinions regarding a topic or event, or their features such as interests, skills, abilities and attitudes are determined while data measurement is performed at once and sample sizes are larger compared to other types of studies (Karasar, 2018).

Participants

A total of 350 individuals, 170 females and 180 males, between the ages of 16 and 50, who regularly exercised in Samsun province, participated voluntarily in the study. As demographic characteristics, gender, disability status, weekly exercise time, educational status and satisfaction with physical appearance were evaluated. The sample was determined through a simple random sampling method. There are various practical rules in the literature for determining the sample size. In this study, the recommendation that the sample size in scale studies should be at least 5 times of each scale item (Tavşancıl, 2014) was taken into consideration. The scale forms used in the study consist of 28 items in

total. For this reason, the minimum number of participants required to participate in the study was determined as 140.

Data collection tools

Personal Information Form: This form was prepared by the researchers and included information about the participants' age, gender, weekly duration of exercise, educational status, gym membership status and satisfaction with physical appearance.

Exercise Addiction Scale (EAS): "Exercise Addiction Scale (EAS)" developed by Demir, Hazar and Cicioğlu was used as a data collection tool to determine the exercise addiction levels of individuals (Demir et al., 2018). "Exercise Addiction Scale" consists of 17 items and 3 sub-dimensions. Items 1, 2, 3, 4, 5, 6, 7 of the scale, which was created in a 5-point Likert-type format, measure the sub-dimension of Excessive Focus and Emotion Change (EFEC); items 8, 9, 10, 11, 12, 13 measure the sub-dimension of Postponement of Individual-Social Needs and Conflict (PISNC), and items 14, 15, 16, 17 measure the sub-dimension of Tolerance Development and Passion (TDP) (Demir, 2018). The scale is scored as '1=Strongly Disagree', '2=Partially Disagree', '3=Moderately Agree', '4=Agree', '5=Strongly Agree'. Score ranges are evaluated as '1-17 normal group, 18-34 low risk group, 35-51 risk group, 52-69 addicted group, 70-85 highly addicted group'.

ORTO-11: In the present study, ORTO-11 test, which was developed to determine obsession with healthy eating in individuals, was used to calculate the orthorexia nervosa risk. The ORTO-11 scale was first prepared as ORTO-15 in 2005 by Donini et al., (2004) and adapted by Arusoğlu et al., 2008. The items in the scale can be answered in a 4-point format. Respondents are asked to tick one of the options 'always', 'often', 'sometimes' and 'never'. Each item is graded as 1, 2, 3 and 4 points. The items examine the obsessive behaviours of individuals in selecting, purchasing, preparing and consuming foods that they themselves consider healthy. As the scores of the respondents increase, their tendency towards orthorexia decreases. The cut-off value used to evaluate the Orthorexia-11 Questionnaire in the present study was determined by utilizing the method adopted by Arusoğlu et al.

Data analysis

When ordinal data such as Likert scales are used in survey data, normality tests (Shapiro-Wilk, Kolmogorov-Smirnov, etc.) often do not yield normal distribution results. The main reason for this is that the Likert scale produces values that are discreet and in a limited range (e.g. 1-5) rather than a continuous variable. Such data may not conform to a perfectly normal distribution by nature. In this case, looking at Kurtosis and Skewness values is a much more practical and meaningful approach. A Kurtosis value between ±1.0 is considered excellent for most psychometric purposes, but a value between ±2.0 is in many cases also acceptable, depending on the application (George & Mallery, 2012). Skewness is the measure of the symmetry of a distribution; in most instances the comparison is made to a normal distribution. A positively skewed distribution has relatively few large values and tails off to the right, and a negatively skewed distribution has relatively few small values and tails off to the left. Skewness values falling outside the range of -1 to +1 indicate a substantially skewed distribution (Hair et al., 2013). In this context, in the present study, the Kurtosis and Skewness values of all survey questions and the total scores obtained from them were found within the ranges specified by the reference sources and the data found were normally distributed. In the analysis, the independent samples t-test was used for two group comparisons and analysis of variance (ANOVA) test was used for more than two group comparisons. The Scheffe post-hoc test was used to determine the groups with differences in multiple comparisons (since the group sample numbers were different). Pearson Correlation analysis was also conducted to examine the correlation between orthorexia nervosa and exercise addiction. The findings were expressed as arithmetic mean and standard deviation, and the significance level was taken as 0.05. All calculations were made with SPSS 21 package program. When the factor structures for both scales were analyzed, Cronbach Alpha values were found as follows: 0.912 for Excessive Focus and Emotion Change factor, 0.882 for Postponement of Individual-Social Needs and Conflict factor, 0.854 for Tolerance Development and Passion factor and 0.949 for Exercise Addiction Total Score. Cronbach Alpha value was found as 0.858 for ORTO-11 scale.

RESULTS

Table 1. Descriptive results

Variables	Groups	n	%
Gender	Male	180	51.43
	Female	170	48.57
Being Satisfied with Physical Appearance	Yes	182	52.00
	No	168	48.00
Educational Status	Secondary	48	13.71
	Associate	68	19.43
	Under/Post graduate	234	66.86
Weekly Training Sessions	1-3	174	49.71
	4-7	109	31.14
	>8	67	19.14
Total		350	100

Among the participants, 180 are male and 170 are female, indicating an almost equal gender distribution. While 52% are satisfied with their physical appearance, 48% stated that they are not. Most of the participants (66.9%) have an undergraduate or postgraduate education. Those with a secondary education make up 13.7%, while associate degree holders account for 19.4%. Most participants (49.7%) train 1-3 days per week, while 31.1% train 4-7 days, and 19.1% train 8 or more days per week.

Table 2. ORTO-11 scores and Exercise Addiction and sub-dimension scores of the participants in terms of gender

Variables	Gender	n	Mean	d.f.	t	p
ORTO-11	Male	180	27.74	4.82	-.088	.930
	Female	170	27.78	4.44		
Excessive Focus and Emotion Change	Male	180	23.89	7.29	.731	.465
	Female	170	23.36	6.19		
Postponement of Individual-Social Needs and Conflict	Male	180	15.85	5.41	3.999	0.001*
	Female	170	13.62	5.01		
Tolerance Development and Passion	Male	180	11.53	4.33	3.970	0.001*
	Female	170	9.78	3.90		
Exercise Addiction Total Score	Male	180	51.28	15.56	2.919	0.004*
	Female	170	46.76	13.18		

**p<0.05*

As can be seen in Table 2, a statistically significant difference was found in "Postponement of Individual-Social Needs and Conflict", "Tolerance Development and Passion" sub-dimensions and total score of "Exercise Addiction Scale" (*p<0.05*). Male participants were found to have higher scores than female participants.

Table 3. Comparison of ORTO-11 scores and Exercise Addiction and sub-dimension scores of the participants in terms of the state of being satisfied with physical appearance

Variables	Satisfaction with physical appearance	n	Mean	d.f.	t	p
ORTO11	Yes	182	26.31	4.69	-6.449	0.001*
	No	168	29.33	4.02		
Excessive Focus and Emotion Change	Yes	182	24.19	7.08	1.599	0.111
	No	168	23.04	6.39		
Postponement of Individual-Social Needs and Conflict	Yes	182	15.32	5.51	2.050	0.041*
	No	168	14.16	5.07		
Tolerance Development and Passion	Yes	182	11.38	4.46	3.291	0.001*
	No	168	9.92	3.79		
Exercise Addiction Total Score	Yes	182	50.90	15.32	2.437	0.015*
	No	168	47.12	13.58		

**p<0.05*

In Table 3, statistically significant differences can be seen in "ORTO-11", "Postponement of Individual-Social Needs and Conflict", "Tolerance Development and Passion" and "Exercise Addiction" scores in terms of the state of being satisfied with physical appearance (p<0.05). Participants who were satisfied with their physical appearance got higher scores.

Tablo 4. Comparison of ORTO-11 scores and Exercise Addiction and sub-dimension scores of the participants in terms of educational status

Variables	Educational Status	n	Mean	d.f.	F	p	Scheffe
ORTO11	Secondary	48	28.17	4.64	.842	.432	-
	Associate	68	28.25	5.05			
	Undergraduate/postgraduate	234	27.53	4.51			
Excessive Focus and Emotion Change	Secondary[1]	48	21.60	7.44	10.807	0.001*	3>1-2
	Associate[2]	68	21.12	7.74			
	Undergraduate/postgraduate[3]	234	24.79	6.03			
Postponement of Individual-Social Needs and Conflict	Secondary[1]	48	14.04	5.69	3.842	.022*	3>2
	Associate[2]	68	13.43	5.55			
	Undergraduate/postgraduate[3]	234	15.30	5.12			
Tolerance Development and Passion	Secondary	48	10.67	4.89	2.251	.107	-
	Associate	68	9.74	4.07			
	Undergraduate/postgraduate	234	10.96	4.08			
Exercise Addiction Total Score	Secondary[1]	48	46.31	16.49	6.887	.001*	3>1-2
	Associate[2]	68	44.28	15.96			
	Undergraduate/postgraduate[3]	234	51.05	13.39			

**p<0.05*

In Table 4, a statistically significant difference can be seen in "Excessive Focus and Emotion Change", "Postponement of Individual-Social Needs and Conflict" and "Exercise Addiction total" scores, with undergraduate and postgraduates having higher scores.

Table 5. Comparison of ORTO-11 scores and Exercise Addiction and sub-dimension scores of the participants in terms of number of weekly training sessions

Variables	Number of weekly training sessions	n	Mean	d.f.	F	p	Scheffe
ORTO-11	1-3[1]	174	29.09	4.46	17.342	0.001*	1>2-3
	4-7[2]	109	26.93	4.19			
	≥8[3]	67	25.66	4.71			
Excessive Focus and Emotion Change	1-3[1]	174	21.41	6.52	24.073	0.001*	2>3>1
	4-7[2]	109	26.75	5.51			
	≥8[3]	67	24.34	7.21			
Postponement of Individual-Social Needs and Conflict	1-3[1]	174	13.25	5.22	15.067	0.001*	2-3>1
	4-7[2]	109	16.29	4.59			
	≥8[3]	67	16.21	5.69			
Tolerance Development and Passion	1-3[1]	174	9.01	3.96	32.138	0.001*	2-3>1
	4-7[2]	109	12.31	3.47			
	≥8[3]	67	12.37	4.28			
Exercise Addiction Total Score	1-3[1]	174	43.68	13.76	28.041	0.001*	2-3>1
	4-7[2]	109	55.36	12.04			
	≥8[3]	67	52.93	15.42			

**p<0.05*

Table 5 shows statistically significant differences in ORTO-11 scores and all sub-dimensions and overall score of "Exercise Addiction Scale" in terms of the number of weekly training sessions ($p<0.05$). It was found that participants who had 1-3 training sessions a week had the lowest scores in all sub-dimensions and overall score of "Exercise Addiction Scale" and the highest score in ORTO-11 scale.

Table 6. Correlation coefficient values between ORTO-11 and Exercise Addiction subscales and total scale

Variable	ExcessiveFocus	IndividualSoc	Tolerance	EASTotal
ORTO-11	-.255*	-.237*	-.284*	-.286*

**p<0.05; Pearson Correlation analysis*

When the results in Table 6 are analysed, a weak negative correlation can be seen between ORTO-11 scores and Exercise Addiction subscales and total scale (**p<0.05*). While ORTO-11 scores increase, exercise addiction scores decrease.

DISCUSSION

The present study, which was conducted to examine the exercise addiction levels and orthorexia nervosa symptoms of individuals who regularly engaged in physical exercise in terms of various variables,

revealed that as orthorexia nervosa tendency of individuals increase, their exercise addiction scores also tend to increase.

When the ORTO-11 scale was analysed in terms of the gender variable, no statistically significant difference was found. McInerney & Ernst (2011) reached the same conclusion in their study with individuals aged 16-40 years. There are also other studies which reported that there is no significant relationship between ORTO-11 score and gender (Brytek et al., 2015; Almedia et al., 2018; Erduğan et al., 2024). Therefore, when the literature was reviewed, it was found that the data obtained from other studies supported the present study.

In the present study, when PISNC, TDP and EAS scores were examined in terms of the gender variable, it was found that male participants had higher scores than female participants. Similar to the results of the present study, Tekkurşun-Demir & Türkeli (2018) found a significant difference in favor of men in the sub-dimensions of PISNC and TDP. In a systematic review by Dumitru et al., (2018) exercise dependence levels were higher in men than in women in 25 of the 27 studies they examined. Zmijewski & Howard (2013) also found that male participants had higher PISNC, TDP and EAS scores than female participants. However, there are also studies in which women had higher scores or in which no significant difference was found (Demirel & Cicioğlu, 2020; Batu & Aydın, 2020). The differences in the results may be due to the differences in the demographic characteristics of the participants in studies.

In terms of the state of being satisfied with physical appearance, it was found that the individuals who were not satisfied with their physical appearance in the present study had higher ORTO- 11 scores. Previous studies have found that dissatisfaction with one's body is related with disrupted eating behavior in university students (Bundros et al., 2016). In a study conducted by Altıntaş et al., (2007) it was found that participants who were dissatisfied with their physical appearance showed more orthorexia nervosa symptoms. The reason for this may be that individuals may never be satisfied with their own physical appearance if they are obsessed with healthy eating, and perhaps they may have turned this into an obsession. However, PISNC, TDP, and EAS scores of individuals who were satisfied with their physical appearance in the present study were statistically significantly higher. Tatlıses (2016) also found a significant difference in PISNC, TDP and EAS scores of individuals who were satisfied with their physical appearance, which supported the findings of the present study. There are also studies in literature which show that orthorexic individuals do not have body dissatisfaction because the main goals of orthorexic individuals are not to lose weight but to eat healthily (Bratman & Knight, 2000). Another study conducted on young adults reported that body image was not a predictor for orthorexic tendency (Topçu & Arıcak, 2019). When the results are compared, it can be said that when individuals who exercise regularly bring this to the degree of addiction, a significant difference in these scores is normal, but it is possible to say that these participants are candidates to becoming addicted to exercise.

In the present study, it was found that participants with undergraduate degrees had higher EFEC and EAS scores than the participants who had associate and secondary education degrees. In terms of PISNC sub-dimension, it was found that participants who had undergraduate and post-graduate degrees had higher scores than the participants who had associate degrees. It was found that the participants with undergraduate and post-graduate degrees had the highest scores in all the subdimensions of exercise addiction scale. In terms of ORTO-11 scores, it was found that the participants with undergraduate and post-graduate degrees had the lowest scores, which means that they had the lowest tendency for being orthorexic. In their study, Arusoğlu et al. (2018) found that post-graduate education group had higher score on ORTO-11. Donini et al., (2014) found a significant difference in orthorexia nervosa levels of individuals who had low levels of education.

It was found that ORTO-11 scores of individuals who had 1-3 training sessions a week were higher than the scores of individuals who had 4-7 sessions and those who had 8 and more sessions a week. Therefore, the first hypothesis of this study that regular physical exercise would have a positive effect on orthorexia nervosa levels of individuals was confirmed. In a study conducted by Polat (2015), while the highest level of orthorexia nervosa was found in participants who exercised once a week, the lowest level of orthorexia nervosa was found in the group who exercised twice a week. While the results support the results of the present study, this study was conducted only on gym members. In Erduğan et al.'s (2024) study, it was found that orthorexic tendency increased as the number of days individuals exercised

increased. In the present study, the participants who had 4-7 or 8 and more training session a week had higher PISNC, TDP, EAS scores than the participants who had 1-3 training sessions a week. Thus, the second hypothesis of the present study that individuals who have regular physical exercise would have high exercise addiction levels was also confirmed. Participants' trying to escape from daily work and facing socialisation problems may be the reasons for extending the exercise duration. In Erduğan et al.'s (2024) study, it was found that the levels of exercise addiction among participants significantly increased with increase in frequency of weekly workouts. Sicilia et al., (2017) stated that exercise intensity significantly predicted exercise addiction. Üstündağ (2020) also examined exercise addiction and orthorexia nervosa symptoms in participants who exercised in gyms. According to the results, it was concluded that whether the participants exercised or not had no effect on their ORTO-11 scores. In another study on 150 participants who exercised regularly, Orhan et al., (2019) reported that weekly exercise duration and exercise addiction were not correlated. On the contrary, Roncero et al., revealed a significant relation between scores for Orthorexia-11 Questionnaire and doing regular physical exercise (Roncero et al. 2017). Different results found in different studies may be due to the different levels of information the participants had about training and the different samples of studies.

A weak negative correlation was found between ORTO-11 and Exercise addiction scores. While ORTO-11 scores increased, exercise addiction scores decreased. Similarly, Erduğan et al., (2024) also found a low negative correlation between orthorexia nervosa and exercise addiction. Zmijewski & Howard (2013) investigated the status of exercise addiction and orthorexia nervosa symptoms in a study of 375 male and female participants who exercised regularly and found a positive correlation between the two groups. Yıldırım et al., (2017) also found that these two variables were correlated. When the literature is reviewed, the results of the present study and similar studies show that as the participants' behaviours towards nutritional obsession increase, their level of addiction on exercise also tends to increase.

CONCLUSION

According to the results of the present study, which was conducted to examine the relationship between orthorexia nervosa and exercise addiction in individuals who exercise regularly, it can be concluded that individuals who engage in regular physical exercise have low levels of orthorexia nervosa symptoms and high levels of exercise addiction. Therefore, decreasing exercise addiction levels can vary depending on the level of orthorexia nervosa.

Etical Approval and Permission Information

Ethics Committee: Ondokuz Mayıs University, Social Sciences Research Ethics Committee
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Genç Erkek Futbolcularda Dinamik Nöromüsküler Stabilizasyon (DNS) Testi Performansı, Ayak Bileği Propriyoseptif Keskinliği ve Denge Tepkileri Arasındaki İlişki*

Ebru ERSOY[1], Abdullah CANİKLİ[2]

Özet

Amaç: Bu çalışma, genç futbolcularda sağ ve sol taraf asimetrisi, propriyoseptif keskinlik, denge ve postüral stabilitenin etkilerini inceleyerek, bu faktörlerin futbolcuların performansını artırma ve yaralanma riskini azaltma üzerindeki etkilerini anlamayı ve daha güvenli ve etkili antrenman protokollerinin geliştirilmesine katkı sağlamayı amaçlamaktadır.

Yöntem: Bu çalışmaya 20 erkek futbolcu katılmıştır (yaş: 20,7±1,68 yıl; vücut kütle indeksi (VKİ): 22,1±1,5 kg/m²; futbol deneyimi: 8,2±2,7 yıl). Test oturumları, sağ ve sol ekstremiteler için sırayla ayak bileği aktif hareket ayrımı testi, DNS testlerinden karın içi basınç, diyafram ve kalça fleksiyon testleri ile Y-Denge testi de uygulanmıştır. Eğim derecelerine ve yönlere göre farklılıklar çift yönlü tekrarlı ölçümler ANOVA testi ile analiz edilirken, testler arasındaki ilişkiler Pearson korelasyon analiziyle incelenmiştir.

Bulgular: Mevcut çalışmanın bulgularına göre propriyosepsiyon skoru 6,3±2,0 olarak belirlenmiş ve sporcuların yaklaşık %63 oranında doğru yanıt verdiği tespit edilmiştir. Ayak bileğinin dört farklı inversiyon derecesindeki propriyoseptif keskinlik değerleri her derece için ayrı ayrı incelenmiş ve sporcuların sağ ve sol taraftaki 16 derecedeki ortalama doğru yanıtlarının, 12 ve 14 dereceye kıyasla daha yüksek olduğu bulunmuştur ($p<0,05$).

Sonuç: Sonuçlar, asemptomatik genç futbolcuların propriyoseptif keskinlikte %63 başarı performansı sergilediğini ve inversiyon açısının ayak bileği propriyosepsiyonu açısından önemli bir ayırt edici faktör olduğunu göstermektedir. Daha yüksek propriyoseptif ayırt edicilik, postüral stabilizasyon ve denge, antrenman ve oyun gelişiminin sınırlarını taklit ederek antrenman planında değerlendirme, önleme ve performans testlerinin önemini vurgulamaktadır.

Anahtar Kelimeler: *Ayak Bileği İnversiyonu, Denge, Spor, Önleme.*

Relationship Among Dynamic Neuromuscular Stabilization (DNS) Test Performance, Ankle Proprioceptive Acuity, and Balance Responses in Young Male Soccer Players

Abstract

Aim: This study aims to examine the effects of right and left side asymmetry, proprioceptive sharpness, balance, and postural stability in young soccer players, to understand the impact of these factors on performance enhancement and injury risk reduction, and to contribute to the development of safer and more effective training protocols.

Methods: This study included 20 male football players (age: 20.7±1.68 years; body mass index (BMI): 22.1±1.5 kg/m²; football experience: 8.2±2.7 years). Test sessions included the ankle active movement discrimination test for both right and left limbs, intra-abdominal pressure, diaphragm, and hip flexion tests from DNS tests, as well as the Y-Balance test. Differences based on inclination angles and directions were analyzed using two-way repeated measures ANOVA, while relationships between tests were examined with Pearson correlation analysis.

Results: According to the findings of the present study, the proprioception score was determined as 6.3±2.0, indicating that the athletes provided correct responses at a rate of approximately 63%. Proprioceptive acuity values at four different degrees of ankle inversion were analyzed separately for each degree, and it was found that the athletes had higher mean correct responses at 16 degrees on both the right and left sides compared to 12 and 14 degrees ($p<0.05$).

Conclusion: The results indicate that asymptomatic young football players exhibit a 63% success rate in proprioceptive acuity and that the inversion angle is a significant distinguishing factor in ankle proprioception. Higher proprioceptive discrimination, postural stabilization, and balance mimic the boundaries of training and game development, emphasizing the importance of assessment, prevention, and performance testing in training programs.

Keywords: *Ankle Inversion, Balance, Sports, Prevention.*

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GİRİŞ

Futbol, içeriğinde yüksek şiddetli aktiviteler bulunan ve yaralanma riski giderek artan bir spordur (Junge & Dvorak, 2004). Bununla birlikte, futbolda yaralanma insidansının %61 ila %90 arasında değişen

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oranlarda alt ekstremite yaralanmaları oluşturduğu bildirilmiştir (Lakshakar ve ark., 2022). Maç veya antrenmana 1000 saatlik maruz kalmada, yaralanma oranları ayak bileği ve çevresi (%1,9), üst bacak (%1,8), diz (%1,2), kalça/kasık (%0,9) ve ayak (%0,4) şeklindedir (López-Valenciano ve ark., 2020). Dolayısıyla, futbolda yaralanma görülme sıklığının bu kadar yüksek olması sebebiyle, yaralanma riskini düşürme potansiyeline sahip müdahalelerin geliştirilmesine ihtiyaç duyulmaktadır (Cooke ve ark., 2020). Yapılan çalışmalarda, propriyosepsiyon, postüral stabilizasyon ve denge çalışmalarının hem yaralanma önleyici hem de rehabilitasyon amaçlı kullanıldığı görülmektedir (Plisky ve ark., 2006; Zech ve ark., 2010; Sadigursky ve ark., 2017).

Dinamik Nöromüsküler Stabilite (DNS), çeşitli postüral stabilizasyon modellerini değerlendiren fonksiyonel testlerin yanı sıra bir rehabilitasyon yaklaşımı olarak da kullanılmaktadır (Frank ve ark., 2013). DNS, gelişimsel kinezyolojiye dayalı olarak vücudun stabilitesini ve fonksiyonel hareketlerini optimize eder (Sharma ve ark., 2024). Bu fonksiyonel hareketleri elde etmek için, beyin uyarımını yönlendirme, postüral farkındalık, nefes alma düzeni ve kas koordinasyon eğitimini birleştirir. Dolayısıyla, DNS yalnızca yaralanma riskini azaltmakla kalmaz, aynı zamanda spor performansını da artırabilir (Frank ve ark., 2013). DNS testleri, klinik uygulamalarda gövde stabilizasyonunu değerlendirmek için potansiyel olarak faydalı bir araç olarak görülmektedir (Jacisko ve ark., 2021).

Propriyosepsiyon, motor kontrol için kritik bir öneme sahip olup, denge ve postüral kontrolü içeren daha geniş bir kavramdır (Ergen & Ulkar, 2008). Ayrıca, dinamik aktiviteler sırasındaki eklem hareketini ve pozisyonunu algılamada temel duyusal mekanizmadır (Riemann & Lephart, 2002a). Optimal bir fonksiyon tasarlamak için sağlıklı bir sensorimotor sistem gerektiğinden, propriyosepsiyonla ilgili elemanlardan herhangi birinden veya kombinasyonundan gelen bir değişiklik veya bilgi kaybı, normal hareketin ve postüral stabilitenin bozulmasına yol açarak, olası yaralanma riskini artıran önemli sorunlara neden olabilir (Ogard, 2011). Dolayısıyla, propriyosepsiyon ve nöromüsküler kontroldeki olumlu değişiklikler, spor yaralanmalarını önlemenin yanında, yaralanma sonrası fonksiyonel performansı artırmada da etkilidir (Zech ve ark., 2010). Yapılan çalışmalarda, propriyoseptif ayırt ediciliğin (propriyoseptif keskinlik), sporcunun performans seviyesi ile önemli ölçüde ilişkili olduğu gösterilmiştir (Goble, 2010; Han ve ark., 2015). Son yıllarda, fizik tedavi ve rehabilitasyon alanında, bireylerin motor çıktı üretme yeteneğine odaklanan geleneksel fiziksel değerlendirmelerin aksine, duyusal geri bildirim keskinliğine, yani propriyoseptif ayırt ediciliğe daha fazla vurgu yapılmaktadır (Goble, 2010). Bu nedenle, propriyoseptif fonksiyonun tam olarak anlaşılması; spora bağlı yaralanmaların rehabilitasyonu, performans üzerindeki katkılarını ve etkilerini anlamak için kritik öneme sahiptir (Ogard, 2011). Yaralanma önleyici programların hedefleri arasında risk altındaki sporcuları tanımlamak ve uygun risk gruplarına sınıflandırmak gösterilebilir (Brumitt ve ark., 2013; Cooke ve ark., 2020). Son raporlar, sporla ilgili yaralanma riski taşıyan sporcuları belirlemek için çeşitli fonksiyonel testleri değerlendirmiştir ve dinamik denge testleri de bunlardan biridir (Plisky ve ark., 2009; Scinicarelli ve ark., 2021). Araştırmalar, dinamik denge testlerinin, spora katılım için bir tarama aracı ve fonksiyonel asimetriyi anlamak için rehabilitasyon sonrası test olarak kullanılmasını önermektedir (Plisky ve ark., 2009; Scinicarelli ve ark., 2021). Ayrıca, propriyosepsiyon gerektiren bu dinamik denge testleri, fiziksel performansı değerlendirmek için de kullanılmıştır (Plisky ve ark., 2009).

Futbol performansı, teknik, taktik, zihinsel ve fizyolojik unsurlar gibi çeşitli biyomotor yetenekler gerektirir. Ayrıca, eğitim programları, futboldaki genel fiziksel performansı artırmak için çeviklik, sprint ve denge gibi motor yetenekleri geliştirmek üzere tasarlanmıştır (Yu ve ark., 2021). Ancak, performansı etkileyen birçok faktör vardır (Silva, 2022). Son yıllarda yaygınlaşsa da antrenman tasarımında fiziksel parametreleri geliştiren metabolik kondisyon faaliyetleri kadar propriyosepsiyona ve postüral stabilizasyona yönelik programlara yeterince önem verilmemektedir (Silva, 2022). Bu yüzden, fiziksel aktiviteler sırasında uygun hareket kalıpları ve hareketin ihtiyaçlarına uyumlanabilecek bir sinir sistemi hem yaralanmaların önlenmesi hem de atletik performans için önemlidir (Minthorn ve ark., 2015). Bu çalışma, genç futbolcularda sağ ve sol taraf asimetrisini inceleyerek, propriyoseptif keskinlik, denge ve postüral stabilitenin etkilerini değerlendirmektir. Bu sayede, futbolcuların yalnızca fiziksel parametrelerle değil, sensomotorik ve postüral farkındalık gibi nöromüsküler faktörlerle de gelişebileceği ortaya konulmakta ve spor bilimlerine katkı sağlanması hedeflenmektedir. Ayrıca, daha güvenli ve etkili antrenman yöntemleri geliştirilerek, futbolcuların performansını artırmak ve yaralanma

riskini azaltmak amacıyla özelleştirilmiş antrenman protokollerine yönelik bir temel oluşturulması amaçlanmaktadır.

YÖNTEM

Araştırmanın Modeli

Bu araştırmada, postüral stabilizasyon, denge ve propriyosepsiyon testlerini değerlendirmek amacıyla nicel araştırma deseni kullanılmıştır. Araştırma, kesitsel tarama modeli kapsamında gerçekleştirilmiş olup, katılımcıların belirli bir zaman diliminde değerlendirilmesi esas alınmıştır.

Evren ve örneklem

Çalışmaya başlamadan önce, katılımcılara araştırma ile ilgili potansiyel faydalar ve riskler ayrıntılı bir şekilde açıklanmış ve bilgilendirilmiş onam formları imzalatılmıştır. Bu çalışmaya, tamamı Bölgesel Amatör Lig'de oynayan ve baskın ayağı sağ olan toplam 20 erkek futbolcu (yaş: 20,7±1,68 yıl; kilo: 69,0±7,0 kg; boy: 176,5 ± 6,7 cm; vücut kütle indeksi: 22,1±1,5 kg/m²; futbol deneyimi: 8,2±2,7 yıl) dahil edilmiştir. Katılımcıların haftalık ortalama antrenman süresi ≥4 gün olup, her bir antrenman yaklaşık 100 dakika sürmektedir. Daha önce tıbbi müdahale gerektiren veya ertesi gün antrenman yapmalarını engelleyecek düzeyde alt ekstremite yaralanması bulunanlar ile herhangi bir sistemik hastalık, kardiyovasküler rahatsızlık, nörolojik bozukluk, kemik kırığı veya cerrahi öyküsü bulunan bireyler çalışma kapsamı dışında bırakılmıştır. Ayrıca, diğer oyunculardan farklı antrenman programına sahip olanlar (örneğin, kaleciler), son 6 ay içinde düzensiz antrenman yapanlar veya çalışmaya katılmaya istekli olmayan sporcular da çalışma dışı bırakılmıştır. Katılımcılara, testlerden en az 24 saat önce yoğun egzersiz yapmamaları ve kafein tüketiminden kaçınmaları gerektiği bildirilmiştir.

Veri toplama araçları

Tüm değerlendirmeler, üç tekrarlı bir öğrenme seansının ardından, aynı gün içinde ve aynı araştırmacı tarafından gerçekleştirilmiştir. Çalışma protokolünün süresi yaklaşık 30 dakika olup, her oyuncu değerlendirmelere aynı sırayla tabi tutulmuştur. Katılımcılar, testlerden önce 15 dakikalık serbest ısınmalarını tamamladıktan sonra sırasıyla ayak bileği aktif hareket ayrım testini, DNS'in intraabdominal basınç, diyafram ve kalça fleksiyon testlerini ve son olarak Y denge testini sağ ve sol ayak olmak üzere tamamlamışlardır. Testlerin her aşaması arasında 2'şer dakikalık ayakta dinlenme süresi verilmiştir. Ölçümler, öğleden sonra, antrenman seanslarından önce ve spor sezonunun başında gerçekleştirilmiştir.

Propriyoseptif Keskinlik: Ayak bileğinin propriyoseptif keskinliğini değerlendirmek için ölçüm yöntemlerinden biri olan Aktif Hareket Ayrımı Değerlendirmesi (AMEDA) tercih edilmiştir. Bu çalışmada, "Ayak Bileği İnversiyon Ayrım Aparatı" (AIDAL) olarak adlandırılan ve AMEDA yöntemine dayanan bir test cihazı kullanılmıştır. AIDAL ölçümlerinin sporcularda daha ayırt edici olduğu belirtilmiş (Han ve ark., 2022) ve test yöntemi olarak seçilmiştir. Test, ayarlanabilir bir aparat yardımıyla gerçekleştirilmiş olup, kısa bir mesafeden iniş sırasında katılımcının dört farklı ayak bileği inversiyon açısını öğrenmesini ve daha sonra bu açıları ayırt etme yeteneğinin değerlendirilmesini amaçlamıştır. Katılımcılar ayakkabısız ve çorapsız olarak test edilmiş ve test prosedürü, Han ve arkadaşlarının çalışmasına göre düzenlenmiştir. Asıl testten önce, dört inversiyon pozisyonunu öğretmek amacıyla, her eğim açısında üçer tekrarlı ısınma atlamaları yapılmıştır (toplam 12 deneme). Her denemede, katılımcılardan kalkış platformundan test ayağı önde olacak şekilde, kalçalar ve dizler doğal biçimde bükülmüş halde, her iki ayakla eş zamanlı olarak iniş yapmaları istenmiştir. Asıl test, dört farklı ayak bileği inversiyon açısı için toplamda 10 tekrardan oluşan ve rastgele sıralanmış 40 atlamadan meydana gelmiştir. Katılımcılardan, öğrendikleri dört farklı ayak bileği inversiyon açısını hatırlayarak, her test denemesinde inversiyon miktarı hakkında kesin bir yanıt vermeleri istenmiştir. Ayrıca, test süresince katılımcılara yargılarının doğruluğuna dair herhangi bir geri bildirim verilmemiştir (Han ve ark., 2021). Elde edilen sonuçlara göre, dört farklı derece grubu arasındaki doğru yanıt ortalamaları çoklu karşılaştırma testi ile analiz edilmiştir.

Dinamik Nöromüsküler Stabilizasyon (DNS) Testleri: Postüral stabilizasyon ve fonksiyonel hareket kalitesini değerlendirmek amacıyla DNS testleri uygulanmıştır. Tüm testler, katılımcının ayaklarının yere temas etmediği bir yükseklikte oturduğu, ellerinin ise gövdesinin yanında veya dizlerinin üzerinde

gevşek bir pozisyonda olduğu şekilde gerçekleştirilmiştir. Değerlendirmeler, Kobesova ve arkadaşları (2020) tarafından açıklanan ayrıntılı prosedürlere uygun olarak yapılmıştır. Puanlama, 100 üzerinden eğitmenin değerlendirmesine göre hesaplanmıştır.

DNS-İntraabdominal Basınç (İAB) Testi: Katılımcılara, önceden öğretilen teknik doğrultusunda, kaslarını sakin bir şekilde değerlendiricinin parmaklarına doğru iterek İAB'ı etkinleştirmeleri talimatı verilmiştir. Aktivasyonun miktarı ve simetrisi palpasyon yöntemiyle değerlendirilmiştir. Test sırasında alt abdominal duvar aktivasyonu gözlemlenmezse, ideal postür korunamazsa veya rektus abdominis kas aktivasyonu ile kompansasyon oluşursa, stabilizasyonun yetersiz olduğu kabul edilerek puanlama buna göre yapılmıştır (Kobesova ve ark., 2020; Jancisko ve ark., 2021).

DNS-Diyafram Testi: Katılımcılardan, karın duvarının lateral-dorsal bölümlerini harekete geçirmek amacıyla, klinisyenin parmaklarına doğru derin bir nefes almaları istenmiştir. Alt kaburgaların yanal hareketi, karın duvarı aktivasyonunun miktarı ve simetrisi hem görsel hem de palpasyon yöntemiyle değerlendirilmiştir. Ardından, klinisyen omurga ve omuz hareketlerini, ayrıca patolojik sinkinezi (istemsiz hareket) varlığını gözlemleyerek test sonucunu puanlandırmıştır (Kobesova ve ark., 2020; Jancisko ve ark., 2021).

DNS-Kalça Fleksiyon Testi: Bu test, prosedür açısından DNS-Diyafram Testi ile benzerlik göstermektedir. Katılımcılardan, sağ bacaklarını yavaşça (yaklaşık 10-20 cm) kaldırmaları ve bu pozisyonu korurken doğal bir şekilde nefes almaları istenmiştir. Test sırasında omurganın dik pozisyonda kalması ve pelvisin stabil olması beklenirken, omurganın yana kayması, kifoz veya lordoz kompansasyon olarak kabul edilmiş ve test puanına etki etmiştir (Kobesova ve ark., 2020; Jancisko ve ark., 2021).

Y Denge Testi (YDT): Test, çıplak ayakla gerçekleştirilmiştir. Denge testinin alt ekstremite versiyonu protokolüne göre, ölçüm yönleri belirlenmiş ve bu yönler, duruş ayağına göre adlandırılmıştır. Katılımcılara, elleri belde sabit olacak şekilde platformun ortasında değerlendirilmekte olan bacak üzerinde duruşlarını korurken, serbest uzuvlarıyla sırasıyla anterior, posteromedial ve posterolateral yöne doğru plakayı mümkün olduğunca itmeleri talimatı verilmiştir. Her yön için üç tekrar yapılmış ve maksimal uzanma mesafesi, gösterge bloğunun proksimal kenarında ayağın ulaştığı en uzak nokta olarak kaydedilmiştir (Gonell ve ark., 2015). Katılımcı, egzersiz sırasında ayağını yere koyduğunda veya platformdaki ayağının topuğunu kaldırdığında deneme iptal edilip tekrar edilmiştir. Testin performans analizi için bileşik bir erişim mesafesi, baskın/baskın olmayan taraflar için kullanılan formül ile hesaplanmış ve kompozit skor (CS) veya bileşik puan olarak santimetre (cm) cinsinden kaydedilmiştir (Gonell ve ark., 2015). Ayrıca uzuv asimetrisini değerlendirmek amacıyla da LSI formülü kullanılmıştır (Bishop ve ark., 2016; Lambert ve ark., 2020).

Veri analizi

Verilerin analizi IBM SPSS 23 istatistik paket programı kullanılarak yapılmıştır (IBM Corp., 2015). Araştırmanın analizinde, tanımlayıcı veriler, aritmetik ortalama ve standart sapma kullanılarak sunulmuştur. Propriyosepsiyon testlerinin analizi bölümünde, verilerin normallik sonuçları, çarpıklık ve basıklık değerleri (±2 aralığı) ile QQ grafikleri incelenerek değerlendirilmiştir. Faaliyet gösterilen eğim derecelerine ve yönlere göre anlamlı bir farklılık olup olmadığı, grupların bağımlı bir yapı sergilemesi nedeniyle çift yönlü tekrarlı ölçümler ANOVA testi ile analiz edilmiştir. ANOVA testi uygulanırken, Mauchly küresellik testi sonucuna bakılmış ve testin sonucuna göre uygun istatistiksel testler seçilmiştir. Derece grupları arasındaki çoklu karşılaştırmalarda, Bonferroni düzeltmesi kullanılarak eşleştirilmiş örneklemler t-testi uygulanmıştır. Son olarak, diğer testlerin birbirleri arasındaki ilişkiyi anlamak için Pearson korelasyon analizi kullanılmıştır. İstatistiksel analizlerde anlamlılık düzeyi $p<0,05$ olarak kabul edilmiştir.

BULGULAR

Bu bölümde çalışma ile ilgili istatistiki verilere yer verilmiştir.

Tablo 1. Propriosepsiyon testinde derece ve yönlere göre tanımlayıcı istatistik sonuçları

Derece	Sağ				Sol				Toplam			
	X̄	S.S.	Min	Maks	X̄	SS	Min	Maks	X̄	S.S.	Min.	Maks.
10	6,90	2,82	1	10	5,85	2,73	2	10	6,37	2,79	1	10
12	6,05	1,79	3	10	5,20	2,80	0	10	5,62	2,36	0	10
14	6,30	2,34	2	10	5,75	2,57	2	10	6,02	2,44	2	10
16	7,50	2,68	2	10	6,85	3,24	0	10	7,17	2,96	0	10
TS	6,68	2,41			5,91	2,84			6,30	2,64		

X̄: Aritmetik Ortalama, SS: Standart sapma, Min: Minimum, Maks: Maksimum, TS: Toplam Skor

Tablo 1'de propriosepsiyon testi sonuçları sunulmuştur. Genel ortalamaya bakıldığında, propriosepsiyonun toplam skoru 6,3±2,64'tür; yani sporcular 10 ölçümden ortalama 6,3'ünü doğru yanıtlamıştır. Bu değer, sporcuların yaklaşık %63 oranında doğru yanıt verdiğini ve proprioseptif keskinlik performanslarını ifade etmektedir.

Tablo 2. Derece ve sağ-sol yön gruplarına göre tekrarlı ölçümler ANOVA sonucu

Kaynak	KT	s.d.	KO	F	p
Derece	52,100	3	17,367	5,516	,001
Yön	6,006	1	6,006	1,280	,265

KT: Kareler toplamı, KO: Kareler ortalaması, sd: Serbestlik derecesi

Tablo 2'de, derece grupları ile sağ-sol yön grupları arasındaki doğru yanıt ortalamaları bakımından anlamlı bir farklılık olup olmadığını belirlemek amacıyla yapılan tekrarlı ölçümler ANOVA analizi yer almaktadır. Sonuçlara göre, sağ-sol yön grupları arasında doğru yanıt ortalamaları açısından istatistiksel olarak anlamlı bir fark bulunmamaktadır (p>0,05). Ancak, dört farklı derece grubundan en az iki grup arasında doğru yanıt ortalamalarına göre istatistiksel olarak anlamlı bir fark olduğu gözlemlenmiştir (p<0,05).

Tablo 3. Derece grupları arasında çoklu karşılaştırma testi sonuçları

Derece-1	Derece-2	Ortalama fark	p
10	12	0,750	,443
	14	0,350	1
	16	-0,800	,260
12	10	-0,750	,443
	14	-0,400	1
	16	-1,550	,007*
14	10	-0,350	1
	12	0,400	1
	16	-1,150*	,021*
16	10	0,800	,260
	12	1,550	,007*
	14	1,150	,021*

**p<0,05*

Tablo 3'te, derece grupları arasındaki doğru yanıt verme ortalamalarına ilişkin çoklu karşılaştırma testi sonuçları sunulmuştur. Test sonuçlarına göre, sporcular arasında 10 derece ile 12, 14 ve 16 derece eğimler arasında doğru yanıt ortalamaları açısından anlamlı bir fark bulunmamaktadır (p>0,05). Benzer şekilde, 12 derece ile 14 derece eğim grupları arasında da anlamlı bir farklılık gözlemlenmemiştir (p>0,05). Ancak, sporcuların 16 derece eğimdeki doğru yanıt ortalamaları, 12 ve 14 derece eğimdeki sonuçlarına kıyasla anlamlı derecede daha yüksek bulunmuştur (p<0,05). Bu durum, inversiyon açısındaki yüksekliğin sporcuların ayırt edicilik performansını etkilediğini göstermektedir.

Tablo 4. DNS ve denge testlerinin tanımlayıcı istatistik sonuçları

Değişkenler	X̄±S.S.	Min.	Maks.
YDT Sağ Kompozit Skor (cm)	98,3±6,5	87,64	104,36
YDT Sol Kompozit Skor (cm)	93,7±7,9	82,05	109,05
Y Denge LSİ (cm)	95,4±6,5	83,6	106,3
DNS-İAB	72,6±13	45	82,5
DNS-Diyafram	74±10,5	50	86,5
DNS-Kalça Fleksiyon	72±8,6	57,5	88

X̄: Aritmetik Ortalama, S.S.: Standart sapma, Min.: Minimum, Maks.: Maksimum

Tablo 4'te, DNS ve Y denge testinin tanımlayıcı sonuçları sunulmuştur. 19-23 yaş arası erkek futbolcuların stabilizasyon ve denge parametrelerine ilişkin değerler gösterilmektedir.

Tablo 5. Propriosepsiyon, DNS testleri ve denge testi arasındaki korelasyon sonuçları

Değişkenler (n=20)	1	2	3	4	5	6	7	8
1. YDT Sağ Komposit Skor (cm)	1	.	.	.	.	.	.	.
2. YDT Sol Komposit Skor (cm)	,615**	1	.	.	.	.	.	.
3. Y Denge LSİ (cm)	-,253	,606**	1	.	.	.	.	.
4. DNS-İAB	-,107	-,006	,121	1	.	.	.	.
5. DNS-Diyafram	,022	,250	,274	,263	1	.	.	.
6. DNS-Kalça Fleksiyon	-,108	,119	,230	,005	,490*	1	.	.
7. Propriosepsiyon Sağ	-,067	,032	,112	,281	,012	,045	1	.
8. Propriosepsiyon Sol	-,048	,094	,164	,115	-,033	,128	,811**	1
9. Propriosepsiyon Toplam	-,059	,070	,148	,197	-,014	,096	,939**	,963**

**p<0.05; **p<0.01*

DNS testleri, Y denge testi ve proprioseptif keskinlik testine ait ilişki analizi sonuçları Tablo 5'te sunulmaktadır. Analiz sonuçları incelendiğinde, bu üç test grubu arasında anlamlı bir ilişki bulunmazken, sağ ve sol YDT kompozit skorları arasında anlamlı bir ilişki gözlemlenmiştir (p<0,01). Ayrıca, sol YDT kompozit skor ile Y denge testi LSİ (uzuv simetri indeksi) arasında pozitif ve anlamlı bir ilişki bulunmuştur (p<0,01). DNS sonuçları incelendiğinde, diyafram testi ile kalça fleksiyon testi arasında pozitif ve anlamlı bir ilişki saptanmıştır (p<0,05). Propriosepsiyon açısından ise, iki tarafın toplam skoru ile sağ ve sol taraf skorları arasında pozitif ve anlamlı bir ilişki bulunmuştur (p<0,05).

TARTIŞMA

Bu çalışmanın amacı, baskın ve baskın olmayan ekstremite farklılıklarını karşılaştırmak ve dinamik nöromüsküler stabilizasyon testi performansı, ayak bileği proprioseptif keskinliği ile alt ekstremite denge yanıtları arasındaki ilişkiyi değerlendirmektir. Sonuçlar, üç değerlendirme yönteminin istatistiksel olarak anlamlı bir ilişkiye sahip olmadığını ve sağ-sol ekstremite farklılıklarının bulunmadığını göstermektedir. Ancak, propriosepsiyon testi, derece grupları ve keskinlik başarısı açısından anlamlı sonuçlar ortaya koymuştur. Çalışmamızda, genç erkek futbolcularda proprioseptif duyarlılık performansının %63 olduğu bulunmuştur. Benzer şekilde, Han ve ark., (2015), genç futbol oyuncularında proprioseptif duyarlılık ile başarı arasındaki ilişkiyi incelemiş ve proprioseptif yeteneğin elit spor performansını desteklediğini ortaya koymuştur. Ayrıca, ayak bileği proprioseptif keskinliğinin, diğer bölgelerin proprioseptif değerlendirmelerine kıyasla spor seviyesi için en iyi tek öngörücü olduğu ve rekabet seviyesinin spora özgü antrenman yıllarından daha iyi tahmin edildiği bulunmuştur (Han ve ark., 2015). Benzer çalışmalar, proprioseptif eğitimin bozulmuş motor fonksiyonu iyileştirmede ortalama %52'lik bir etki sağladığını (Aman ve ark., 2015) ve duyu-motor performansının iyileştirilmesinde en başarılı yöntemin kişinin aktif hareketini gerektiren uygulamalar olduğunu öne sürmektedir (Winter ve ark., 2022). Dolayısıyla, proprioseptif keskinlik, yaralanma önleme ve performans geliştirme içeren daha etkili bir antrenman stratejisinin temel bir unsuru olabilir. Ancak, "propriyosepsiyon" olarak tanımlanan tek bir egzersiz ya da değerlendirme yöntemi bulunmamaktadır; bu da hangi yöntemin daha fazla veya daha az proprioseptif olabileceği ve bunun doğrudan propriyosepsiyon, işlev ve atletik performanstaki iyileşmelere nasıl yol açabileceği konusunda belirsizliğe neden olmaktadır (Ogard, 2011).

Literatüre göre ayak bileğinde inversiyon belirsizliğinde açı değeri, yaralanmalara zemin hazırlayan faktörlerden biridir (Han ve ark., 2015; Kang ve ark., 2022). Bu çalışmanın sonuçları, inversiyon derinliği açılarından 16 derecedeki doğru yanıt ortalamalarının yani proprioseptif keskinliklerin, 12 ve 14 dereceye kıyasla anlamlı derecede daha yüksek olduğunu göstermiştir (bkz. Tablo 3). Kang ve ark.,

(2022) test sırasında sporcuların iki ayağa eşit şekilde ağırlık aktaramayacağını, özellikle ölçülmeyen sabit ayakta daha fazla ağırlık olabileceğini açıklamıştır. Dolayısıyla, inversiyon derinliği arttıkça yani zemin dikleştikçe katılımcılar ağırlık aktarımını değiştirerek en dik eğim açısında zeminlerin farkını daha iyi ayırt etmiş olabilirler. Ayrıca benzer çalışmalarda, her bir eğim derecesinin ayırt ediciliğini ölçmek amacıyla tekrar sayısının fazla olmasının, bireylerin aynı ayak bileği propriosepsiyon görevi için farklı "örtük öğrenme" stratejileri geliştirmelerine yol açtığı düşünülmüştür (Han ve ark., 2015; Kang ve ark., 2022; Yu ve ark., 2022). Sonuçlarımızda, en düşük doğru yanıt düzeyi 12 derecede görülmüştür; üstelik bu durum hem sağ hem de sol taraf için geçerlidir. Ayak bileği yapısı gereği, yerle teması anında yüklenme oranını belli bir dereceye kadar süspanse ederek şok emilimi sağlamaktadır (Morrison & Kaminski, 2007). Sonuçlara göre ayırt edicilikteki açısal farkın süspansiyon yeteneğinden kaynaklanmış olabileceğini düşünmekteyiz. Waddington & Adam'ın (1999) araştırmasına göre, inversiyon belirsizliğinde 0,04°'lik bir artış bile ayak bileği üzerine iniş sırasında yaralanma olasılığını %1,2'den %1,22'ye kadar artırma potansiyeline sahiptir. Sakatlanmadaki bu %0,02'lik artış düşük gibi görünse de spor aktivitelerinde inişlerin çok olması nedeniyle yaralanma oluşumunda önemli bir faktör olabilir. Bu nedenle, propriosepsiyon farklarının ayak bileği stabilitesi üzerinde belirgin etkiler yarattığı söylenebilir (Kang ve ark., 2022).

İnversiyon derinliğinin etkisinin yanı sıra, bir diğer gözlem ise sağ ayağın, dört farklı inversiyon derinliğinde de sol ayaktan belirgin şekilde daha iyi hareket ayırt etme skorlarına sahip olduğudur. Katılımcıların tamamında sağ ayak baskın olduğundan, sağ ayak skorlarının daha yüksek olması bekleniyordu. Ancak literatür, uzaysal bilgiyi ve konum duyusunu işlemenin sağ serebral hemisferin ağırlıklı bir işlevi olduğunu belirtmektedir. Ayrıca, uzamsal gereksinimlere sahip görevlerin yerine getirilmesinde, sağ hemisfer tarafından kontrol edilen uzvun üstünlüğü, dolayısıyla sol tarafın avantajlı olduğunu ortaya koymaktadır (Goble & Brown, 2009). Benzer şekilde, sağ tarafı baskın olan sağlıklı bireylerde, sağ ve sol taraflar arasındaki proprioseptif asimetrinin vücudun tamamına mı yoksa sadece belirli bir bölgeye mi özgü olduğunu incelemek amacıyla yapılan bir çalışmada; vücudun dört farklı bölgesinde gerçekleştirilen testlerin tamamında, baskın olmayan/sol tarafın, baskın olan/ sağ taraftan tutarlı olarak daha iyi performans gösterdiği bulunmuştur (Han ve ark., 2013). Stokes ve ark., (2020) tarafından yapılan bir çalışmada ise, genç erkek sporculardaki bir yaralanma riski tarama testinde, sağ ve sol vücut tarafındaki proprioseptif keskinlik değerlerinin yaralanma oranlarıyla ilişkili olduğu ancak sağ-sol asimetrisinin karşılaştırılmasında, iki grup arasında istatistiksel olarak anlamlı bir fark bulunmamıştır.

Literatürde yaralanmalara ilişkin risk faktörlerinin belirlenmesinde denge anormallikleri, sağ-sol taraf asimetrisi veya hareket kalıpları kullanılmaktadır (Chimera ve ark., 2015; Scinicarelli ve ark., 2021). Bu geçerlilikler dikkate alınarak çalışmanın değerlendirme sürecinde dinamik Y denge testi kullanılmıştır. Testinin sağ ve sol bacak kompozit skor erişim farkları (CS) ≥ 12 cm olduğunda sakatlık riskinin arttığı bildirilmiştir (De la Motte ve ark., 2016). Çalışmamızda literatürle tutarlı olarak değerler arasındaki fark 12 cm'den az çıkmıştır (bkz. Tablo 4). Genel olarak, performanstaki fonksiyonel uzuvlar arası asimetriler yaralanmamış sporcular için bir yaralanma risk faktörü olabilir (Scinicarelli ve ark., 2021). LSI yani asimetri tespiti, uzuvlar arasındaki farkların hesaplanması açısından literatürde önemli bir ilgi konusu olmuştur (Bishop ve ark., 2016). Sağlıklı katılımcılarda, test sonuçlarının %10'dan büyük uzuvlar arası farklılıklar sergilememesi veya uzuv simetri indeksi (LSI) ≥ %90 olması önerilmektedir dolayısıyla sonuçların bu oranlardan farklı olması yaralanma riskini ifade eder (Lambert ve ark., 2020; Scinicarelli ve ark., 2021). Çalışma sonuçlarımızda Y denge testi LSI puanları da literatürle tutarlı çıkmıştır. Kısacası yaralanma tahmin etme potansiyeline sahip olan denge testleri, aynı zamanda dinamik postüral kontroldeki eksiklikleri ve iyileştirmeleri ayırt etmek için nesnel ölçümler sağlayabilir (Gribble ve ark., 2012). Ayrıca çeşitli denge ve spora özgü aktiviteler kullanarak dinamik stabiliteyi zorlayan müdahalelerin performansta iyileşmeye, yaralanmalardan kurtulmaya ve yaralanmaların önlenmesine yol açabileceğini gösterilmiştir (Ogard, 2011). Postüral fonksiyon hareketle yakından ilişkilidir ayrıca hareket ve stabilite, merkezi sinir sisteminin sürekli kontrolü altında olan fonksiyonel bir birimdir (Jacisko ve ark., 2021). Motor kontrolde kritik olan duyusal bilgi, proprioseptif bilgidir ve proprioseptif geri bildirim sayesinde üretilen motor yanıtlar, komutlarının planlanması ve değiştirilmesi sağlanır (Riemann & Lephart, 2002a, 2002b). Dolayısıyla, proprioseptif bilgi, nöromüsküler kontrol için temel bir unsurdur (Riemann & Lephart, 2002a). DNS bakış açısına göre gelişimsel kinezyolojinin motor kalıpları, genetik evrelemeye dayalı olarak merkezi sinir sistemi (MSS) tarafından öğrenilir ve

hatırlanır. Başka bir deyişle, sağlıklı bir bebekte genetik bilgilerle gelen belirli gelişimsel hareket kalıpları zaten oluşturulmuştur ve MSS'de yetişkinlik boyunca depolanmaktadır (Frank ve ark., 2013; Mahdieh ve ark., 2020). Bu karmaşık gelişimsel davranışları yönlendiren nöral devreler, periferal alanların veya bölgelerin uyarılmasıyla etkinleştirilebilir (Sharma & Yadav, 2020). Aman ve ark., (2015) propriyoseptif eğitimin kortikal yeniden yapılanmayı tetiklediği ve sensörimotor fonksiyonu iyileştirmek için uygun bir yöntem olduğu ileri sürmektedir. Literatürdeki benzer konulu çalışmalar DNS egzersizlerinin propriosepsiyon fonksiyonuna dayalı olarak nöromüsküler koordinasyonun geliştirilmesi için gerekli olduğunu vurgulamaktadır (Frank ve ark., 2013; Mansori ve ark., 2021). Yine de propriosepsiyon ve DNS arasında doğrudan bir ilişki kurulabileceği hatta DNS'in propriosepisyonu geliştirip geliştirmeyeceğine dair soruları netleştirmek için daha fazla çalışmaya ihtiyaç vardır.

Bu çalışma sınırlamalardan yoksun değildir. Örneklem büyüklüğü bulguları genelleştirmek için yeterince büyük değildir ve etkileri karşılaştırmak amacıyla kontrol grubu kullanılmamıştır. Bu nedenle, sonuçlarımızda DNS testleri, proprioseptif keskinlik ve denge arasında istatistiksel olarak anlamlı bir ilişki olmadığı gözlemlenmiştir.

SONUÇ

Literatür incelemeleri doğrultusunda yapılan bu çalışma, DNS değerlendirme testleri ve proprioseptif keskinlik arasındaki ilişkiyi inceleyen ilk çalışma olması nedeniyle uluslararası yazına özgün bir katkı sağlamaktadır. Şu an için, sporcuların sezon öncesi taramalarında nöromüsküler verimlilik açısından bu değerlendirmelerin tercih edilebileceği sonucuna varılabilir. Özetle, sporda başarı için fiziksel ve zihinsel hazırlığın uluslararası düzeydeki önemi yaygın olarak kabul edilmekle birlikte, mevcut veriler postüral stabilizasyon ve proprioseptif yeteneğin de metabolik kondisyon faaliyetleri kadar önemli bir belirleyici olduğunu ortaya koymaktadır. Bu çalışma, proprioseptif keskinlik, postüral stabilizasyon ve denge faktörleri arasındaki ilişkilerin anlaşılmasına katkı sağlamakta ve futbolcuların performansını optimize etmek için antrenman programlarının daha etkili bir şekilde tasarlanmasına olanak tanımaktadır. Ayrıca, elde edilen bilgilerin yaralanma riski belirleme stratejilerinde antrenörler, fizyoterapistler ve spor hekimleri için değerli bir kaynak oluşturacağı düşünülmektedir.

ÖNERİLER

DNS'in bir egzersiz yaklaşımı olarak uygulanıp, ön-son analizli bir çalışmada propriosepsiyon ve denge üzerindeki etkinliğinin incelenmesi; daha farklı spor branşlarının ve demografik değişkenlerin dahil edildiği çalışmalarla değerlendirilmesi önerilmektedir. Ancak bazı sınırlamalara rağmen mevcut kanıtlar, proprioseptif duyarlılığın ve stabilizasyon değerlendirmesinin spor klinik uygulamalarında değerlendirme, önleme ve performans amaçlı kullanılması gereken önemli bir belirleyici özellik olduğunu önermektedir.

TEŞEKKÜR

Yazarlar tüm oyunculara emeklerinden dolayı teşekkür etmek isterler.

Etik Onay ve İzin Bilgileri

Etik Komitesi:	TOGÜ Sosyal ve Beşerî Bilimler Araştırma Etik Kurulu
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Awareness of Women Doing Team and Individual Sports in Türkiye About Being Exposed to Sexual and Psychological Harassment

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Abstract

Aim: The aim of this study is to investigate the awareness of women doing team and individual sports in Türkiye about being exposed to sexual and psychological harassment.

Method: A sexual harassment inventory was applied to athletes participating in 474 team and individual sports competitions. The chi-square test was used in statistical operations. Data were collected using the "Sexual Harassment Inventory in Sports" developed by Özen et al. (2018), which includes four sections: recognition of harassment behaviors, frequency and location of incidents, reactions and complaint mechanisms, and suggestions for prevention. The validity and reliability of the inventory were confirmed in prior studies, and internal consistency for the current sample was re-evaluated. Chi-square tests were applied to examine differences between team and individual sports.

Results: While 2.58% of female athletes reported frequent sexual harassment, 14.12% experienced it occasionally, and 9.12% once. A majority (74.65%) reported no experience of such behavior. No statistically significant difference was found between team and individual sports in overall harassment exposure ($p>0.05$). However, significant differences were found in the frequency of sexually explicit jokes and forced sexual intercourse ($p<0.05$).

Conclusion: Athletes in team and individual sports shared similar perceptions of sexual harassment. Establishing a dedicated institutional unit where athletes can safely report harassment was recommended to address and prevent such cases effectively in Turkish sports environments.

Key words: *Individual Sports, Psychological Harassment, Sexual Harassment, Team Sports.*

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INTRODUCTION

Sexual abuse, in general, is defined as all kinds of sexual behaviour (contact, non-contact or penetrative) performed by an adult to satisfy sexual satisfaction (Mathews & Mathews, 2019). Sexual harassment is bullying or coercion of a sexual nature or the promise of unwelcome or inappropriate rewards for sexual favours. “Sexual harassment” can include sexual innuendos, requests for sexual favours, and any verbal or physical harassment of a sexual nature (De Wet, 2016). Abuse; It can occur in a variety of social settings, such as workplaces, homes, schools, religious institutions, gyms, clubs, and elsewhere (Mountjoy et al., 2016; Mohamed, 2023) Sexual behaviour, propensity, and orientation can represent the most intimate and profound expressions of a person's identity. It is also stated that it can also represent a fundamental vulnerability for all humans. Sexual abuse may mean that people who do not consent to a matter or whose consent is not accepted become the target of others' sexual orientation and are exploited for various reasons (through physical force, deception or threat for reasons such as youth, age or mental illness) (Chroni et al., 2012). Sexual harassment refers to behaviour that implies or contains sexuality. These expressions or behaviours can take different forms (mimics, gestures, hand-arm jokes, physical contact, verbal expressions, looks, threats, blackmail or rape). These situations are encountered at mild or severe levels in the field of sports. Athletes who encounter these situations may experience many negative symptoms (anger, fear of being raped, guilt and anxiety, fear of humiliation, alienation from people or introversion, decreased self-esteem due to feelings of fragility and helplessness, decreased life satisfaction and generally increased fear of crime) (Fasting et al., 2002; Şahin et al., 2012; Doğan et al., 2023).

Expressions perceived as sexual harassment include the following: Insisting on flirting, making sexual jokes and compliments, using slang words, asking questions about the athlete's sexual life, blackmailing, or actions that do not contain insults but create an uncomfortable and undesirable

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environment (Hlavka, 2014). It is known that both male and female athletes are subjected to sexual harassment in sports fields. Harassment acts that may seem simple can turn into continuous and severe harassment if done repeatedly. When acts of harassment are repeated, they can have much more severe consequences for the individual. For those who do not comply with sexual offers, their lives may be in danger; if these offers are followed or accepted, unfair gain and negative situations may arise (Leahy et al., 2002; Malloy & Zakus, 2004; Ifeanyichukwu et al., 2011; Özen et al.,2018; Doğan et al., 2023). In cases of sexual abuse, the effects of the physical and mental trauma experienced by the abused person become more severe. Compensating these negative effects is difficult and takes a long time (Fasting & Knorre, 2005; Mimaroğlu & Özgen, 2008; Fasting et al., 2013).

Sexual harassment and assault may differ slightly and be perceived differently across societies and cultures (Yıldız, 2009). It is stated that sexual harassment and abuse are among the factors that negatively affect athletes in Türkiye (Onag et al., 2022). It has been determined that the perpetrators of sexual harassment in the education and sports environment are peer students and athletes rather than teachers and trainers and that sexual harassment occur (occurs-occurs) in the field of education rather than the events experienced in the sports environment (Fasting et al., 2014). Another variable that may affect child sexual abuse in sports is the branch of the sport. When examining whether there is a relationship between individual sports or team sports and sexual abuse, it is seen that there are different results. Some studies (Vertommen et al., 2015; Ahmed et al., 2018) revealed a statistically significant relationship, while others (Fasting et al., 2004; Mountjoy et al., 2016) revealed no significant relationship between them. However, individual sports can create more problems due to the working environment and the way of working with the trainer. Working with more children simultaneously in team sports and the presence of more than one individual creates protection for children. However, working one-on-one with the trainer in individual sports or lacking a third person to protect child athletes from a possible threat causes them to carry more risks than in team sports. In this context, children in individual sports may be more vulnerable to the sexual abuse of their coaches (Ahmed et al., 2018). Considering Türkiye in particular, performing individual sports in more closed and non-transparent places than team sports, mainly due to the economic situation and support, increases the possibility of abuse (Çetin & Hacısoftaoğlu, 2020).

It is widely acknowledged that individuals subjected to sexual harassment often experience serious psychological problems. These include social withdrawal, emotional instability, anxiety, diminished self-worth, and alienation from close social networks (Brackenridge et al., 2008). Although research in the field predominantly focuses on women and girls, studies such as that of Parent & Bannon (2012) highlight that male athletes are also affected, yet their cases remain underreported due to societal perceptions linked to homophobia. In sports contexts, different structural dynamics exist between team and individual disciplines. In individual sports, athletes often train in isolated environments with limited oversight, potentially increasing vulnerability to harassment. In contrast, team sports typically involve shared spaces and multiple observers, which may provide a protective buffer. These structural differences suggest the need for a comparative investigation. Addressing the issue of harassment in sports is essential for ensuring the psychological safety and integrity of athletes. Recognizing athletes' perceptions and experiences is a foundational step toward developing preventive strategies. The aim of this study is to investigate the awareness of women doing team and individual sports in Türkiye about being exposed to sexual and psychological harassment.

METHOD

Research model

The research was conducted using the descriptive survey model, which is frequently employed in social sciences to identify and interpret existing situations. This model is suitable for exploring individuals' opinions, perceptions, and experiences on a specific issue. In this study, the model was used to investigate the awareness of women participating in team and individual sports in Türkiye regarding their exposure to sexual and psychological harassment. Furthermore, comparative elements were included to examine differences between team and individual sports settings in terms of harassment frequency, types, reactions, and reporting behaviors.

Population and sample

The study sample consisted of 474 female athletes aged between 17 and 30. Participants included 283 women engaged in team sports and 191 in individual sports. All participants were students enrolled in the Faculty of Sport Sciences at various Turkish universities and were actively participating in amateur-level sports competitions. A convenience sampling method was used, where participants were selected based on their accessibility and willingness to participate. The nature and significance of the study were explained to the athletes prior to participation, and informed consent was obtained. Data collection was conducted face-to-face under ethical and voluntary participation principles.

Although the sample provides valuable insights into the awareness of female athletes regarding harassment, it does not claim to statistically represent the entire population of female athletes in Türkiye. Instead, it offers a snapshot of perceptions among sport sciences students who are actively involved in sports. This limitation is acknowledged and considered in the interpretation of results.

Data collection tools

Sexual Harassment Inventory in Sports: The sexual harassment inventory in sports for Turks consists of four parts. In the first part of the inventory, they were asked which of the 17 behaviors they considered as sexual harassment/sexual assault. The inventory is structured into four sections covering (1) recognition of harassment behaviors, (2) frequency and location of harassment incidents, (3) reactions and complaints, and (4) suggestions for prevention. In Section 1, each of the 17 items was rated as "Yes," "No," or "Not Sure" regarding whether it is perceived as sexual harassment. In Section 2, frequency was categorized into four levels: "Never," "Once," "Occasionally," and "Very Often." Responses were coded numerically (0–3) for statistical analysis. Women were asked how often, in which places and by whom they were subjected to sexual harassment. In the third part of the inventory, reactions to sexual harassment, their reasons and complaints were asked. In the last section, opinions on precautions to be taken against sexual harassment are included (Özen et al., 2018). The validity and reliability of the "Sexual Harassment Inventory in Sports" developed by Özen et al. (2018) were previously confirmed with Cronbach's alpha values ranging from 0.81 to 0.89 across subdimensions. In the current study, internal consistency was re-evaluated with the present sample (n=474). Overall Cronbach's alpha was found to be 0.87, indicating high internal consistency. Additionally, expert review was conducted to ensure content validity for use among Turkish female athletes aged 17–30.

Data analysis

SPSS 25.00 package program was used in statistical operations. Normality was assumed for the collected data (Kolmogorov-Smirnov test). Chi-square (X^2) analysis was performed on the data. The data collected from 474 participants were coded and analyzed using the SPSS 25.0 statistical package program. Prior to conducting inferential analyses, the normality of the distribution was assessed using the Kolmogorov-Smirnov test. As the data were categorical and not normally distributed, non-parametric tests were deemed appropriate. Descriptive statistics (frequency, percentage) were used to summarize demographic characteristics and participants' responses to the items in the Sexual Harassment Inventory. To examine the relationship between sport type (team vs. individual) and variables such as frequency of harassment, types of behavior, reaction patterns, and reasons for not reporting, the Chi-square test (χ^2) was employed. A significant level of $p<0.05$ was set for all statistical interpretations. Each item was analyzed separately to determine whether there were statistically significant differences between team and individual sports participants regarding their experiences and awareness of sexual and psychological harassment. The data were interpreted considering the distribution assumptions and sample size adequacy.

RESULTS

Table 1. The status and frequency of sexual harassment in the sports environment

Behaviours	Never		Once		Occasionally		Very Often	
	n	%	n	%	n	%	n	%
Sexually explicit jokes (SEJ)	325	68.57	49	10.34	91	19.20	11	2.32
Compliments of a sexual nature (CSN)	324	68.35	59	12.45	83	17.51	8	1.69
Annoying remarks (AR)	320	67.51	45	9.49	95	20.04	14	2.95
Persistent questions about your lover (PQL)	326	68.78	33	6.96	93	19.62	22	4.64
Asking questions about your sex life (AQSL)	330	69.62	57	12.03	71	14.98	16	3.38
Making sexist remarks about female and Male (MSRWM)	320	67.51	66	13.92	74	15.61	14	2.95
Using sexually explicit remarks about your body (USERB)	338	71.31	43	9.07	71	14.98	22	4.64
Sexually suggestive glances (SSG)	340	71.73	52	10.97	67	14.14	15	3.16
Being disturbed by sexually explicit material (BDSEM)	350	73.84	45	9.49	69	14.56	10	2.11
Persistent invitations despite refusal (PIDR)	352	74.26	47	9.92	67	14.14	8	1.69
Insistent behaviours to flirt (IBF)	347	73.21	59	12.45	56	11.81	12	2.53
Sending offensive messages containing a flirting request (SOMCFR)	370	78.06	41	8.65	52	10.97	11	2.32
Feeling/discourse of special interest and gain when sexually explicit offer is complied with ((F/SISEC)	386	81.43	29	6.12	51	10.76	8	1.69
Making you feel that you will pay a price if the sexually explicit offer is not complied with (MFSEC)	392	82.70	25	5.27	49	10.34	8	1.69
Touching any part of your body without your consent (TPBC)	390	82.28	31	6.54	45	9.49	8	1.69
Kissing, hugging without your consent (KHC)	395	83.33	35	7.38	35	7.38	9	1.90
Forced into sexual intercourse (FSI)	410	86.50	19	4.01	39	8.23	6	1.27
Total mean	-	74.65	-	9.12	-	14.10	-	2.58

74.65% of the students participating in the study have not been exposed to sexual harassment behaviours.

Table 2. Change of sexual harassment behaviours in sports environment according to team and individual sports

Behaviours	Never				Yes				χ^2	P
	Team sport (TS)		Individual sport (IS)		Team sport (TS)		Individual sport (IS)			
	n	%	n	%	n	%	n	%		
SEJ	199	70	121	63	84	30	69	36	2,09	0,410
CSN	176	62	127	67	107	38	63	33	1,56	0,740
AR	173	61	123	65	109	38	67	35	1,25	0,755
PQL	199	70	132	69	84	30	59	31	1,03	0,855
AQSL	196	69	138	72	86	30	52	27	1,22	0,638
MSRWM	196	69	123	65	86	30	67	35	1,58	0,450
USERB	207	73	136	71	75	27	54	28	1,09	0,753
SSG	211	75	140	73	71	25	50	26	1,04	0,845
BDSEM	211	75	144	76	71	25	46	24	1,03	0,840
PIDR	213	75	144	76	69	24	46	24	1,00	0,901
IBF	199	70	144	76	84	30	46	24	0,81	0,469
SOMCFR	209	74	155	81	73	26	36	19	2,61	0,404
F/SISEC	230	81	163	85	52	18	27	14	1,69	0,504
MFSEC	238	84	161	84	44	16	29	15	0,55	0,970
TPBC	240	85	155	81	42	15	36	19	1,59	0,541
KHC	238	84	157	82	44	16	33	18	1,16	0,786
FS	253	89	165	86	29	10	25	13	1,42	0,515
Total mean	-	74,47	-	74,82	-	25,18	-	24,76	1,28	0,325

The differences between the status of sexual harassment in the sports environment and the status of team and individual sports are statistically insignificant ($p>0.05$).

Table 3. Frequency of sexual harassment in sports environment by team and individual sports status

Behaviours	Once				Occasionally				Very Often				χ^2	p
	TS		IS		TS		IS		TS		IS			
	n	%	n	%	n	%	n	%	n	%	n	%		
SEJ	33	39.29	23	33.33	49	46.77	32	45.45	2	58.33	15	21.21	7,85	0,020*
CSN	43	40.15	23	36.67	62	37.49	36	56.67	2	57.90	4	6.67	1,59	0,462
AR	21	19.19	16	24.01	78	17.53	36	53.83	10	71.27	15	22.16	3,86	0,151
PQL	17	20.27	13	21.43	56	24.16	36	60.71	10	67.27	11	17.86	0,45	0,797
AQSL	38	44.15	16	30.85	44	51.30	25	48.81	4	50.99	11	20.34	3,94	0,160
MSRWM	21	24.48	16	24.01	54	28.53	40	60.16	10	63.34	11	15.83	0,22	0,903
USERB	25	33.26	15	26.92	38	44.26	32	57.69	13	50.05	8	15.38	0,39	0,835
SSG	17	23.83	22	43.71	44	33.40	22	43.71	10	61.52	6	12.58	3,25	0,198
BDSEM	27	38.09	15	31.82	40	53.73	27	59.09	4	56.02	4	9.09	0,38	0,871
PIDR	31	45.18	12	26.02	31	65.84	32	69.40	6	45.69	2	4.58	4,90	0,088
IBF	36	42.82	21	45.66	36	50.94	23	49.77	13	42.26	2	4.57	3,78	0,153
SOMCFR	25	34.21	13	35.29	33	46.82	21	58.82	15	45.76	2	5.88	1,88	0,399
F/SISEC	19	36.23	6	23.08	29	69.09	19	69.23	4	55.80	2	7.69	0,71	0,705
MFSEC	17	38.49	4	14.33	25	87.14	21	71.33	2	56.78	4	14.33	2,83	0,244
TPBC	15	35.57	13	35.29	23	84.35	19	52.94	4	54.52	4	11.76	0,04	0,988
KHC	19	43.10	13	38.91	23	97.78	17	51.87	2	52.16	3	9.22	0,75	0,760
FS	6	20.63	11	41.67	21	70.90	11	41.67	2	72.19	4	16.67	6,07	0,004*

*p<0,05

There was a significant difference in the frequency of sexual harassment in the sports environment according to team and individual sports performance (p<0.05).

Table 4. Distribution of reactions to sexual harassment by competition in team and ındividual sports

Behaviours	No				Yes				χ^2	p
	TS		IS		TS		IS			
	n	(%)	n	(%)	n	(%)	n	(%)		
I took it as a joke	230	81.24	171	89.53	52	18.46	21	10.94	2,46	0,126
I told you not to	236	83.45	160	83.77	46	16.25	31	16.41	0,251	0,980
Physical response	253	89.36	146	76.44	35	12.37	40	20.94	0,240	0,687
Don't shout out of fear	276	97.48	181	94.76	7	2.47	10	5.47	1,79	0,192
Request for help from the environment	276	97.48	183	95.81	6	2.22	8	4.38	0,89	0,345
Don't leave the environment	272	96.01	186	97.38	10	3.69	6	3.28	0,03	0,871
Disregard	257	90.84	183	95.81	25	8.86	9	4.71	1,69	0,296
Making a formal complaint	276	97.48	183	95.81	6	2.22	9	4.71	0,913	0,555

The differences according to the situation of being sexually harassed and the competition situation in team and individual sports are insignificant (p>0.05).

Table 5. Distribution of participants' reasons for not making official complaints by team and ındividual sports

Behaviours	No				Yes				χ^2	p
	TS		IS		TS		IS			
	n	(%)	n	(%)	n	(%)	n	(%)		
I was so scared	275	97.17	182	95.20	7	2.47	9	4.71	0,895	0,368
Fear of affecting the future of sports	274	96.75	184	96.29	9	3.18	7	3.66	0,030	0,896
Fear of suspension from the team	274	96.75	187	97.91	9	3.18	4	2.09	0,823	0,360
disbelief that anything will be done	245	86.41	173	90.82	38	13.29	18	9.42	1,132	0,265
Don't be afraid of others hearing	278	98.22	186	97.39	5	1.77	5	2.62	0,170	0,789
disbelief and disregard	268	94.53	186	97.39	16	5.65	4	2.19	1,369	0,270
I don't want to prolong	238	84.19	167	87.54	45	15.90	24	12.57	0,938	0,463
Don't be shy to tell	270	95.27	184	96.29	13	4.59	7	3.66	0,287	0,655
Not sure if it's sexual harassment	275	97.17	182	95.20	7	2.47	9	4.71	2,594	0,361
I had no place to apply	274	96.75	184	96.29	9	3.18	7	3.66	0,343	0,622
I got used to it a lot	274	96.75	187	97.91	9	3.18	4	2.09	1,260	0,344

The reason why the participants did not make a formal complaint is similar according to their team and individual sports (p>0.05).

Table 6. Distribution of the state of agreeing with the views about the private structure that those who have been subjected to sexual harassment in the sports environment can apply, by gender

Variables	Yes		No		it doesn't matter	
	n	(%)	n	(%)	n	(%)
Individual sport	175	91.62	11	5.76	5	2.62
Team sport	254	89.75	22	7.77	7	2.47

The distribution of agreement with the views on the special structure to which those who are sexually harassed in sports can apply is given in the table according to gender.

Table 7. Agreeing with the ideas to facilitate access to structures to prevent sexual harassment in the sports environment

Behaviours	No		Yes	
	n	%	n	%
Sports organizations offer athlete training	145	30.59	329	69.41
Developing punitive procedures that deter sexual harassment by sports organizations	181	38.19	293	61.81
Putting easily accessible informative announcements on the web pages of sports organizations	191	40.30	283	59.70
Leaving brochures constantly on sports fields	213	44.94	261	55.06
Emailing athletes periodically	201	42.41	273	57.59
To introduce this structure to the infrastructure and new athletes with activities.	207	43.67	267	56.33
(Facebook, Instagram, etc.)	221	46.62	253	53.38

The findings related to accepting ideas that would facilitate access to structures to prevent sexual harassment in sport are given in the table.

DISCUSSION

This study aimed to determine the perceptions of female university students aged 17–30, who are receiving sports education, regarding their exposure to sexual harassment and psychological abuse during the environments and training sessions where they participated as amateur athletes. Several previous studies have documented the existence of sexual harassment and abuse in sports settings (Toftegaard Nielsen, 2001; Alexander et al., 2011; Fasting & Knorre, 2005; Jolly & Décamps, 2006; Décamps et al., 2011).

For example, in one of these studies, 93.1% of the participants stated that they did not feel any sexual harassment or sexual abuse, while 6.9% did. Onag et al., 2022). In another study, 40 percent of female athletes stated that they were sexually harassed by spectators, 33.1 percent by their male teammates and 24.8 percent by their coaches (Smiley, 2016). Aşık (2020) and Doğan et al. (2023) in their study, approximately one-third of both women and men stated that they were subjected to sexual harassment and assault. In the study of Çetin & Hacısoftaoğlu (2023), 43.3% of those who do individual sports and 25.9% of those who do team sports declared that they were exposed to abuse during childhood. In this study, the answers given by the athletes to the statements about not being sexually harassed contain differences in percentages. The highest percentage stated that they have never been sexually harassed as being forced into sexual intercourse, with 86.50%. Those who say once to say sexist words about women and men are at the highest rate with 16.88%. It has been observed that those exposed to sexual harassment behaviour occasionally have disturbing addresses, with 24, 26%. While 74.65% of the athletes participating in the study stated that they were not exposed to sexual harassment behaviours, 9.12% encountered these behaviours once, 14.12% occasionally, and 2.58% very often. According to this study, approximately one in one of the athletes was exposed to sexual harassment behaviours.

In the study of Fasting et al., (2003), it was stated that athletes engaged in individual sports were exposed to sexual abuse and harassment more than individuals engaged in team sports. In the study of Onağ et al., (2022), 17.3% of those who engage in individual sports and 4.1% of those who engage in team sports state that they experience sexual harassment and abuse in the sports environment according to the types of sports. The study of Aşık (2020) determined that the frequency of sexual harassment behaviour in the sports environment did not change according to gender, according to the

answers given by the people who were sexually harassed for the questions considered as sexual harassment behaviour. Dogan et al., (2023) studies found that there were differences in the perception of sexual harassment behaviours among student-athletes of the faculty of sports sciences. This study determined that the average of those who were not sexually harassed in different questions was 74.47% for team athletes and 74.82% for individual athletes. This study determined that the status and frequency of sexual harassment in the sports environment did not show a statistically significant difference between the athletes who competed in team and individual sports ($p>0.05$). In some studies, it has been stated that the personality traits, body perception, quality of life and fitness levels of the students of the Faculty of Sports are generally similar (Koca et al.,2018; Yamak et al., 2016). However, while the highest rate of sexual harassment behaviours was seen in team athletes, "compliments with sexual content and disturbing addresses" were observed, and it was determined that "annoying addressing and making sexist remarks about women and men" behaviours were observed in individual athletes. The behaviour encountered at the lowest level was seen to be "forced to have sexual intercourse". While Onağ et al., (2022) and Fasting et al., (2003) stated that there were more cases of sexual harassment and abuse in individual sports than in team sports, the study by Aşık (2020) found no significant difference. The findings of the present study are consistent with those reported by Aşık (2020). In the study of Aşık (2020), there was a significant difference in the frequency of sexual harassment in the sports environment according to the status of the team and individual sports, while the difference in some statements was found to be insignificant. This study found a statistically significant difference in the frequency of sexual harassment in the sports environment, the frequency of sexual jokes and the frequency of forced sexual intercourse according to team and individual sports performance ($p<0.05$). In terms of other sexual harassment expressions (sexual compliments, disturbing addresses, persistent questions about the lover, etc.) included in the research, no significant difference was found for the variation of the frequency of sexual harassment in the sports environment according to the type of sport ($p>0.05$).

In the study of Aşık (2020), it was determined that the responses of the participants to the behaviours of perceiving it as a joke, telling not to do it, physical reaction, shouting out of fear, asking for help from the environment, leaving the environment, ignoring and making official complaints did not change according to the team and individual sports status. In this study, in the distribution of their reactions according to the situation of being sexually harassed according to the competition situation in the team and individual sports, the answers given to the behaviours of perceiving it as a joke, telling not to do it, physical reaction, shouting out of fear, asking for help from the environment, leaving the environment, ignoring and making an official complaint, in the team and individual sports. It was found that it did not change according to the state of doing it ($p>0.05$). Team and Individual athletes' reactions to sexual harassment are generally similar. Factors such as coming from the same cultural environment, being in the same environment, encountering similar words and receiving similar education may affect this situation. It is seen that some acts of abuse are normalized due to the physical contact and performance-requiring nature of sports (Toftegaard Nielsen, 2001). Acts involving close contact with normalizing discourses in sports and children's difficulties in expressing abuse pose a severe threat (Gaedicke et al., 2021).

In their study, Rodriguez & Gill (2011) stated that women exhibit avoidance, receiving social support from friends and family, verbal confrontation, resistance and seeking institutional support to cope with sexual harassment and its consequences. Özen et al. (2018) stated that the reasons for not making an official complaint were that they did not want to prolong the issue, they were not sure about sexual harassment, and they did not believe that anything could be done. Donnelly et al., (2016) found in their study that most of the athletes who were exposed to sexual harassment did not believe that anything would be done and that their information would be kept confidential. In the study conducted by Özen et al. (2018), the difference in the answers given to the statements of "I did not believe that anything would be done, I was afraid of what others would hear, I was afraid that it would not be believed, and I had no place to apply" was found to be significant in the distribution of the reasons for not making a formal complaint by the participants by gender. In some studies conducted in Türkiye, it has been stated that the reasons why athletes do not complain when they are subjected to sexual harassment are that they do not want to deal with it, that it may harm their sports life, they are embarrassed, they are afraid of not being believed, they think that nothing will be done, they believe

that there are legal deficiencies and they are not fully clear on this issue (Aşık, 2020; Doğan et al., 2023). In Narin's (2019) study, authorities stated that a person who has been sexually harassed should not tell anyone about it; It was stated that otherwise their names would be disclosed. Most athletes prefer to remain silent in the face of these threats in order not to harm their place in society and to avoid problems in their family and kinship relationships (Doğan et al., 2023). In this study, it was determined that the reasons why athletes did not file a complaint were similar according to their team and individual sports activities ($p>0.05$). Taylor et al., (2017), in their research conducted at sports faculties in the USA, the participants stated that a structure is necessary for those who are exposed to harassment and pressure (The Guardian, 2017). On the other hand, to the question of having a particular structure, 90.7% of women and 85.4% of men stated that such a structure is necessary. In the study of Aşık (2020), 92.6% of men and 88.6% of women think there should be a particular structure that those exposed to sexual harassment can apply according to gender. According to the competition situation in the team and individual sports, the rate of agreeing with the opinions about the unique structure that those exposed to sexual harassment in the sports environment can apply was 91.62% for men. In comparison, it was 89.75% for women. It was observed that most of them wanted a unique structure to be used by those subjected to sexual harassment. The results of this study are like the results of the Aşık (2020) study. This similarity may also be because the study participants are citizens of the same state and live in the same or similar culture. It was observed that most of them wanted a unique structure to be used by those subjected to sexual harassment.

Any action, whether a minor infraction, sexual misconduct or sexual assault, is a form of illegal discrimination in many countries, and some form of abuse (physical and psychological) must be prevented. Preventing sexual harassment and defending employees against sexual harassment allegations has become the primary goal of decision-makers in many organizations, companies, sports institutions, educational institutions and industries (Mohamed, 2023). In the study conducted by Özen et al., (2018), they answered the question "Which functions should the structure to prevent sexual harassment in the sports environment should fulfil" with the highest rate as "To determine the sanction to be applied against the harassers in the sports environment". In the Aşık (2020) study, approximately one-third of the participants responded positively that sports organizations should offer athlete training and develop disciplinary procedures that deter sexual harassment. In this study, it was found that the rate of those who said yes when they agreed with the ideas that were thought to facilitate access to the structures to prevent sexual harassment in the sports environment among the athletes competing in team and individual sports were found to be higher than those who said no.

CONCLUSION

This study revealed that female athletes in both team and individual sports demonstrate similar levels of awareness regarding sexual and psychological harassment. Although the overall frequency of harassment did not significantly differ between the two groups, specific behaviors such as sexually explicit jokes and being forced into sexual intercourse showed higher prevalence in certain contexts, particularly among individual sport participants. The findings highlight the need for context-specific preventive strategies, especially in sports disciplines where one-on-one interaction and isolated training environments increase the risk of harassment. Unlike previous studies that broadly addressed harassment in sports, this study draws attention to the structural vulnerabilities within individual and team sports and emphasizes the importance of tailored interventions.

The study contributes to the limited body of literature from Türkiye by shedding light on how sport type may influence exposure and perception of harassment. It is recommended that sports institutions develop dedicated reporting units and adopt training programs addressing harassment awareness and prevention, considering the differences in sport-specific dynamics.

SUGGESTIONS

It was deemed necessary to establish a particular unit where sexually harassed persons would apply. Among the wishes of women who have been sexually harassed is the creation of a special unit to support them in this regard. It is thought that this unit to be established in Türkiye is necessary to effectively combat sexual harassment in the field of sports.

Etical Approval and Permission Information

Ethics Committee: Ondokuz Mayis University Social and Humanities Research Ethics Committee Decisions
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Investigation of the Effect of Shooting Without Moving Elbow Support on Heart Rate and Shooting Performance in Air Rifle Shooting

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Abstract

Aim: The aim of this study is to examine the effects of two different shooting protocols on shooting scores and heart rate (HR) in air rifle shooting.

Method: Shooting scores and HR were measured during two protocols: the unsupported protocol, where the elbow support remained stationary throughout the 60 shots, and the supported protocol, where the elbow support was moved after each shot. HR was measured using a heart rate monitor, while shooting scores were measured using an electronic target system. The relationship between the mean HR and shooting scores across consecutive series was analyzed using Repeated Measures ANOVA. The relationship between the mean HR and shooting scores between the two protocols was assessed using the Paired Sample t-test.

Results: The mean HR during the unsupported shooting protocol was found to be higher than during the supported protocol across all series ($p<0.01$). The mean shooting scores for the 5th (102.3) and 6th (102.2) series in the supported protocol were significantly higher than those of the 1st series (100.7) ($p<0.05$). Additionally, the mean shooting scores for the 4th (101.5) and 6th (102.2) series in the supported protocol were significantly higher than those of the 4th (98.9) and 6th (99.5) series in the unsupported protocol ($p<0.01$).

Conclusion: The findings of our study indicate that unsupported shots increased HR in 10m air rifle shooters, consequently negatively affecting shooting performance.

Key words: *Shooter, Supported Shot, Unsupported Shot.*

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INTRODUCTION

Shooting is a highly precise and inclusive sport, open to individuals of all ages, genders, and performance levels (Krasilshchikov et al., 2007). It is featured in 15 different disciplines at the Olympic Games, with air rifle shooting, which has been part of the Olympic program since 1984, standing out for its demand for extreme accuracy (ISSF). In this discipline, shooters must hit a target from 10 meters away, where the center has a diameter of just 0.5 mm. Completing 60 shots within 75 minutes, shooters face minimal error tolerance, making air rifle shooting one of the most precise sports in the Olympic lineup (Ball et al., 2003). Research has shown that even the smallest movement can affect accuracy; for example, the angular movement of the rifle must be less than 0.016° to achieve a perfect ten-point shot (Zatsiorsky and Aktov, 1990). The physical and mental demands on the shooter are immense, as they must synchronize muscle coordination, balance, breath control, and visual-motor perception to achieve success. This level of precision is made possible by controlling micro-movements of the body, particularly during the shot, when even the shooter's heartbeat can affect stability. Thus, managing internal physiological rhythms is essential for consistent performance at this level.

Achieving elite scores in 10-meter air rifle shooting requires not only technical mastery but also high precision and stability (Magill & Anderson, 2010; Mon et al., 2014; Park et al., 2019). Success depends on a delicate interplay between mental skills, postural balance, and rifle control, and improving performance involves addressing various physical and physiological factors. Biomechanically, the shooter stands in a fixed position, supporting the rifle on their shoulder, while minimizing muscle use to achieve a steady aim. During this process, the body's balance systems particularly the spine, leg muscles, and feet are critical. Isometric muscle contractions keep movements controlled, while proper breath control helps the shooter remain stable and make precise shots. Synchronizing breathing with the shot reduces tremors and enhances accuracy. In recent sports research, heart rate has been recognized as a significant factor in precision sports like shooting (Liu & Zhang, 2019). A resting heart rate in healthy individuals means 75 beats per minute, but many factors—including environmental temperature,

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body position, altitude, age, diet, psychological state, and even smoking—can influence it (Aubert et al., 2003). The autonomic nervous system, composed of sympathetic and parasympathetic divisions, regulates heart rate (Freeman et al., 2006). The sympathetic system dominates in stressful situations, while the parasympathetic system prevails during relaxation. Balance between these systems is crucial for cardiovascular health and performance. In shooting, where accurate aim, steady posture, and body control are essential, heart rate can also significantly impact performance. However, research remains divided on its exact effects. Some studies suggest that a high heart rate negatively impacts shooting success (Kayihan, 2012; Hoffman et al., 1992; Ito et al., 2000; Kolayış, 2000; Landers et al., 1994), while others argue that the relationship is more complex and multifaceted (Karabağ et al., 2022; Bentley et al., 2007). This ongoing debate emphasizes the intricate nature of precision sports like shooting, where even physiological rhythms play a vital role in determining success.

The aim of this study was to evaluate the hearth rate and shooting performance of air rifle athletes during unsupported and supported shots. In this context, the objective was to examine athletes' heart rate and shot scores in both protocols and analyze the differences between unsupported and supported shots.

METHOD

Research model

This study was conducted using a controlled experimental design to evaluate the effects of supported and unsupported shooting techniques on heart rate and shooting performance in air rifle athletes. A sample of 13 licensed athletes with at least 3 years of active competition experience and having participated in national finals at least once was selected using simple random sampling. All participants were right-handed, and informed consent was obtained before participation. Two different shooting protocols were applied to the athletes on separate days: the first protocol involved unsupported shooting, while the second protocol involved supported shooting. Both protocols followed a 15-minute preparation and sighting time before starting the tests. Heart rate data were continuously monitored using a Polar H10 heart rate monitor, and shooting performance was recorded using the Sius HS10 Hybridscore electronic target system. In the unsupported shooting protocol, athletes performed 60 shots without lowering their rifles onto the tripod after loading the first shot, maintaining their position throughout the process. In contrast, during the supported shooting protocol, athletes lowered their rifles onto the tripod either after every shot or at certain intervals to load the pellets. Data collection involved continuous monitoring of heart rate and shooting scores for both protocols. Heart rate values were analyzed for 10-shot series, and shooting performance was assessed for both the 10-shot series and total competition scores (60 shots).

The research protocol

Two different protocols were applied to the athletes on two separate days. Before the protocols, a Polar H10 chest band was worn to monitor heart rate values; real-time shots made by athletes on the electronic shooting target were recorded to monitor shooting performance. After the devices were attached, athletes wore their underware and shooting clothes. Athletes wearing shooting clothes took positions on the shooting range. In both test protocols, athletes were given 15-minute preparation and sighting time. After 15 minutes, athletes lowered their rifles onto the table, and the devices were started. A 2-minute rest period with arms free was provided. After the rest period, athletes lifted their rifles onto the tripod, and in both protocols, they loaded the first pellets while on the tripod. In the protocol of the first day, athletes loaded their rifles on the tripod for 60 shots without lowering them and completed the competition without taking a break from shooting. In the second protocol, athletes lowered their rifles onto the tripod to load the pellets and completed the competition in this way. After completing 60 shots in both protocols, athletes lowered their rifles onto the table, and after a 2-minute recovery period with arms free, the device recording was terminated.

Unsupported shot: In this shooting pattern, athletes loaded the first shot pellets on the tripod. Then they took the shooting position. After completing the first shot, without altering the shooting position, with the lower extremities completely fixed and the upper extremity maintaining the position and location of the left hand holding the grip and the left elbow resting on the hip bone, and without lowering the rifle

onto the tripod, the athlete only loaded the shot pellets using the right arm and completed 60 shots in this manner.

Supported shot: In this shooting pattern, athletes loaded the first shot pellets on the tripod and took the shooting position. After completing the first shot, each athlete lowered their rifle onto the shooting table at their own preference, either for every shot or at certain intervals. Those who lowered the rifle for each shot loaded the shot pellets on the tripod. Those who preferred to lower the rifle at intervals loaded their rifles with the help of their right arms during the shooting process without altering the position of the left arm, i.e., without lowering the rifle onto the tripod. All athletes completed 60 shots in this manner, intermittently lowering their rifles.

Population and sample

The study population consists of licensed air rifle shooters aged 18 and above. The sample of the study was selected through simple random sampling from athletes who have been actively licensed for at least 3 years, have competed in national finals at least once, and did not have any health problems. Necessary information was provided to, and consent was obtained from the research group. The sample group consisted of 13 athletes, all of whom were right-handed.

Data collection tools

Heart Rate (HR) Measurement: During both protocols, the athletes' heart rates were continuously recorded until 60 shots were done, using the Polar H10 heart rate monitor device. The duration between heartbeats (R-R interval) was recorded with a resolution of 1ms. The R-R interval is a parameter that measures the time between two consecutive R waves in a cardiac cycle. The R wave is one of the peak points of the heart's electrical activity on an electrocardiogram and represents the stimulus that initiates the heart's contraction. The heart rates during both protocols were evaluated in a series of 10 shots, and mean values were calculated.

Shooting Score Measurement: The athletes' shooting scores were measured using the 4.5 mm diameter shot pellets fired with their own 10-meter air rifles at the electronic target in the shooting range. The electronic targets (Sius HS10 Hybridscore system) are equipped with special software that connects the target and the shooting line, allowing for automatic determination of the shooting scores. Athletes made real-time shots with their air rifles at the electronic target on the shooting range, and these scores were evaluated. During the evaluation process, the scores of 10 shots per athlete were accumulated to calculate the series scores. The scores of six series were then accumulated to calculate the competition scores. Series and competition scores were considered during analysis.

Data analysis

Statistical analyses were performed using Jamovi 2.5.3 software. Descriptive statistics, including the mean and standard deviation values for all physical parameters, were initially calculated. The athletes' heart rates and shooting scores (both supported and unsupported) were analyzed in series of 10 shots each, as well as in terms of total competition scores (60 shots). For both the first and second protocols, mean values for the series of 10 shots were determined. Shooting scores for consecutive series within each protocol were compared using Repeated Measures ANOVA. Additionally, shooting scores between the first and second protocols were compared in series of 10 shots using the Paired Sample T-test. Mean heart rate values for the first and second protocols were also calculated for each series of 10 shots. The heart rate values for consecutive series of each protocol were compared using Repeated Measures ANOVA. The mean heart rate values for both the first and second protocols were further compared using the Paired Sample T-test. The difference in heart rate between supported and unsupported protocols was calculated by subtracting the mean heart rate of each series from the other. Similarly, the difference in scores between supported and unsupported protocols was determined by subtracting the mean scores of each series from one another.

RESULTS

Table 1. Demographic Data

Variables	Mean	S.D.	Minimum	Maximum
Age (years)	27,2	7,94	18	40
Sport Experience (years)	12,7	6,80	5	25
Height (m)	1,70	0,07	1,62	1,85
Weight (kg)	67,1	11,8	50	83
Body Mass Index (kg/m^2)	23,0	3,22	17,3	27,7

n= 13

The average age has been determined as 27.2 years. The minimum age is 18, while the maximum age is 40. The participants' average sports experience is 12.7 years, ranging from a minimum of 5 years to a maximum of 25 years. The average height of the participants is 1.70 m, with the shortest individual measuring 1.62 m and the tallest measuring 1.85 m. The average body weight is 67.1 kg, with a minimum of 50 kg and a maximum of 83 kg. Since the standard error is 11.8, weight distribution shows more variability compared to height distribution. The average BMI is 23.0 kg/m², ranging from 17.3 (underweight) to 27.7 (overweight).

Table 2. Supported - Unsupported heart rate descriptives

Series	Mean	S.D.
Supported 1st Series HR	91.7	7.66
Supported 2nd Series HR	92.8	7.20
Supported 3rd Series HR	92.2	7.25
Supported 4th Series HR	91.9	7.59
Supported 5th Series HR	92.4	7.73
Supported 6th Series HR	92.3	8.51
Unsupported 1st Series HR	97.4	6.37
Unsupported 2nd Series HR	99.5	6.16
Unsupported 3rd Series HR	100.8	6.73
Unsupported 4th Series HR	100.7	7.13
Unsupported 5th Series HR	100.3	7.47
Unsupported 6th Series HR	99.3	7.75

n=13

A Repeated Measures ANOVA was conducted to examine intra-group differences in heart rate between supported and unsupported shooting protocols. No statistically significant differences were found between the heart rates in the supported and unsupported series.

Tablo 3. Supported - Unsupported series scores descriptives

Scores	Mean	S.D.
Supported 1st Series score	100,7	2,24
Supported 2nd Series score	100,8	3,01
Supported 3rd Series score	101,4	1,76
Supported 4th Series score	101,5	2,24
Supported 5th Series score	102,3	1,64
Supported 6th Series score	102,2	2,80
Unsupported 1st Series score	101,3	2,23
Unsupported 2nd Series score	100,4	2,58
Unsupported 3rd Series score	100,1	3,12
Unsupported 4th Series score	98,9	3,67
Unsupported 5th Series score	100,8	2,96
Unsupported 6th Series score	99,5	3,54

n=13

A Repeated Measures ANOVA was performed to evaluate within-group differences in shooting scores between supported and unsupported series. Statistically significant differences were observed in the supported series scores ($p<0.05$), while no significant differences were found for the unsupported shots.

Table 4. Supported series scores results

Series Skor	Series	Mean Difference	S.D.	d.f.	t	p_{tukey}
1st Series score	2nd Series score	-0.154	0.639	12.0	-0.241	1.000
	3rd Series score	-0.685	0.248	12.0	-2.757	0.134
	4th Series score	-0.800	0.323	12.0	-2.476	0.206
	5th Series score	-1.654	0.484	12.0	-3.418	0.045*
	6th Series score	-1.508	0.443	12.0	-3.406	0.046*
2nd Series score	3rd Series score	-0.531	0.569	12.0	-0.934	0.930
	4th Series score	-0.646	0.621	12.0	-1.040	0.895
	5th Series score	-1.500	0.749	12.0	-2.004	0.394
	6th Series score	-1.354	0.638	12.0	-2.122	0.338
3rd Series score	4th Series score	-0.115	0.322	12.0	-0.359	0.999
	5th Series score	-0.969	0.402	12.0	-2.408	0.227
	6th Series score	-0.823	0.425	12.0	-1.936	0.427
4th Series score	5th Series score	-0.854	0.417	12.0	-2.049	0.372
	6th Series score	-0.708	0.523	12.0	-1.352	0.753
5th Series score	6th Series score	0.146	0.649	12.0	0.225	1.000

**p<0,05; Repeated Measures Anova*

Statistical comparisons of the consecutive series scores within the supported shooting protocol revealed significant differences only between the 1st and 5th series, as well as between the 1st and 6th series ($p<0.05$).

Table 5. Supported - Unsupported series heart rate analysis results

Supported HR	Unsupported HR	d.f.	t	p
1st Series	1st Series	12.0	-3.11	0.009**
2nd Series	2nd Series	12.0	-3.41	0.005**
3rd Series	3rd Series	12.0	-3.91	0.002**
4th Series	4th Series	12.0	-3.76	0.003**
5th Series	5th Series	12.0	-3.45	0.005**
6th Series	6th Series	12.0	-3.12	0.009**

***p<0,01; Paired Samples T-Test; HR: Heart Rate*

The inter-group comparison of heart rates for supported and unsupported shots was conducted using a Paired Samples T-Test. Statistically significant differences were found between the two conditions across all series ($p<0.01$), with unsupported shots eliciting significantly higher heart rates than supported shots. Across all series, heart rate was significantly higher during unsupported shooting compared to supported shooting ($p<0.01$), indicating a physiological stress response associated with unsupported conditions.

Tablo 6. Supported - Unsupported series scores analysis results

Supported Scores	Unsupported Scores	d.f.	Statistic	p
1st Series	1st Series	12.0	-1.451	0.172
2nd Series	2nd Series	12.0	0.700	0.497
3rd Series	3rd Series	12.0	1.946	0.075
4th Series	4th Series	12.0	3.560	0.004**
5th Series	5th Series	12.0	1.912	0.080
6th Series	6th Series	12.0	3.156	0.008**

***p<0,01; Paired Samples T-Test*

A Paired Samples T-Test was employed to compare the shooting scores between the supported and unsupported conditions. Statistically significant differences were observed in the 4th and 6th series, with the scores for supported shots being significantly higher than those for unsupported shots ($p<0.01$). The analysis revealed significant differences in shooting scores for the 4th and 6th series, where supported shots outperformed unsupported shots ($p<0.01$). No significant differences were observed in the first two series.

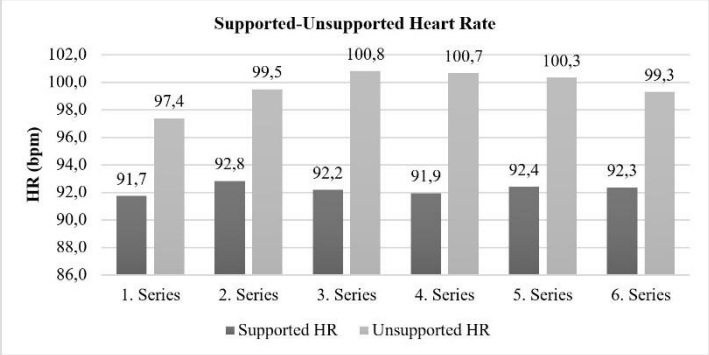

Figure 1. Supported - Unsupported series heart rate

The heart rate data for supported and unsupported series were plotted, revealing a consistent increase in heart rate for unsupported shots across all series (Graphic 1). In the first series, although the mean heart rate during unsupported shots was 5.7 bpm higher, the shooting performance in the unsupported series was 0.6 points higher. In the second series, the heart rate difference between supported and unsupported shots increased to 1 bpm, and while the score for supported shots improved slightly by 0.1 points, unsupported shots showed a decrease of 0.9 points. The performance for unsupported shots continued to decline from the second series onward. Although there was some recovery observed in the fifth series, there was another decline in the sixth series (see. Figure 2).

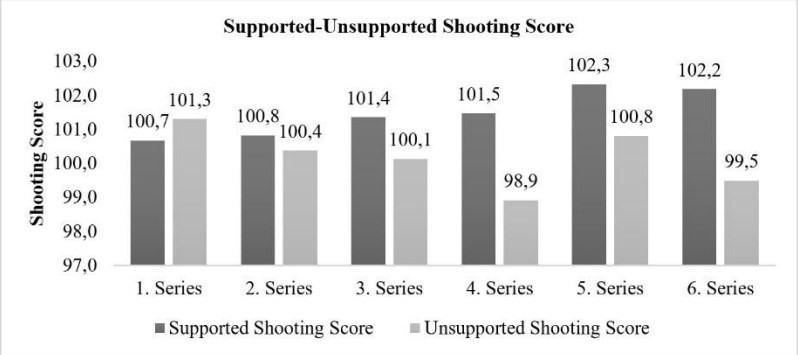

Figure 2. Supported - Unsupported series shooting score

The shooting performance scores for supported and unsupported series were visualized, showing a decline in scores for unsupported shots from the second series onward. There was no significant difference in shot scores between supported and unsupported protocols in the first 2 series. The decrease in scores in the 3rd and 5th series approached statistical significance. Significant decreases in shooting scores for unsupported shots were observed in the 4th and 6th series, which were statistically significant ($p<0.01$) (see. Table 6). Based on the available data, it has been observed that the increasing heart rate started to negatively impact on the scores of unsupported shots from the 2nd series onwards, but it became statistically significant in the 4th and 6th series.

DISCUSSION

In our study investigating the effects of shooting without moving elbow support on heart rate and shooting performance in air rifle shooting, it was found that participants had higher heart rates during unsupported shots, and consequently, lower shot scores were observed ($p<0.01$)

The mean age of the 13 participants in our study was 27.2±7.94 years, with a mean sports experience of 12.7±6.80 years, weight of 67.1±11.8 kg, height of 170±6.45 cm, and body mass index (BMI) of 23±3.22 kg/m². Comparable demographic characteristics have been observed in existing literature. Lang & Zhou (2022) conducted a study with 12 athletes from China's air rifle national team, reporting participants' mean age as 25.5±5.1 years, mean sports experience as 14.5±4.2 years, and mean weight as 67.2±6.6 kg. In a study by Gumussoy et al., (2024), the mean age was reported as 22.23±6.45 years, mean sports experience as 7.60±4.89 years, mean body weight as 69.77±14.27 kg, mean height as 168.43 ± 6.41 cm, and mean BMI as 24.94±4.99 kg/m². Kurt & Cengizel (2023) reported demographic data from a study

involving 15 rifle athletes, indicating a mean age of 17.5±1.9 years, mean sports experience of 3.26±1.1 years, mean height of 173.9±4.9 cm, and mean body mass of 67.3±6.7 kg. Furthermore, Wedman (2023) conducted research with 5 male and 5 female participants from the Finnish national team, reporting mean ages of 36.5±8.0 years and 27.2±2.4 years, respectively. Tinaz (2019) conducted a study with 10 pistol shooters, reporting a mean age of 31.00 ± 10.54 years. Considering these findings, the demographic characteristics of our study align with those reported in existing literature. This correspondence enhances the generalizability of our study's results to a broader population.

The findings of this study are consistent with the conflicting results observed in previous literature regarding the relationship between heart rate and shooting performance. The analysis of both supported and unsupported shots revealed that heart rate is an important variable influencing shooting performance, but its impact may vary depending on the type of shot being taken. The participants showed higher mean heart rates during unsupported shots compared to supported shots in all series, with the differences being statistically significant ($p<0.01$). This is consistent with previous studies that found increased heart rate during physical exertion negatively affects performance. For example, Vickers & Williams (2007) & Kayihan (2012) both reported that higher heart rates result in decreased shooting accuracy due to physiological factors such as tremors during the systolic phase of the cardiac cycle. In this study, the unsupported shots consistently showed higher heart rates, and although this could be expected to negatively impact performance, the effect seemed to depend on the series. The difference in heart rate between supported and unsupported shots was significant across all series, which may suggest that the unsupported shots require more physical effort, thus leading to higher heart rates.

The scores for supported shots showed a gradual increase over the six series, with significant differences observed between the first and fifth, as well as the first and sixth series ($p<0.05$). This suggests that there is a positive adaptation or improvement in technique or focus as the participants progressed through the series, possibly due to increased familiarity or comfort with the supported shooting protocol. Unsupported Shots: In contrast, scores for unsupported shots did not exhibit the same improvement. The significant decrease in performance observed in the fourth and sixth series ($p<0.01$) aligns with the expectation that a higher heart rate and the increased difficulty of unsupported shots negatively impacted performance. The steady decline in performance after the second series supports previous findings that increased heart rate, coupled with the physical demand of unsupported shots, results in decreased shooting accuracy. The increasing heart rate observed in the unsupported shooting series directly correlates with the decline in shooting scores from the second series onward. Although the first two series did not show significant differences in performance between supported and unsupported shots, the third and subsequent series demonstrated a significant drop in performance under the unsupported condition, which was statistically significant in the fourth and sixth series. The findings are consistent with Kolayiş (2000), who showed a significant negative correlation between heart rate and shooting score, especially when heart rates exceeded certain thresholds. The increase in heart rate during unsupported shots likely contributed to muscle fatigue and coordination challenges, as seen in the tremors that can affect precise hand-eye coordination in shooting sports (Kayihan, 2012).

The observation that supported shots produced more consistent and higher scores over time suggests that shooters may benefit from incorporating supported shots into their training to build technique, resilience, and stability in their performance. However, the performance decrement observed in unsupported shots highlights the need for additional training aimed at managing physical exertion and heart rate control during high-stress shooting situations. As the unsupported shot protocol showed a decline in performance as the heart rate increased, incorporating targeted training that involves shots under varied heart rates could help shooters adapt to physical and psychological pressure during competitions. Additionally, shooters could benefit from training under progressively higher heart rates to improve resilience to the tremors and mental fatigue associated with increased heart rate. The study's findings reinforce the notion that increased heart rate has a negative impact on shooting performance, especially in unsupported shots, aligning with previous research that emphasized the importance of managing heart rate during shooting sports. The results suggest that shooters may benefit from training designed to address the physical and psychological challenges associated with elevated heart rates. Future studies with larger sample sizes could help further elucidate the effects of heart rate on shooting accuracy and explore ways to mitigate its negative impact through training and technique refinement.

CONCLUSION

This study offers valuable insights into the effects of supported and unsupported shooting techniques on heart rate and performance in air rifle athletes. A key strength is the controlled experimental design, which enabled a detailed comparison of the two protocols under realistic conditions. The use of the Sius HS10 Hybridscore system ensured precise measurements, enhancing the validity of the results. The inclusion of experienced athletes further strengthened the study by minimizing variability. However, the small sample size (13 participants) limits the generalizability of the findings. Future research with larger groups and the inclusion of other factors like muscle fatigue, focus, and anxiety could provide a more comprehensive understanding. Despite these limitations, the study highlights the importance of heart rate management and technique adaptation in training, offering valuable insights for developing more effective training strategies for air rifle shooters.

In conclusion, this article investigated the impact of supported and unsupported shooting protocols on shooting performance and heart rate. Additionally, existing literature was reviewed to better understand the relationship between heart rate and shooting performance. Our study found that the heart rate during unsupported shots was higher than during supported shots across all series. Furthermore, the shooting scores in the 5th and 6th series of supported shots were higher than those in the 1st series, and the scores in the 4th and 6th series of supported shots were higher than those in the 4th and 6th series of unsupported shots. The research findings have revealed that the decline in unsupported shooting performance is not only attributed to the increase in heart rate but also to the unfamiliar shooting style for the athletes. The higher score in the first 10 unsupported shots compared to supported shots suggests that unsupported shooting technique can be improved with training. This encourages exploring strategies like keeping the elbow support still during each series, which could reduce movement distance and time, potentially lowering the athlete's physiological load and psychological stress. Training sessions with varying numbers of unsupported shots can be designed for air rifle shooters, and these can be incorporated into competitions. Additionally, including 60-shot unsupported training in endurance routines could help athletes build resilience to rhythm, focus, and competition pressures. This research is expected to guide future studies and offer practical insights for coaches.

Etical Approval and Permission Information

Ethics Committee: Marmara University Faculty of Medicine Clinical Research Ethics Committee
Protocol/Number: 09.2022.1540

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Düzenli Spor Yapan ve Sedanter Üniversite Öğrencilerinin İnternet Bağımlılığı ile Stres Algılarının Bazı Değişkenlere Göre İncelenmesi

Savaş AYDIN[1], Zekiye ÖZKAN[2], Oğuzhan ÇALI[3], Maksut GÜNEŞ[4]

Özet

Amaç: Araştırmanın amacı, düzenli spor yapan ve sedanter üniversite öğrencilerinin internet bağımlılığı ile stres algılarının bazı değişkenlere göre incelenmesidir.

Yöntem: Betimsel tarama modeli kullanılarak gerçekleştirilen bu araştırmaya Van Yüzüncü Yıl Üniversitesi'nde öğrenim gören ve rastgele örnekleme yöntemiyle seçilen toplam 330 öğrenci katılmıştır. Veri toplama araçları olarak İnternet Bağımlılığı Ölçeği ve Algılanan Stres Ölçeği kullanılmıştır. Verilerin analizinde Mann-Whitney U testi ve Kruskal-Wallis H Testi kullanılmıştır.

Bulgular: Araştırmada sedanter üniversite öğrencilerinin spor yapanlara göre internet bağımlılığı düzeylerinin ve stres algılarının daha yüksek olduğu bulunmuştur. Cinsiyete göre kadın öğrencilerin stres-rahatsızlık algıları ile internet bağımlılıklarının erkek öğrencilere göre daha yüksek olduğu, erkek öğrencilerin ise yetersiz özyeterlik algılarının daha yüksek olduğu tespit edilmiştir. Akademik başarı, boş zaman değerlendirme, evde internet olması ve kendine ait odanın varlığı, ailede spor yapan bireylerin olup olmaması, ebeveynlerin eğitim durumu gibi araştırma değişkenleri arasında anlamlı fark tespit edilmiştir ($p<0,05$).

Sonuç: Bu araştırma, düzenli spor yapan üniversite öğrencilerinin internet bağımlılığı ve stres algılarının, sedanter öğrencilere göre daha düşük olduğunu ortaya koymuştur. Ayrıca, bazı demografik faktörler ve yaşam tarzı değişkenlerinin internet bağımlılığı ve stres algıları üzerinde etkili olduğu bulunmuştur. Bu bulgular, üniversite öğrencilerinin fiziksel ve psikolojik iyilik halleri üzerinde sporun olumlu etkilerini vurgulamaktadır.

Anahtar Kelimeler: *Beden eğitimi, İnternet bağımlılığı, Spor, Stres.*

Investigation of Internet Addiction Status and Stress Perceptions of Sedentary University Students Who Do Regular Sports According to Some Variables

Abstract

Aim: The aim of this study is to examine the relationship between internet addiction and perceived stress among university students who engage in regular sports activities and those who lead a sedentary lifestyle, considering various variables.

Methods: This study was conducted using a descriptive survey model and included a total of 330 students studying at Van Yüzüncü Yıl University, selected through a random sampling method. The Internet Addiction Scale and the Perceived Stress Scale were used as data collection tools. The Mann-Whitney U test and Kruskal-Wallis H test were employed for data analysis.

Results: The study found that sedentary university students had higher levels of internet addiction and perceived stress compared to those who engage in sports. Regarding gender differences, female students exhibited higher levels of stress-related discomfort and internet addiction compared to male students, whereas male students showed higher levels of perceived inadequate self-efficacy. Significant differences were found among the research variables, including academic achievement, leisure time activities, internet access at home, having a personal room, the presence of family members engaged in sports, and parental education level ($p<0.05$).

Conclusion: This study revealed that university students who engage in regular sports activities have lower levels of internet addiction and perceived stress compared to sedentary students. Additionally, certain demographic factors and lifestyle variables were found to influence internet addiction and perceived stress. These findings highlight the positive effects of sports on the physical and psychological well-being of university students.

Keywords: *Physical education, Internet addiction, Sports, Stress.*

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GİRİŞ

İletişim teknolojilerindeki ilerlemelerle birlikte hayatımıza giren internet, bireylerin her türlü bilgiye kolayca erişmesine, keyifli vakit geçirmesine ve sevdikleriyle anlık olarak iletişim kurmasına olanak sağlayan bir kitle iletişim aracı hâline gelmiştir (Bing, 2009). Bilgi çağı olarak adlandırdığımız bu

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günlerde, bilgiye en hızlı ve kolay erişim şüphesiz internet aracılığıyla olmaktadır (Bankole & Oludayo, 2012). İnternetin ortaya çıkması, bilgi paylaşım olanaklarını artırmıştır. İnternetin bilgiye erişim aracı olarak kullanılmasının yanı sıra; iletişim, sosyal ilişkiler, çevrimiçi oyun oynama ve çevrimiçi video izleme gibi birçok amaç için de kullanılmaktadır (Berisha-Shaqiri, 2015).

İnternetin yaygınlaşmasıyla birlikte birey ve toplum üzerinde olumsuz etkileri de kendini göstermeye başlamıştır. Bu olumsuz etkilerin başlıca nedeni, internet kullanımının bağımlılığa dönüşmesidir. İnternetin sunduğu kolaylıklar, yoğun ve kontrolsüz kullanım sonucunda bazı sorunları da beraberinde getirmektedir. Bu sorunların en başında internet bağımlılığı yer almaktadır (Balcı ve Gülnar, 2009). Tereshchenko & Kasparov' a (2019) göre internet bağımlılığı, özellikle zaman kaybı veya temel işlevlerin ihmal edilmesiyle karakterize aşırı internet kullanımının olduğu, internet kullanımına yönelik kompulsif çaba, internete erişilemediği takdirde stres, öfke, depresyon ve anksiyete gibi yoksunluk belirtilerinin görüldüğü, internet kullanım miktarının sürekli arttığı ve bu tür bir meşguliyetin sonucu olarak önceki hobilerin ve eğlencelerin kaybedildiği, sosyal ilişkilerin, eğitim ve spor olanaklarının yitirildiği, ne kadar internet kullanıldığına ilişkin yalanlar söylendiği, olumsuz sonuçlara rağmen kullanımın sürdürüldüğü ve internet kullanımıyla ilgili olarak kendi kendini kontrol edememeye yol açan bir psikopatolojik durum olarak ifade edilmektedir (Akt.: Yıldız & Tamam, 2024). İnternet bağımlılığı veya internet zorlantısı gibi birçok adı vardır. Bağımlının hayatını ele geçiren zorlayıcı bir davranıştan başka bir şey değildir. Bireyin internetin hayattaki en önemli şey olduğunu hissetmesine ve kendi hayatından veya ailesinden, işinden, arkadaşlarından veya akrabalarından daha öncelikli olduğunu düşünmesine neden olur. Bağımlının hayatı internet etrafında döner (Singh & Srivastava, 2021). İnternet bağımlılığı, çok çeşitli davranışları ve dürtü kontrol sorunlarını kapsayan siberseksüel ve siber-ilişkisel bağımlılık, net zorlantıları, bilgi aşırı yüklenmesi, bilgisayar bağımlılığı kavramlarını içinde barındıran geniş bir terimdir (Shaw & Black, 2008). İnternet bağımlılığı kavramı bir dönem spesifik anlamlar taşısa da günümüzde; sosyal medya bağımlılığı, internet oyun oynama bozukluğu, pornografi bağımlılığı, sanal kumar bağımlılığı ve internette alışveriş bağımlılığı gibi alanları da içinde barındıran genel şemsiye bir terim halini almıştır. İnternetin olmadığı yıllarda atari bağımlılığı, oyun bağımlılığı, bilgisayar bağımlılığı ve teknoloji bağımlılığı gibi kavramlarla anlatılan olgular, günümüzde internetin yaygınlaşmasıyla ve kullanımının kolaylaşmasıyla beraber internet bağımlılığı çatısı altında incelenmektedir. İnternetin kendisi tek başına bağımlılığın bir nedeni değil, internet aracılığıyla elde edilen oyun, sosyal medya, alışveriş vb. alışkanlıklar, bağımlılık nedeni olmaktadır (Yıldız & Tamam, 2024).

İnternet bağımlılığı, günümüzün modern toplumunda birçok çalışmada araştırılmış ve tartışılmıştır (Wang, 2018). İletişim ve eğlencenin gelişmesiyle birlikte (Zhang ve ark., 2018) internet bağımlılığı dünya genelinde karşılaşılan ve hızla büyüyen (Lozano-Blasco ve ark., 2022) özellikle genç nesil arasında çeşitli olumsuz sonuçlar doğurmuş endişe verici (Wang, 2018) bir sorun haline gelmiştir (Lozano-Blasco ve ark., 2022). Üniversite öğrencileri için vazgeçilmez bir araç haline gelen internet bağımlılığı bir sağlık sorunu olarak ortaya çıkmakla beraber yaygınlığı ülkeden ülkeye değişiklik göstermektedir (Zhang ve ark., 2018). Günümüz dünyasında internet olgusu son derece geniş bir kullanıcı kitlesine ulaşmıştır. Internet World Stats'ın verilerine göre, 2000 yılında dünya genelinde yaklaşık 300 milyon kişi internet kullanırken, 2009 yılına gelindiğinde bu sayı 1,5 milyara yükselmiştir. 2014 yılının ortalarına ait veriler ise internet kullanıcı sayısının dünya genelinde 3 milyarı aştığını göstermektedir (Kabadayı, 2020). İnternetin akademik kullanımı öncelikli olarak öğrenme ve araştırma amaçlı olsa da aynı zamanda öğrenci hayatının önemli bir parçası haline gelmiştir. Özellikle okul kampüslerinde ve toplumda internet kullanımı önemli ölçüde artmıştır (Chou, 2005). Özellikle bu dönemde internet bağımlılığı, kullanıcının günlük yaşantısını aksatabilecek düzeyde internet kullanımına bağlı çekilme ve tolerans bozukluklarına yol açmaktadır (Song ve Park, 2019). Bağımlığı arttıran birçok faktör bulunmaktadır. Bunlardan biri de algılanan stres durumlarıdır. Stres başlıca faktörler arasında bulunmaktadır. Algılanan stres, internet bağımlılığı, üniversite öğrencileri arasında yaygın sorunlar arasında bulunmaktadır (Sharma ve ark., 2023; Gong ve ark., 2021).

Lyon (2000) "stres" terimini insanları olumsuz etkileyen ve yok eden deneyimleri ifade etmek için kullanmıştır. Stresin ne olduğunu ve hangi nedenlerin strese yol açtığını bilmek gerekir. Aile, iş, meslektaşlar, arkadaşlar ve yönetimden gelen baskılar ve istekler stresin dış kaynaklarıdır. Bireyin sahip olduğu baskı ve beklentiler ise stresin iç kaynaklarıdır (Altıntaş, 2014). Stres ve sağlık arasındaki ilişki

henüz tam olarak bilinmemektedir. Ancak sağlık ile ilgili bilimsel çalışmalar için elde edilen sonuçların olumlu katkıları olduğu vurgulanmaktadır (Schneiderman ve ark., 2005).

Sporun toplumsal yaşam üzerindeki önemli etkileri göz önüne alındığında, düzenli spor yapan bireylerin bağımlılığa neden olabilecek tüm etkenlerden uzaklaşabileceği ve spor yapmayan bireylere göre hem fiziksel hem de psikolojik (stres) olarak daha sağlıklı olabileceği düşüncesi ön plana çıkmaktadır (Kabadayı, 2020). Eğitim ve sağlık sektörleri, internet bağımlılığının ne olduğunu, hangi belirtileri ortaya çıkardığını, nasıl teşhis edildiğini ve nasıl tedavi edilebileceğini tanımlamak için WHO ve APA gibi uluslararası kurumlara ihtiyaç duymaktadır. Bu tanımların eksikliği, değerlendirme kriterlerinin farklı olduğu çok sayıda ölçüm aracı ortaya çıkarmış ve bu da tutarsız bulgulara yol açmıştır. Bu nedenle, bilim camiası arasında ortak bir eylem çizgisi oluşturmak için bir fikir birliğine varılması gerekmektedir (Lozano-Blasco ve ark., 2022). Fiziksel egzersiz ile internet bağımlılığı ve stres arasındaki bağlantı kapsamlı bir şekilde araştırılmış ve iyi belgelendiği ancak, bu ilişkinin ardındaki olası aracı ve düzenleyici faktörler yeterince araştırılmadığı ifadee edilmektedir (Yu & Mu, 2024). Sporun toplumsal yaşam üzerindeki bu güçlü etkileri göz önüne alındığında, düzenli olarak spor yapan bireylerin bağımlılıkla ilişkili faktörlerden uzak durabilecekleri ve spor yapmayanlara kıyasla fiziksel ve psikolojik açıdan daha sağlıklı olabilecekleri düşünülmektedir. Bu bilgiler ışığında, çalışmanın amacı, düzenli spor yapan ve sedanter üniversite öğrencilerinin internet bağımlılığı ile stres algılarının bazı değişkenlere göre incelenmesidir.

YÖNTEM

Araştırmanın Modeli

Araştırmada benimsenen yöntem betimsel tarama modelidir. Buna göre internet bağımlılığı ve algılanan stres öğrencilerin sahip oldukları bazı değişkenlere göre karşışaltırılmıştır. Dolayısıyla var olan bilgilerin olduğu haliyle incelenmesi amaçlanmıştır (Karasar, 2009).

Evren ve örneklem

Çalışmanın katılımcılarını, Van Yüzüncü Yıl Üniversitesi'nde eğitim öğretimine devam etmekte olan üniversite öğrencileri oluşturmaktadır. Araştırmaya katılan bireyler, belirli bir sınıf düzeyini veya yaş grubunu hedeflemek yerine, rastgele örnekleme yöntemi kullanılarak seçilmiştir. Bu yaklaşım, araştırmaya dâhil edilen katılımcı grubunun, üniversitedeki tüm öğrencileri temsil etme olasılığını artırmıştır. Araştırmaya katılmayı kabul eden öğrenciler tamamen gönüllülük esasına göre belirlenmiş ve süreç boyunca etik kurallara uygun hareket edilmiştir. 174 erkek ve 156 kadın toplamda 330 öğrenci araştırmaya katılmıştır. Ayrıca, araştırma sürecinde katılımcıların sınıf düzeyleri, yaş grupları vb. demografik verileri detaylı bir şekilde ele alınarak analiz edilmiştir.

Veri toplama araçları

Katılımcılara ait tanımlayıcı bilgileri toplamak amacıyla araştırmacılar tarafından hazırlanan bir form oluşturulmuştur. Bu formda; yaş, cinsiyet, medeni hal, sınıf düzeyi ve spor yapıp yapmama, kitap okuma süresi, akademik başarı, boş zaman değerlendirmesi, aile bireylerinin internet kullanım durumu, evde internet bağlantısının varlığı, kendisine ait odanın varlığı, ailede spor yapma durumu, anne-baba eğitim durumularına ilişkin değişkenler yer almaktadır.

İnternet Bağımlılığı Ölçeği (İBÖ): Nichols & Nicki (2004) tarafından geliştirilen, İnternet Bağımlılığı Ölçeği, yalnızlık ve can sıkıntısı eğilimine ilişkin 4 ölçütle birlikte 233 lisans öğrencisine uygulanmıştır. Bir madde güvenilirlik analizi, başlangıç ölçeğini 36'dan 31 maddeye düşürmüş ve Cronbach'ın alfa değeri .95 olarak tespit edilmiştir. Ölçeğinin Türkçe' ye uyarlaması Günüç & Kayri (2010) tarafından yapılmıştır. 35 sorudan oluşan ölçek dört alt faktöre ayrılmaktadır. Bunlar yoksunluk (11 madde), kontrol güçlüğü (10 madde), işlevsellikte bozulma (7 madde) ve sosyal izolasyon (7 madde) alt ölçekleridir. 5'li likert tipinde olan ölçek, "Kesinlikle katılmıyorum" ile "Tamamen katılıyorum" arasında katılımcıların puanlamaları istenmektedir. Bulgulara göre internet bağımlılık ölçeği (α=0,97), yoksunluk (α=0,93), kontrol güçlüğü (α=0,92), işlevsellikte bozulma (α=0,89) ve sosyal izolasyon (α=0,91) alt boyutlarının yüksek güvenilirlikte olduğu görülmektedir.

Algılanan Stres Ölçeği (ASÖ): Cohen ve ark., (1983) tarafından geliştirilmiş ve Eskin ve ark., (2013) tarafından Türkçe'ye uyarlanarak güvenirlik ve geçerlik çalışmaları yapılmıştır. Toplam 14 maddeden

oluşan ASÖ, kişinin hayatındaki birtakım durumları ne derece stresli algıladığını ölçmek için tasarlanmıştır. Katılımcılar her maddeyi "Hiçbir zaman (0)" ilâ "Çok sık (4)" arasında değişen 5'li Likert tipi ölçek üzerinde değerlendirmektedir. Algılanan Stres Ölçeği iki alt boyuttan oluşmaktadır. Bu alt boyutlar; "yetersiz öz yeterlik algısı" ve "stres/rahatsızlık algısı" dır. Alt boyutlarda skorlar 0–28 aralığında, toplam puanda ise 0-56 aralığında değişmektedir. Yüksek puanlar kişinin stres algısının fazlalığına işaret etmektedir. Maddelerden olumlu ifade içeren 7'si tersten puanlanmaktadır. (4-5-6-7-9-10-13). Maddelerden alınan puanlar toplanarak bireylerin algılanan stres düzeyi belirlenmektedir. Ölçeğin Cronbach Alpha katsayısı 0,90; alt boyutların Cronbach Alpha katsayıları 0,86 ve 0,83 olarak belirlenmiştir.

Veri analizi

Araştırmaya ait verilerin analizinde SPSS paket programından faydalanılmıştır. Verilerin normalliği Kolmogorov-Smirnov ve Shapiro-Wilk testleri ile değerlendirilmiştir ($p<0,05$). Verilerin analizinde normallik ve varyansların homojenliği sağlanmadığı durumlarda bağımlı değişkenlerde, ikili karşılaştırmalar için Mann-Whitney U testi, çoklu karşılaştırmalar için Kruskal-Wallis H testi, gruplar arasındaki farkların analizi için yeniden Mann-Whitney U testi uygulanmıştır. Ayrıca, bu analizlerin tamamında tanımlayıcı istatistiklerden yararlanılmıştır. Tüm istatistiksel testlerde anlamlılık düzeyi $p<0,05$ olarak kabul edilmiştir.

BULGULAR

Araştırmanın bu bölümünde elde edilen bulgular tablo halinde sunulmuştur.

Tablo 1. Betimsel sonuçlar

Değişkenler	Gruplar	n	%
Cinsiyet	Erkek	174	52,73
	Kadın	156	47,27
Spor Yapma Durumu	Evet	112	33,93
	Hayır	218	66,07
Aile Spor Yapma Durumu	Evet	110	33,33
	Hayır	218	66,66
Ailede İnternet Kullanımı	Evet	216	65,45
	Hayır	114	34,54
Evde İnternet Varlığı	Evet	235	71,21
	Hayır	95	28,78
Kendine Ait Oda	Evet	235	71,21
	Hayır	95	28,78
Kitap Okuma Süresi	Okumuyorum	149	45,15
	1-3 saat	156	47,27
	3-5 saat	25	7,57
Akademik Başarı	Çok kötü	42	12,72
	Normal	113	34,24
	İyi	146	44,24
	Çok iyi	29	8,78
Anne-Baba Eğitim	Okuryazar değil	86	26,06
	İlkokul	71	21,51
	Ortaokul	72	21,81
	Lise	83	25,15
	Yüksekokul	18	5,45
Boş zaman değerlendirme	Kitap okuma	70	21,21
	Müzik dinleme	93	28,18
	Teknoloji	102	30,91
	Diğer	65	19,70
Toplam		330	100

Elde edilen bulgular, düzenli spor yapmanın internet bağımlılığı ve stres algısı üzerindeki etkisini anlamakla birlikte, bu değişkenlerin demografik özelliklere göre nasıl farklılık gösterdiğine dair önemli ipuçları sunmaktadır. Aşağıda, araştırmadan elde edilen temel bulgular detaylandırılmıştır.

Tablo 2. Spor yapma durumuna göre Mann Whitney-U testi sonuçları

Ölçekler	Spor Yapma Durumu	n	X	U	p
Yetersiz -özyeterlik	Evet	112	180,40	10539,5	0,042
	Hayır	218	157,85		
Stres/Rahatsızlık	Evet	112	141,83	9557,0	0,001
	Hayır	218	177,66		
Algılanan Stres Toplam Puan	Evet	112	156,64	11215,5	0,224
	Hayır	218	170,05		

**p<0,05; Mann-Whitney-U Test*

Tablo 2'de, üniversite öğrencilerinin Algılanan Stres Ölçeği'ni oluşturan yetersiz öz yeterlik ve stres/rahatsızlık alt boyut puanlarının düzenli spor yapıp yapmama durumuna göre Mann-Whitney U testi sonuçları sunulmaktadır. Algılanan stres alt boyutlarının spor yapma değişkenine göre düzenli spor yapan üniversite öğrencilerin lehine anlamlı farklılık gösterdiği tespit edilmiştir (U=10539,5 / 9557,0; p<0,05). Sıra ortalamaları dikkate alındığında spor yapan üniversite öğrencilerin yetersiz özyeterlik (180,40±157,85) ve stres/rahatsızlık (141,83±177,66) alt boyut puanlarının sedanter üniversite öğrencilerine göre daha fazla olduğu görülmektedir. Bu sonuçlar düzenli spor yapan üniversite öğrencilerinin spor yapmayanlara göre stres algılarının daha iyi olduğunu göstermektedir.

Tablo 3. Spor yapma durumuna göre Mann Whitney-U testi sonuçları

Ölçek	Spor Yapma Durumu	n	X	U	p
İnternet Bağımlılık	Evet	112	149,21	10383,000	0,026*
	Hayır	218	173,87		

**p<0,05; Mann-Whitney-U Test*

Tablo 3' de, üniversite öğrencilerinin internet bağımlılık ölçeği puanlarının düzenli spor yapıp yapmama değişkenine göre Mann-Whitney U testi sonuçları sunulmaktadır. Spor yapma değişkenine göre internet bağımlılık durumlarının düzenli spor yapan üniversite öğrencilerin lehine anlamlı farklılık gösterdiği tespit edilmiştir (U=10383,0; p<0,05). Sıra ortalamaları dikkate alındığında düzenli spor yapan üniversite öğrencilerin internet bağımlılık (149,21±173,87) durumlarının yapmayanlara göre daha az olduğu görülmektedir. Bu sonuçlar düzenli spor yapan üniversite öğrencilerinin sedanter öğrencilere göre internet bağımlılıklarının daha az olduğunu göstermektedir.

Tablo 4. Cinsiyete göre Mann Whitney-U testi sonuçları

Ölçekler	Cinsiyet	n	X	U	p
Yetersiz özyeterlik	Erkek	174	185,72	10053,5	0,000*
	Kız	156	142,95		
Stres/Rahatsızlık	Erkek	174	144,97	10000,0	0,000*
	Kız	156	188,40		
Algılanan Stres Toplam Puan	Erkek	174	161,06	12800,0	0,370
	Kız	156	170,45		
İnternet Bağımlılık Toplam Puan	Erkek	174	155,43	11819,5	0,043*
	Kız	156	176,73		

**p<0,05; Mann-Whitney-U Test*

Tablo 4' te, üniversite öğrencilerinin algılanan stres ve internet bağımlılık ölçeği puanlarının cinsiyet değişkenine göre Mann-Whitney U testi sonuçları sunulmaktadır. Elde edilen bulgulara göre cinsiyet değişkeni ile ölçek puanları arasında anlamlı fark tespit edilmiştir (p<0,05). Erkek üniversite öğrencilerin yetersiz özyeterlik alt boyut puanlarının (185,72±142,95) kız öğrencilere göre daha fazla olduğu; kız öğrencilerin ise stres/rahatsızlık (188,40±144,97) puanlarının erkek öğrencilere göre daha fazla olduğu görülmektedir. Cinsiyet değişkeni ile internet bağımlılık durumları arasında erkeklerin lehine anlamlı fark tespit edilmiştir (U=11819,5; p<0,05). Sıra ortalamaları dikkate alındığında kız öğrencilerin erkek öğrencilere göre internet bağımlılık durumlarının fazla olduğu görülmektedir.

Tablo 5. Kitap okuma süresine göre Kruskal Wallis testi sonuçları

Ölçek	Kitap okuma süresi (gün)	n	X	s.d.	X^2	p	Post-Hoc
İnternet Bağımlılık	Okumuyorum (a)	149	184,06	2	11,957	0,000*	a>b
	1-3 saat (b)	156	146,55				
	3-5 saat (c)	25	173,14				a>c

**p<0,05; Kruskal Wallis Test*

Tablo 5' te üniversite öğrencilerinin kitap okuma süresi değişkenine göre internet bağımlılık ölçeği Kruskal Wallis Test sonuçları sunulmaktadır. Üniversite öğrencilerinin kitap okuma süresi değişkenine

göre internet bağımlılık durumları arasında anlamlı fark tespit edilmiştir [$X^2(2)= 11,957$, $p<0,05$]. Bu bulgu, günlük kitap okumayan üniversite öğrencilerinin internet bağımlılık durumlarının günlük belirli bir saat kitap okuyanlara göre daha fazla olduğunu göstermektedir.

Tablo 6. Akademik başarıya göre Mann Whitney-U testi sonuçları

Ölçekler	Akademik Başarı	n	X	s.d.	X^2	p	Post-Hoc
Yetersiz özyeterlik	Çok kötü (a)	42	186,08	3	21,027	0,001	b>a
	Normal (b)	113	187,67				b>c
	İyi (c)	146	138,54				b>d
	Çok iyi (d)	29	185,00				
Stres/Rahatsızlık	Çok kötü (a)	42	140,69	3	18,533	0,001	b>a
	Normal (b)	113	146,13				a>c
	İyi (c)	146	190,71				a>d
	Çok iyi (d)	29	149,98				
Algılanan Stres Toplam Puan	Çok kötü (a)	42	150,49	3	1,389	0,708	
	Normal (b)	113	169,71				
	İyi (c)	146	165,37				
	Çok iyi (d)	29	171,50				
İnternet Bağımlılık Toplam Puan	Çok kötü (a)	42	148,43	3	13,139	0,004	b>a
	Normal (b)	113	147,82				b>c
	İyi (c)	146	186,84				b>d
	Çok iyi (d)	29	151,69				

**p<0,05; Kruskal Wallis Test*

Tablo 6' da üniversite öğrencilerinin akademik başarı değişkenine göre Algılanan stres Ölçeği ile İnternet Bağımlılık Ölçeği Kruskal Wallis Test sonuçları sunulmaktadır. Üniversite öğrencilerinin akademik başarı değişkenine göre yetersiz/özyeterlik [$X^2(3) = 21,027$] ve stres/rahatsızlık [$X^2(3) = 18,533$] alt boyutları ve internet bağımlılık durumları [$X^2(3) = 13,139$] arasında anlamlı fark tespit edilmiştir ($p<0,05$). Bu bulgu, akademik başarıları iyi olan üniversite öğrencilerinin yetersiz/özyeterlik ile stres/rahatsızlık algılarının akademik başarıları kötü olanlara göre daha iyi olduğunu göstermektedir. Bununla birlikte araştırma bulguları, akademik başarıları kötü olanların internet bağımlılık durumlarının daha fazla olduğunu göstermektedir.

Tablo 7. Boş zaman değerlendirme durumuna göre Kruskal Wallis testi sonuçları

Ölçekler	Boş zaman değerlendirme	n	X	s.d.	X^2	p	Post-Hoc
Yetersiz özyeterlik	Kitap okuma (a)	70	176,60	3	12,823	0,005	a>c
	Müzik dinleme (b)	93	166,15				b>c
	Teknoloji (c)	102	140,63				d>c
	Diğer (d)	65	191,64				
Stres/Rahatsızlık	Kitap okuma (a)	70	139,86	3	18,533	0,001	c>a
	Müzik dinleme (b)	93	172,18				c>b
	Teknoloji (c)	102	192,46				c>d
	Diğer (d)	65	141,25				
Algılanan Stres Toplam Puan	Kitap okuma (a)	70	158,86	3	1,045	0,790	
	Müzik dinleme (b)	93	173,21				
	Teknoloji (c)	102	162,73				
	Diğer (d)	65	165,98				
İnternet Bağımlılık Toplam Puan	Kitap okuma (a)	70	135,66	3	13,139	0,004	c>a
	Müzik dinleme (b)	93	150,92				c>b
	Teknoloji (c)	102	215,63				c>d
	Diğer (d)	65	139,83				

**p<0,05; Kruskal Wallis Test*

Tablo 7' de üniversite öğrencilerinin boş zaman değerlendirimi değişkenine göre Algılanan stres Ölçeği ile İnternet Bağımlılık Ölçeği Kruskal Wallis Test sonuçları sunulmaktadır. Üniversite öğrencilerinin boş zaman değerlendirimi değişkenine göre yetersiz/özyeterlik [$X^2(3) = 12,823$] ve stres/rahatsızlık [$X^2(3) = 17,929$] alt boyutları ve internet bağımlılık durumları [$X^2(3) = 41,896$] arasında anlamlı fark tespit edilmiştir ($p<0,05$). Bu bulgu, boş zamanlarını teknoloji kullanarak geçiren üniversite öğrencilerinin yetersiz/özyeterlik ile stres/rahatsızlık algılarının kitap okuma ve müzik dinleme ve ye göre daha fazla olduğunu göstermektedir. Bunula birlikte araştırma bulguları, boş zamanlarını teknoloji kullanarak geçirenlerin internet bağımlılık durumlarının daha fazla olduğunu göstermektedir.

Tablo 8. Aile bireylerinin internet kullanımına göre Mann Whitney-U testi sonuçları

Ölçekler	Aile bireylerinin internet kullanımı	n	X	U	p
Yetersiz özyeterlik	Evet	216	153,69	9762,000	0,002
	Hayır	114	187,87		
Stres/Rahatsızlık	Evet	216	179,55	9278,000	0,001
	Hayır	114	138,89		
Algılanan Stres Toplam Puan	Evet	216	166,20	12160,500	0,853
	Hayır	114	164,17		
İnternet Bağımlılık Toplam Puan	Evet	216	178,37	9532,500	0,001
	Hayır	114	141,12		

**p<0,05; Mann-Whitney-U Test*

Tablo 8' de, üniversite öğrencilerinin algılanan stres ve internet bağımlılık ölçeği puanlarının aile bireylerinin internet kullanımı değişkenine göre Mann-Whitney U testi sonuçları sunulmaktadır. Elde edilen bulgulara göre aile bireylerinin internet kullanımı değişkeni ile ölçek puanları arasında anlamlı fark tespit edilmiştir (p<0,05). İnterneti kullanmayan aile bireylerinin yetersiz özyeterlik alt boyut puanlarının (187,87±153,69) interneti kullanan aile bireylerine göre daha fazla olduğu; interneti kullanan aile bireylerinin ise stres/rahatsızlık (179,55±128,89) puanlarının interneti kullanmayanlara göre daha fazla olduğu görülmektedir. Aile bireylerinin internet kullanımı değişkeni ile internet bağımlılık durumları arasında internet kullanmayan aile bireylerin lehine anlamlı fark tespit edilmiştir (U=9532,500; p<0,05). Sıra ortalamaları dikkate alındığında internet kullanan aile bireylerinin internet kullanmayan aile bireylerine göre internet bağımlılık durumlarının fazla olduğu görülmektedir.

Tablo 9. Evde internet varlığına göre Mann Whitney-U testi sonuçları

Ölçekler	Evde internet varlığı	n	X̄	U	p
Yetersiz özyeterlik	Evet	235	158,79	9585,500	0,044
	Hayır	95	182,10		
Stres/Rahatsızlık	Evet	235	176,98	8464,000	0,001
	Hayır	95	137,09		
Algılanan Stres Toplam Puan	Evet	235	170,85	9905,000	0,107
	Hayır	95	152,26		
İnternet bağımlılık toplam puan	Evet	235	174,49	9050,000	0,007
	Hayır	95	143,26		

**p<0,05; Mann-Whitney-U Test*

Tablo 9'da üniversite öğrencilerinin algılanan stres ve internet bağımlılık ölçeği puanlarının evde internet bağlantısının varlığı değişkenine göre Mann-Whitney U testi sonuçları sunulmaktadır. Elde edilen bulgulara göre evde internet bağlantısının varlığı değişkeni ile ölçek puanları arasında anlamlı fark tespit edilmiştir (p<0,05). Evde internet bağlantısı bulunmayan aile bireylerinin yetersiz özyeterlik alt boyut puanlarının (182,10±158,79) evde internet bağlantısı olan aile bireylerine göre daha fazla olduğu; evde internet bağlantısı bulunan aile bireylerinin ise stres/rahatsızlık (176,98±137,09) puanlarının evde internet bağlantısı bulunmayan aile bireylerine göre daha fazla olduğu görülmektedir. Aile bireylerinin internet bağlantısının varlığı değişkeni ile internet bağımlılık durumları arasında evde internet bağlantısı bulunmayan aile bireylerin lehine anlamlı fark tespit edilmiştir (U=9050,000; p<0,05). Sıra ortalamaları dikkate alındığında evde internet bağlantısı bulunan aile bireylerinin evde internet bağlantısı bulunmayan aile bireylerine göre internet bağımlılık durumlarının fazla olduğu görülmektedir.

Tablo 10. Kendisine ait oda varlığına göre Mann Whitney-U testi sonuçları

Ölçekler	Kendisine ait oda varlığı	n	X	U	p
Yetersiz özyeterlik	Evet	235	157,07	9180,500	0,011
	Hayır	95	186,36		
Stres/Rahatsızlık	Evet	235	174,09	9144,500	0,010
	Hayır	95	144,26		
Algılanan Stres Toplam Puan	Evet	235	165,52	11158,000	0,995
	Hayır	95	165,45		
İnternet Bağımlılık Toplam Puan	Evet	235	173,64	9248,500	0,015
	Hayır	95	145,35		

**p<0,05; Mann-Whitney-U Test*

Tablo 10' da, üniversite öğrencilerinin algılanan stres ve internet bağımlılık ölçeği puanlarının kendisine ait odanın varlığı değişkenine göre Mann-Whitney U testi sonuçları sunulmaktadır. Elde edilen

bulgulara göre kendisine ait odanın varlığı değişkeni ile ölçek puanları arasında anlamlı fark tespit edilmiştir (p<0,05). Kendisine ait odası bulunmayan öğrencilerin yetersiz özyeterlik alt boyut puanlarının (186,36±157,07) kendisine ait odası olan öğrencilere göre daha fazla olduğu; kendisine ait odası bulunan öğrencilerin ise stres/rahatsızlık (174,09±144,26) puanlarının kendisine ait odası bulunmayan öğrencilere göre daha fazla olduğu görülmektedir. Kendisine ait odanın varlığı değişkeni ile internet bağımlılık durumları arasında kendisine ait odası olmayan öğrencilerin lehine anlamlı fark tespit edilmiştir (U=9248,500; p<0,05). Sıra ortalamaları dikkate alındığında kendisine ait odası bulunan öğrencilerin kendisine ait odası olmayanlara göre internet bağımlılık durumlarının fazla olduğu görülmektedir.

Tablo 11. Ailede spor yapma durumuna göre Mann Whitney-U testi sonuçları

Ölçekler	Ailede Spor Yapma Durumu	n	X	U	p
Yetersiz özyeterlik	Evet	110	193,16	8837,000	0,001
	Hayır	220	150,04		
Stres/Rahatsızlık	Evet	110	138,82	9165,000	0,001
	Hayır	220	177,46		
Algılanan Stres Toplam Puan	Evet	110	168,15	11588,500	0,619
	Hayır	220	162,66		
İnternet Bağımlılık Toplam Puan	Evet	110	134,28	8665,500	0,001
	Hayır	220	179,75		

**p<0,05; Mann-Whitney-U Test*

Tablo 11' de, üniversite öğrencilerinin algılanan stres ve internet bağımlılık ölçeği puanlarının ailede spor yapma durumu değişkenine göre Mann-Whitney U testi sonuçları sunulmaktadır. Elde edilen bulgulara göre ailede spor yapma durumu değişkeni ile ölçek puanları arasında anlamlı fark tespit edilmiştir (p<0,05). Ailelerinde spor yapmayan öğrencilerin yetersiz özyeterlik alt boyut puanlarının (186,36±157,07) ailelerinde spor yapan öğrencilere göre daha fazla olduğu; ailesinde spor yapan öğrencilerin ise stres/rahatsızlık (174,09±144,26) puanlarının ailelerinde spor yapmayan öğrencilere göre daha fazla olduğu görülmektedir. Ailede spor yapma durumu değişkeni ile internet bağımlılık durumları arasında ailelerinde spor yapan öğrencilerin lehine anlamlı fark tespit edilmiştir (U=8666,500; p<0,05). Sıra ortalamaları dikkate alındığında ailelerinde spor yapan öğrencilerin ailelerinde spor yapmayan öğrencilere göre internet bağımlılık durumlarının fazla olduğu görülmektedir.

Tablo 12. Anne-Baba eğitim duurmuna göre Mann Whitney-U testi sonuçları

Ölçekler	Anne-Baba Eğitim Durumu	n	X	s.d.	X^2	p	Post-Hoc
Yetersiz özyeterlik	Okuryazar değil (a)	86	179,33	4	20,893	0,001	e>a
	İlkokul (b)	71	189,89				e>b
	Ortaokul (c)	72	157,09				e>c
	Lise (d)	83	130,11				e>d
	Yüksekokul (e)	18	200,08				
Stres/Rahatsızlık	Okuryazar değil (a)	86	132,74	4	28,148	0,001	d>a
	İlkokul (b)	71	143,94				d>b
	Ortaokul (c)	72	178,17				d>c
	Lise (d)	83	201,31				d>a
	Yüksekokul (e)	18	191,22				
Algılanan Stres Toplam Puan	Okuryazar değil (a)	86	149,21	4	8,294	0,081	
	İlkokul (b)	71	163,99				
	Ortaokul (c)	72	175,04				
	Lise (d)	83	164,54				
	Yüksekokul (e)	18	215,56				
İnternet Bağımlılık Toplam Puan	Okuryazar değil (a)	86	142,81	4	13,840	0,008	d>a
	İlkokul (b)	71	149,42				d>b
	Ortaokul (c)	72	180,87				d>c
	Lise (d)	83	189,11				d>e
	Yüksekokul (e)	18	167,03				

**p<0,05; Kruskal Wallis Test*

Tablo 12' de üniversite öğrencilerinin anne-baba eğitim durumu değişkenine göre Algılanan stres Ölçeği ile İnternet Bağımlılık Ölçeği Kruskal Wallis Test sonuçları sunulmaktadır. Üniversite öğrencilerinin anne-baba eğitim durumu değişkenine göre yetersiz/özyeterlik [$X^2_{(4)}$= 20,893] ve stres/rahatsızlık [$X^2_{(4)}$= 28,148] alt boyutları ve internet bağımlılık durumları [$X^2_{(4)}$= 13,840] arasında anlamlı fark tespit edilmiştir (p<0,05). Bu bulgu, anne-baba eğiyim durumu yüksek seviyede iyi olan üniversite

öğrencilerinin yetersiz/özyeterlik ile stres/rahatsızlık algılarının anne-baba eğitim seviyeleri düşük olanlara göre daha iyi olduğunu göstermektedir. Bununla birlikte araştırma bulguları, anne-baba eğitim seviyeleri düşük olan üniversite öğrencilerinin anne-baba eğitim seviyeleri yüksek olanlara göre internet bağımlılık durumlarının daha fazla olduğunu göstermektedir.

TARTIŞMA

Bu çalışma, üniversite öğrencilerinin düzenli spor yapma durumları ile internet bağımlılığı ve stres algıları arasındaki farkları incelemeyi amaçlamıştır. Aynı zamanda bazı demografik değişkenlerin bu farklar üzerindeki rolü incelenmiştir. Elde edilen bulgular, düzenli spor yapmanın internet bağımlılığını azalttığını ve stres algısını iyileştirdiğini ortaya koymaktadır. Ayrıca, demografik değişkenlerin, bu ilişkilerin şekillenmesinde önemli bir rol oynadığı tespit edilmiştir. Çalışma bulguları, literatürde yer alan birçok araştırma ile tutarlılık göstermektedir ve bu konudaki bilgi birikimimize önemli katkılar sağlamaktadır. Bulguları, her bir değişkenle bağlantılı olarak detaylı bir şekilde tartışmak, konunun kapsamını daha iyi anlaşılmasına yardımcı olacaktır.

Çalışmanın belirgin bulgularından biri, düzenli spor yapmanın internet bağımlılığı üzerinde anlamlı bir etkisi olduğudur. Spor yapan öğrencilerin internet bağımlılığı düzeylerinin, yapmayanlara kıyasla daha düşük olduğu tespit edilmiştir. Çalışmanın bulgularına benzer bulgular literatürde yer almaktadır (Selçuk ve ark., 2021; Koçak, 2018). Fiziksel aktivitenin kapsamlı refah girişimlerine entegre edilerek daha sağlıklı yaşam tarzlarının teşvik edilmesi ve bu sayede bireyler ve toplum üzerindeki internet bağımlılığı yükünün azaltılması gerektiği vurgulanmaktadır (Luo ve ark., 2024). Bu durum, fiziksel aktivitenin internet bağımlılığına karşı bir koruyucu faktör olarak kullanılabileceğini (Qui ve ark., 2023), bağımlılığının semptomlarını ve her boyutun sorunlu durumunu azaltmada yardımcı olabileceğini (Du & Zhang, 2022) ve öğrencilerin dijital bağımlılıklardan korunmalarına yardımcı olabileceğini göstermektedir. Fiziksel aktivitenin internet ve telefon kullanımı (Yang ve ark., 2009), sosyal medya gibi bağımlılık türlerinin azaltılmasında olumlu bir etkisi olduğu ifade edilmektedir (Selçuk ve ark., 2021). Bununla birlikte egzersizin sadece psikososyal alanda değil bilişsel alanda internet bağımlılığı üzerinde etkili olduğu ifade edilmektedir. Merkezi ve otonom sinir sistemlerinin nörobiyolojisini düzenleyerek internet bağımlılığını hafifletmektedir (Li ve ark., 2020). İnternet bağımlılığı olan üniversite öğrencilerinin bilişsel alanda da (sempatik ve parasempatik) işlevini dengeleyebilmekte bu da egzersize dayalı müdahalenin internet bağımlılığını hafifletmenin veya hatta ortadan kaldırmanın etkili bir yolu olabileceği ifade edilmektedir (Zhang & Xu, 2022). Bu durum zihinsel sağlık müdahalelerine yeni bir bakış açısı sunarak, stresle mücadele etmek ve internet bağımlılığını önlemek için fiziksel aktivitenin teşvik edilmesini belirtmektedir.

Araştırmanın bir diğer değişkeni de stres algısı değişkenidir. Algılanan stres düzeyleri, spor yapan öğrenciler lehine anlamlı farklılık göstermiştir. Spor yapan öğrenciler, stresle başa çıkma konusunda daha başarılı olmuş ve stres seviyeleri düşmüştür. Düzenli spor yapan öğrencilerin stres algılarının, yapmayanlara göre daha düşük olduğu bulgusu, sporun stresle başa çıkma becerileri üzerindeki olumlu etkilerini doğrulamaktadır. Literatürde düzenli fiziksel aktivitenin ergenler ve üniversite öğrencileri arasında internet bağımlılığını önemli ölçüde azalttığı gösterilmiştir (Zhang ve Xu, 2022). Bununla birlikte fiziksel egzersizin öz-yeterliği, psikolojik dayanıklılığı ve öz kontrolü önemli ölçüde kontrol edebileceği (Qui ve ark., 2023); kaygı, stres, depresyon ve yalnızlık semptomlarını azaltarak ruh sağlığını iyileştirdiği ifade edilmektedir (Zhang ve ark., 2023). Stres ve İnternet bağımlılığı arasında güçlü bir pozitif korelasyon olduğu (Song & Park, 2019); aşırı internet kullanımı/bağımlılık yapıcı kullanım kalıpları ile algılanan öz yeterlilik arasında yüksek düzeyde negatif bir ilişki olduğu ifade edilmektedir (Berte ve ark., 2019). Pozitif psikolojik faktörlerin (farkındalık ve öz kontrol) stres seviyelerini düşürebileceğini ve bunun da internet bağımlılığı olasılığını azaltabileceği belirtilmektedir (Song & Park, 2019). Orta düzeyde fiziksel aktiviteye yapmanın yalnızca stres yönetimine yardımcı olmakla kalmayıp aynı zamanda internet bağımlılığına karşı koruyucu bir faktör olarak da hareket ettiği ifade edilmektedir (Luo ve ark., 2024). İnternet kullanımı üniversite öğrencilerinde algılanan öz yeterlilik duygusunu olumsuz yönde etkileyerek, yaşam boyu sürecek alışkanlıklara ve eğitimsel görevlere müdahaleye yol açabilmektedir (Berte ve ark., 2019).

Çalışmanın bulguları, cinsiyetin internet bağımlılığı ve stres algısı üzerindeki etkilerine ilişkin önemli bilimsel veriler sağlamaktadır. Erkek öğrenciler, internet bağımlılığı konusunda daha düşük seviyelerde

bulunurken, kadın öğrenciler daha yüksek stres algılarına sahip olmuşlardır. Bu bulgu, cinsiyetler arasındaki psikolojik ve davranışsal farkları yansıtmaktadır. Çalışmada elde edilen sonuçlara karşı literatürde erkeklerin sosyal medya puan ortalamalarının kadınlardan daha yüksek olduğu ifade edilmektedir (Selçuk ve ark., 2021; Gavurová ve ark., 2022; Lin ve ark., 2021). Bu sonuç, çalışma bulgularını desteklememektedir. Ancak, benzer sonuçlara ulaşan çalışmalar da bulunmaktadır. Literatürde, internet bağımlılığı ile cinsiyet arasında farklılık olduğu belirtilmektedir (Satılmış, 2021). Ayrıca, problemli internet kullanımının cinsiyete göre değiştiği (Odacı & Çıkrıkçı, 2014) ve erkeklerin problemli internet kullanımından kızlara kıyasla daha fazla etkilendiği ifade edilmektedir (Li ve ark., 2014). Bu bulgular, cinsiyetin internet bağımlılığı ve stres algısı üzerinde önemli bir değişken olduğunu göstermektedir. Erkek öğrencilerin dijital teknolojilere olan ilgilerinin internet bağımlılığı riskini artırabileceği, buna karşılık kadın öğrencilerin sosyal etkileşimlere ve duygusal süreçlere daha fazla odaklanmalarının stres algılarını yükseltebileceği düşünülmektedir. Nitekim Ceyhan (2008), cinsiyetin psikolojik semptom düzeyi, internete en sık gece saatlerinde bağlanma ve interneti öncelikli olarak sosyal ilişkileri sürdürme ve eğlence amaçlı kullanma gibi faktörlerle ilişkili olduğunu ifade etmektedir.

Çalışmada bulguları, akademik başarı ile stres arasında anlamlı fark olduğunu göstermektedir. Demir & Kutlu (2017), akademik başarıları düşük olan öğrencilerin internet bağımlılığı düzeylerinin daha yüksek olduğu sonucuna ulaşmışlardır (Demir & Kutlu, 2017). Başka bir çalışmada, düşük akademik başarıya sahip öğrenciler ile yüksek akademik başarıya sahip öğrencilerin ortalama stres puanlarının farklı olduğu ve ayrıca düşük stres seviyesine sahip öğrenciler ile yüksek stres seviyesine sahip öğrenciler arasında da anlamlı bir fark olduğu belirtilmektedir (Talib & Zia-ur-Rehman, 2012). Bu, düşük akademik performansın, artan stres ve kaygıyı tetikleyerek bireylerin dijital ortama yönelmelerine neden olabileceğini göstermektedir (Cai ve ark., 2021). Literatürde yapılan çalışmalar bu bulguları desteklemektedir. İnternet bağımlılığı öğrencilerin akademik katılımını önemli ölçüde azalttığı, (Singh & Srivastava, 2021; Hardie & Tee, 2007); algılanan stresin, 18-26 yaş aralığındaki üniversite öğrencilerinde akademik motivasyonu önemli ölçüde azalttığı ifade edilmektedir (Chawla & Kumari, 2024). Akademik başarıları yüksek olan öğrenciler, stres düzeylerini daha iyi yönetebilmekte ve internet bağımlılıklarından daha az etkilenmektedir (Abdullah ve ark., 2020). Bu durum, eğitimdeki başarıyı artıran faktörlerin, psikolojik sağlığı iyileştirebileceğini ve öğrencilerin bağımlılıklardan korunmalarına yardımcı olabileceğini düşündürmektedir. Bununla birlikte, çalışmada akademik başarıda zorlanan öğrencilerin internet bağımlılığına daha yatkın hale geldiği görülmektedir. Bu bulgu, akademik stresin ve başarısızlığın internet bağımlılığına yol açabileceğini ve öğrencilerin akademik destek almasının önemini vurgulamaktadır.

Boş zamanlarını teknoloji kullanarak geçiren öğrencilerin internet bağımlılık düzeyleri daha yüksek bulunurken, kitap okuma gibi alternatif aktivitelerle vakit geçiren öğrencilerde bu düzeyin daha düşük olduğu belirlenmiştir. Bu sonuçlar, boş zamanın verimli kullanılması ile internet bağımlılığı arasındaki ilişkiyi ortaya koymaktadır. Literatürde benzer ilişki olarak boş zaman sıkıntısının serbest zaman yönetimi ve internet bağımlılığı arasında belirgin bir aracı rolü oynadığı ifade edilmektedir (Wang, 2018). Bu ilişkide dengesizliğin nedeni öğrencilerin internete erişimi arttığı (Gavurová ve ark. 2022), daha fazla boş zamanlarının olduğu, pandemi sırasında çevrimiçi öğrenmeye geçilmesi, ders çalışmaları ve ödevler için yoğun internet kullanımı gerektirmiştir. Bu durumun, potansiyel olarak internet bağımlılığı eğilimlerini daha da kötüleştirdiği ifade edilmektedir. (Lozano-Blasco ve ark., 2022). Araştırma bulgularına göre, teknoloji kullanımının aşırıya kaçması, öğrencilerin sosyal becerilerinin zayıflamasına, yalnızlık hissine yol açarak internet bağımlılığına yol açabilir. Literatürde aşırı internet kullanıcılarının giderek daha sorunlu kişilik profillerine sahip olduğu, aşırı kullanıcılar arasında daha düşük sosyallik ve daha fazla olumsuz etki eğilimi olduğu, internet bağımlısı grupta ise bu durumun daha da büyüdüğü ifade edilmektedir (Lozano-Blasco ve ark., 2022). Boş zamanın etkin ve egzersiz yaparak kullanımının, internet bağımlılığını azaltmada önemli bir koruyucu faktör olabileceği ifade edilmektedir. Bu durumun, öğrencilerin düzenli egzersiz yoluyla boş zamanlarını azaltabilecekleri ve rutinlerini daha verimli yönetebilecekleri anlamına gelmektedir. İnternette geçirilen süreyi azaltmak ve düzenlemek internet bağımlılığının psikososyal, fiziksel ve fizyolojik etkilerini korumaya yardımcı olabilmektedir (Koçak, 2018).

İnternet kullanan aile bireylerinin öğrencilerde internet bağımlılığını artırdığı gözlemlenmiştir. Bu bulgu, dijital alışkanlıkların aile içindeki sosyal normlar ve etkileşimlerle şekillendiğini göstermektedir.

Aile içindeki internet kullanımı öğrencilerin internet bağımlılığı üzerinde önemli bir etkiye sahiptir (Jahantigh & Nourimoghadam, 2023). Aile bireylerinin internet kullanım alışkanlıkları, öğrencilerin kendi internet bağımlılığı düzeylerini doğrudan etkilemektedir. Literatürde özellikle ergenlik dönemindeki problemli internet kullanımının kalıtsal olduğu ifade edilmektedir (Li ve ark., 2014). Bu durumun, interneti aktif olarak kullanan aile bireylerinin, internet bağımlılığını teşvik edici bir etki yaratabileceği düşünülmektedir. Ayrıca, spor yapan aile üyelerinin öğrencilerinin stres algısını ve internet bağımlılığını olumlu yönde etkilediği bulunmuştur. Aile içindeki sağlıklı yaşam alışkanlıkları, öğrencilerin psikolojik ve fiziksel sağlıklarını geliştirmekte önemli bir rol oynamaktadır. Yapılan araştırmalarda ailelerde internet kullanımına ilk maruz kalma yaşının, internet bağımlılığıyla önemli ölçüde ilişkili olduğu ifade edilmektedir (Ni ve ark., 2009). Ebeveyn davranışlarının ve normlarının diğer özellikleri ve ebeveyn-ergen iletişiminin internet kullanımı üzerinde etkisini inceleyen araştırmada, ebeveyn internet kullanımının ergen internet bağımlığı ile pozitif, ebeveyn internet kullanımı normlarının ve ebeveyn-ergen iletişiminin ergen internet bağımlılı ile negatif korelasyon gösterdiği ifade edilmektedir (Liu ve ark., 2012). Çalışma bulgularından hareketle, aile içindeki sosyal normlar, öğrencilerin alışkanlıklarını şekillendiren temel etkenlerden biri olduğu görülmektedir. Bu bağlamda, ailelerin sağlıklı yaşam alışkanlıklarına yönelik davranış modelleri, çocukların internet bağımlılık ve stres düzeylerini iyileştirebilir.

Evde internet bağlantısı bulunan öğrencilerin internet bağımlılıklarının daha yüksek olduğu tespit edilmiştir. Bu bulgu, dijital erişimin artmasının, internet kullanımının kontrolsüz hale gelmesine yol açabileceğini göstermektedir. Literatürde internet bağlantısının varlığı ile stres ve internet bağımlılığını inceleyen çalışmalar sınırlıdır. Mustafa ve ark., (2020) ailenin strese ilişkin farklı deneyimleri ve anlayışları olduğunu, ailedeki stres faktörlerinden biri de internet bağımlılığı olduğu ifade edilmektedir. İnternet bağımlılığı nedeniyle aileyi görmezden gelmek, her aile üyesinin duygusal, psikolojik ve ruhsal refahını da etkilemektedir. İnternet bağımlılığı ile dikkat edilmesi gereken semptomları, nedenleri ve etkileri içeren ev içi stres birbiriyle bağlantılıdır. Her ailenin bu sorunun farkında olması ve daha da kötüleşmeden önce buna bir çözüm bulması gerekmektedir (Mustafa ve ark., 2020). Çalışma bulguları evde internet kullanımı değişkeni ile stres arasında anlamlı bir fark olmadığını göstermektedir. Literatürde bu konu ile ilgili çalışmalar sınırlıdır.

Kendine ait odası olmayan öğrenciler, yetersiz öz yeterlik algılarına ve daha yüksek stres seviyelerine sahip olmuşlardır. Bununla birlikte, kendine ait odası bulunan öğrencilerin internet bağımlılığı daha yüksek bulunmuştur. Bu bulgu, öğrencilerin kişisel alanlarının, psikolojik sağlık ve internet kullanımı ile ilişkili olduğuna işaret etmektedir. Kendine ait bir alan, öğrencilerin kişisel gelişim ve bağımsızlıklarını artırabilir, ancak aynı zamanda daha fazla yalnızlık hissine ve dijital bağımlılığa yol açabilir. Literatürde bu bulguya dayalı çalışmalara rastlanmamıştır. Kendisine ait odanın olup olmaması yanlızlık olgusunu gösterdiğini varsayarsak bununla ilgili yapılan çalışmada yalnızlık, diğer beklentilerden kaynaklanan akademik stres ve kendi beklentilerinden kaynaklanan akademik stres gibi kişisel duyarlılık değişkenleri internet bağımlılığıyla anlamlı derecede pozitif korelasyon gösterdiği, sosyal desteğin tüm alanları internet bağımlılığıyla anlamlı derecede negatif korelasyon gösterdiği ifade edilmektedir (Tan, 2019).

Ailede spor yapan öğrencilerin internet bağımlılık seviyeleri daha yüksek bulunurken, spor yapmayan aile üyelerine sahip öğrencilerde ise internet bağımlılığının daha düşük olduğu tespit edilmiştir. Literatürde ailede spor yapma durumu ile internet bağımlılık seviyeleri arasında yapılan çalışmalar sınırlıdır. Çalışmada elde edilen bulgular ışığında ailede spor yapan bireylerin, öğrencilerin stres seviyelerini ve psikolojik sağlıklarını olumlu yönde etkileyebileceği düşünülmektedir. Aile içindeki spor alışkanlıkları, öğrencilerin genel yaşam tarzlarını şekillendirerek, bağımlılık riskini azaltabilmektedir. Anne-baba eğitim durumu, öğrencilerin internet bağımlılığı ve stres algısı üzerinde belirgin bir etkiye sahiptir. Çalışma bulguları, eğitim seviyesi yüksek olan ebeveynlerin çocuklarının daha düşük stres algısına sahip olduğunu ve internet bağımlılığının daha az olduğunu göstermektedir. Bu bulgu, ebeveyn eğitiminin, çocukların psikolojik sağlıkları üzerinde önemli bir etkiye sahip olduğunu göstermektedir. Lüteratürde aile faktörlerinde aile eğitimi ve aile atmosferinin stresle başa çıkma yeteneği, sosyal faktörlerde sosyal destek ve sosyal çevrenin üniversite öğrencilerinin ruh sağlığı üzerinde etkisi olduğu belirtilmektedir (Chen, 2024). Bununla birlikte ebeveyn ruh sağlığı, özellikle depresyon ve çocuklarının

internet bağımlılık durumu arasında önemli bir ilişki olduğunu ve ebeyn tutum ve davranışların çocukların internet bağımlılığı ve stres üzerinde etkili olduğu ifade edilmektedir (Lam, 2015).

Bulgular, günlük kitap okumayan öğrencilerin internet bağımlılık seviyelerinin, belirli bir süre kitap okuyan öğrencilere kıyasla daha yüksek olduğunu göstermektedir. Bu durum, bireylerin zaman yönetimini, dijital bağımlılık ve akademik alışkanlıkları bağlamında ele alınması gerektiğinin göstergesidir. Kitap okuma alışkanlığının bireyin bilişsel becerileri ve zaman yönetimi üzerindeki etkileri göz önünde bulundurulduğunda, bu sonucun literatürdeki bazı çalışmalarla paralel olduğu görülmektedir. Hosťovecký ve ark., (2019) üniversite öğrencilerinde internet bağımlılığının yaş, cinsiyet, okunan fakülte türü ve roman okuma ile anlamlı şekilde ilişkili olduğu ifade etmektedir. İnternetin aracı olan Akıllı telefonla olan bağımlılık üzerine yapılan bir araştırmada, cinsiyet ve eğitim düzeyi fark etmeksizin Türk gençleri arasında kitap okuma tutumlarını olumsuz etkilediği belirtilmiştir (Çizmeci, 2017).

SONUÇ

Bu çalışma, düzenli spor yapmanın üniversite öğrencilerinin internet bağımlılığı ve stres algısı üzerindeki olumlu etkilerini ortaya koymuştur. Elde edilen bulgular, spor yapan öğrencilerin internet bağımlılıklarının daha düşük, stres algılarının ise daha iyi olduğunu göstermektedir. Ayrıca, demografik değişkenler ve ailevi faktörlerin, öğrencilerin dijital bağımlılığı ve stres algısı üzerinde önemli rol oynadığı bulunmuştur. Özellikle, cinsiyet, akademik başarı, boş zaman değerlendirme alışkanlıkları ve ailedeki spor yapma gibi etkenlerin, bu ilişkileri şekillendirdiği anlaşılmaktadır. Aile içindeki sağlıklı alışkanlıklar ve bireylerin stresle başa çıkma becerileri, internet bağımlılıkla mücadelede belirleyici unsurlar olarak öne çıkmaktadır. Sonuç olarak, düzenli spor yapmanın, stres yönetimi ve internet bağımlılıkla başa çıkma sürecinde etkili bir araç olduğu ve üniversite öğrencilerinin psikolojik sağlıklarının iyileştirilmesi için daha fazla teşvik edilmesi gerektiği sonucuna varılmaktadır. Bu bulgular, sporun gençlerin internet bağımlılığı ve zihinsel sağlıkları üzerinde önemli bir iyileştirici etkisi olduğunu ortaya koymakta olup, gelecekteki araştırmalar için değerli bir temel oluşturmaktadır.

Etik Onay ve İzin Bilgileri

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