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**İletişim Ad:** Yusuf BARSBUĞA
**E-posta:** turkjse@gmail.com
**Telefon:** +90 332 223 47 93
**Adres:** Alaeddin Keykubat Campus, Faculty of Sport Science, Selcuklu, Konya, Turkey.

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# Examination of Learned Helplessness and Problem Solving Skills Between Candidate Students Who Applied to the Faculty of Sport Sciences Talent Exam and Students Who Have Definite Registration

Bekir Furkan TÜZER[1A], Havva DEMİREL[1B]

[1] *Selcuk University, Faculty of Sport Sciences, Department of Sport Management, Konya, TÜRKİYE*
*Address Correspondence to Bekir Furkan TÜZER: e-mail:.* bekir.tuzer@selcuk.edu.tr

** This study was created from the author's master's thesis.*



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A: Orcid ID: 0000-0002-1665-7205 B: Orcid ID: 0000-0003-2805-4281

**Abstract**

In this study, it was aimed to measure the learned helplessness and problem solving skills levels of the candidates who participated in the Selcuk University Faculty of Sport Sciences special talent exam. The study was conducted on a total of 1325 candidates, 317 females and 1008 males, who applied for the special talent exam, and 200 students who passed the exam. The problem solving skill scale, learned helplessness scale and personal information form were used in the study In addition, independent t-test and paired-sample t-test analyses were performed. According to the results of the research, we found that the problem solving skill levels of the individuals were high in the factors of attending a course, being an athlete and being accepted to the school. In addition, it was seen that the problem solving skills of the individuals who won the school were higher in the first test and the first measurements of the accepted girls. The learned helplessness levels of men and women who did not pass the exam were found to be higher than those who passed the exam. It can be stated that the mental endurance and problem solving skills of individuals who attend the pre-exam course and support these courses by doing sports will develop positively. It can be said that as problem solving skills increase, the level of learned helplessness will decrease.

**Keywords:** Learned Helplessness, Problem Solving Skills, Special Aptitude Test, Sport, Winning and Losing

**Spor Bilimleri Fakültesi Yetenek Sınavına Başvuran Aday Öğrenciler ile Kesin Kayıt Hakkı Kazanmış Öğrenciler Arasındaki Öğrenilmiş Çaresizlik ve Problem Çözme Becerilerinin İncelenmesi**

**Özet**

Bu çalışmada Selçuk Üniversitesi Spor Bilimleri Fakültesi özel yetenek sınavına katılan adayların öğrenilmiş çaresizlik ve problem çözme beceri düzeylerinin ölçülmesi amaçlanmıştır. Çalışma, özel yetenek sınavına başvuran 317 kadın ve 1008 erkek olmak üzere toplam 1325 aday ve sınavı geçen 200 öğrenci üzerinde yürütülmüştür. Araştırmada

problem çözme becerisi ölçeği, öğrenilmiş çaresizlik ölçeği ve kişisel bilgi formu kullanılmış, ayrıca bağımsız t-testi ve paired-sample t-testi analizleri yapılmıştır. Araştırma sonuçlarına göre, bireylerin problem çözme beceri düzeylerinin kursa gitme, sporcu olma ve okula kabul edilme faktörlerinde yüksek olduğu bulunmuştur. Ayrıca okulu kazanan bireylerin problem çözme becerilerinin ilk testte ve okula kabul edilen kızların ilk ölçümlerinde daha yüksek olduğu görülmüştür. Sınavı geçemeyen erkek ve kadınların öğrenilmiş çaresizlik düzeyleri sınavı geçenlere göre daha yüksek bulunmuştur. Sınav öncesi kursa katılan ve bu kursları spor yaparak destekleyen bireylerin zihinsel dayanıklılık ve problem çözme becerilerinin olumlu yönde gelişeceği ifade edilebilir. Problem çözme becerileri arttıkça öğrenilmiş çaresizlik düzeyinin azalacağı söylenebilir.

**Anahtar Kelimeler:** Kazanma ve kaybetme, öğrenilmiş çaresizlik, özel yetenek sınavı, problem çözme becerileri, spor

## INTRODUCTION

People face many problems as well as basic needs such as food and shelter at every stage of life. Although the solutions to the problems sometimes occur naturally, it is often necessary to demonstrate problem solving skills in the face of problems (Kuru 2009). Problems vary according to the conditions, needs and expectations of the individuals. The emergence and development of the problems under different conditions reveals the need for people to adapt to these conditions and cope with these problems (Akyüz 2021). The fact that people are beings who can learn by nature enables them to develop physically, mentally and psychologically from birth, as well as to learn both positive and negative skills. The basic information learned can facilitate or complicate the next learning of the individual. People may face many negative emotional states such as stress, anxiety and learned helplessness as a result of their reactions to the problems they encounter in their lives (Duzgun et al. 2006). The complexity of the decision-making process in these situations can cause individuals to experience problems. One of the factors associated with the decision-making process is problem solving skills (Secer 2022).

Morgan (1995) defined the problem as "a conflict situation in which the individual encounters obstacles in the process of reaching his/her goal". Sagar (2022) defines it as difficulties arising from obstacles that an individual encounters while reaching a goal, causing physical and psychological difficulties.

On the other hand, Van De Walle (1989) defined it as a matter of research, discussion or reflection. Although the concept of problem solving has different meanings, it is a key process that enables individuals to demonstrate their abilities and skills at every stage. It may be possible for individuals to overcome the problems they face with some superstructive actions. Among these actions are the stages of combining new information, searching for new solutions, determining different strategies to reach a solution and applying, monitoring and evaluating the determined appropriate strategy. Individuals can use these stages more positive and successful against problems. (Hidiroglu 2018). Today, individuals need to have certain skills to be successful. These skills include using technology, sharing information, thinking logically and rationally, communicating with each other, researching and producing, respecting and owning human values and having problem solving skills (Soylemez 2002).

Problem solving skills is explained as “a multi-step process in which the problem solver must find the relationships between past experiences (schema) and the problem at hand and then act on a solution” (Mayer 1983). It is also defined as the effort put forth by the individual in the face of problems. Many people face problems and stress in their daily lives. The problems experienced take place according to the degree of importance in the lives of individuals. Events that pressure human psychology may inevitably affect individuals physically and psychologically and cause greater problems in the social life of the individual (Sagar 2022).

People may encounter many problems in their work, family and social life throughout their life. These problems appear as internal factors when the individual is caused by himself, and as external factors when caused by the individuals around him. People may experience failure by being affected by these situations and be exposed to psychological helplessness as a result of failure. The continuous repeat of this situation may result in learned helplessness. In the life-long process, individuals may enter into a state of psychological helplessness such as failure and sadness as a result of certain events. People should have the skills to deal with this situation. However, as a result of the recurrence of such psychological helplessness, there may be a sense

of helplessness in individuals. The concept of learned helplessness entered the literature for the first time by Maier and Seligman's research on dogs (Maier and Seligman 1976). However, it has been criticized by many because it is still a new concept and is insufficient to explain human behavior. In the ongoing process, the variety of studies on the concept of learned helplessness has increased, and as a result, the existence of its negative effects on people has been revealed. It has also emerged that negative emotional states experienced in the past can direct the future of the individual (Mermer 2022).

"Helplessness" is when nothing you choose to do affects what happens to you (Seligman 2007). In another definition, it is explained as "a condition which occurs when exposed to unavoidable, undesirable events and, with its adverse effects, prevents or delays learning in later situations where escape (or avoidance) is possible" (Kumbul 2006).

Learned helplessness is when an organism loses control after a negative situation that it cannot overcome and then remains unresponsive even in situations that it can control with the effect of this negativity (Norman 1988).

The sense of learned helplessness may cause the individual to realize that he cannot control the outcome of his behavior, and therefore to expect a failure or not show the necessary behaviors to succeed, although he can control the results in a similar event (Abramson et al. 1980).

The concept of learned helplessness is a psychological state of emotion that continues past childhood and affects the lives of individuals. At the end of this process, individuals may experience a loss of control in learned helplessness. As a result, they may be affected emotionally, cognitive and motivational. (Bilge and Poyraz 2021). Disturbance in the motivational area may appear as a decrease in voluntary behavior. Cognitive disorder can be defined as the difficulty in learning that a result can occur in the behavior. The fact that individuals have difficulty in evaluating the possible positive and negative consequences that may arise as a result of their behavior and cannot make the right decision between possible choices by controlling the result can create a blockage in their intellectual processes If individuals cannot control the events they encounter with their behaviors, their control mechanisms leave their place to a deep depression. If this situation becomes a long process, it is perceived as depression. This situation, which is also perceived as general depression, can be expressed as emotional disorder (Peterson and Seligman 1984a).

The sense of learned helplessness may not be innate, but the situations or events that cause learned helplessness arise through learning. In addition, learned helplessness draws attention as a process, and the individual's way of explaining events or the causal explanation process begins. As negative situations experienced later are perceived as out of control, an expectation may arise that the outcome of future behavior will not be controlled. At the end of the process, signs of learned helplessness such as sadness, decreased self-esteem, decreased appetite, cognitive impairment and anxiety may appear (Peterson and Seligman 1984b).

Excitement disorder also occurs in individuals affected by various aspects. Psychological disorders may also have an effect on individuals' learning and directly affect their athletic performances (Guven 2021).

One of the most determining factors for success is the way individuals perceive and assess the situation they are in. While one of the individuals who have experienced two similar events can achieve success, the other may despair as a result of failure (Mermer 2022).Therefore, individuals are exposed to permanent, involuntary and unresolved events. People must attribute their lack of control to their own inadequacies and thus create helpless cognitive bias. For example, an athlete may attribute the reason for her failure to the lack of a special talent for the branch of sports he is involved in. Since this situation is based on an unchanging feature of the athlete, it will be an internal situation and will repeat itself in the future. Another athlete may attribute the failure to an unfair outcome. This will be an external situation and will be unlikely to have an impact on future competitions (Peterson et al. 1993). The opposite of the concept of learned helplessness in the literature is the concept of learned resourcefulness. Learned resourcefulness is defined as keeping the events under control by increasing the motivation of the individual in unpleasent and frustrating situations, and staying psychologically strong in the social process by being aware of his/her own abilities and competencies. Developing individuals' learned resourcefulness and problem solving skills against learned helplessness will support them to develop effective solution methods for the obstacles they face throughout life (Guler and

Tasliyan 2021). For this reason, it is essential to develop these perspectives, especially in situations where winning and losing are experienced in competition.

While recruiting students in higher education institutions, selection and placement examinations are of great importance for students and institutions that conduct examinations. Making logical and correct decisions about the future for students allows them to receive education in accordance with both their success and abilities. For this reason, the main purpose of education to be given to individuals is to raise individuals who can think, solve problems in a short time, are skilled and have good behavior, cultural values and social environment relations (Guzeller and Kelecioglu 2006). Acting with this basic purpose, the Departments of Physical Education and Sports School and Sports Sciences Faculties are recruited through student selection exams and special talent exams. The main purpose of these exams is to distinguish between the students who are talented in sportive terms (Peker 2003). Students attend courses that provide sports training in order to improve their personal skills and abilities for the special talent exam. Thus, they can gain experience in preparation for the special talent exam. It is thought that the factor of taking a course for the exam before may affect the psychological state of the participants. In addition to this, it is very important to examine the psychological difference between the individuals who won and lost the Faculty of Sports Sciences, as well as the sportive success. In addition, the levels of learned helplessness and problem-solving skills of the individuals who won the school before and after they entered the school can also reveal the results of the psychological effect of success on individuals.

It can be said that the problem solving skills of individuals can be an important power in avoiding the feeling of learned helplessness in the problems encountered in daily life, difficult situations, intractable situations and repeated unsuccessful results. and also in the environment of increasing competition in sports. It is thought that a problem solving-oriented approach to life-long problems rather than helplessness is very important especially in terms of mental health. For this reason, the aim of the research is to examine the problem solving skills and learned helplessness levels of the individuals who took the special talent exam and to determine their relationship with the factors of gender, participation in the course, sportsmanship and winning.

## METHOD

### Research Model

Relational screening models are research models that aim to determine the existence or degree of change between two or more variables (Karasar 2019). Relational screening model was used in this study.

### Research Group

The universe of this research, which compares the learned helplessness and problem solving skills of the students who took the special talent exam of the Faculty of Sports Sciences of Selcuk University, was formed by the students who took the special talent exam in schools related to Sports Sciences 2019-2020 exam period. The sample group consisted of 1325 (response rate %61) people who took the aptitude test at Selçuk University Faculty of Sports Sciences and 200 (response rate %57) students who passed this exam. Among the individuals participating in the research, there are 944 people between the ages of 17-20, 333 people between the ages of 21-24, and 48 people aged 25 and over.

### Measures

The participants who came to the school to register for the special talent exam delivered the necessary documents for the exam. After the exam record was created, the participants answered the problem solving skills scale and the learned helplessness scale. The first measurements are complete. Then, the same scales were applied again to the individuals who passed the special talent exam and won the school. Thus, we made the first and last measurements of the participants who took the exam.

### Analysis of Data

For the scales used in the research; missing values and outliers were examined. Analyzes were carried out with the participation of 1325 candidates. Parametric tests were applied because the obtained data showed normal distribution (±2) (George and Mallery 2010, Chapman 2018, Homer 2018). Significance was accepted

as p<0.05. The independent t-test was used to compare the differences between two independent groups, and the paired sample t-test was used to compare the pre-test and post-test groups.

**Data Collection Tools**

Problem Solving Skills Scale (PSSS): This scale, which was developed by Causey and Dubow (1992) in order to determine the problem solving levels of individuals in the face of problems, is in the 5-point Likert type. The scale consists of 2 sub-dimensions, approach (6 items) and avoidance (16 items), and 22 items. The average values (x) are calculated by collecting as a result of the answers given by the participants on the scale. For this study cronbach alpha internal coefficient was calculated for each sub-dimensions and total score. As avoidance .72, approach .88 and total Cronbach alpha .79.

Learned Helplessness Scale (LHS): The Learned Helplessness Scale (LHS), which was developed by Quinless and Nelson (1988) and whose validity and reliability were studied by Yavaş (2012), was applied. The scale, which was developed to determine the helplessness of individuals as a result of the problems they experienced, is in the 5-point Likert type. It consists of 2 sub-dimensions, internal controllability and external uncontrollability, and 21 items. As a result of original adopted study the validity and reliability analysis, the validity value was found to be 0.85 and the reliability coefficient Cronbach $\alpha$: 0.80. The average values (x) are calculated by collecting as a result of the answers given by the participants on the scale. For this study cronbach alpha internal coefficient was calculated for each sub-dimensions and total score. As external uncontrollability .78, internal controllability.80 and total Cronbach alpha .74.

This research was approved by the ethics committee report of Selçuk University, Faculty of Sports Sciences, dated 07.10.2019 and numbered 70.

## FINDINGS

First, the results of the analysis were given depending on the gender, previous course and athletic factors of the individuals. Then, the results of the analysis were compared depending on the winning factor of the individuals.

**Table 1.** Average Scores in Problem Solving Skills and Learned Helplessness Related to Gender Factor

| | | Gender | n | x | Sd | t | *p* |
|---|---|---|---|---|---|---|---|
| **Problem Solving Skills (PSSS)** | Avoidance | Female | 317 | 2,34 | 0,72 | -0,67 | 0,50 |
| | | Male | 1008 | 2,37 | 0,75 | | |
| | Approach | Female | 317 | 3,81 | 0,58 | 0,58 | 0,55 |
| | | Male | 1008 | 3,79 | 0,62 | | |
| | Total | Female | 317 | 3,41 | 0,44 | 0,26 | 0,80 |
| | | Male | 1008 | 3,40 | 0,45 | | |
| **Learned Helplessness (LHS)** | Internal Controllability | Female | 317 | 3,68 | 0,53 | 0,81 | 0,41 |
| | | Male | 1008 | 3,65 | 0,54 | | |
| | External Uncontrollability | Female | 317 | 3,79 | 0,67 | 0,36 | 0,71 |
| | | Male | 1008 | 3,77 | 0,71 | | |
| | Total | Female | 317 | 3,57 | 0,43 | 0,47 | 0,63 |
| | | Male | 1008 | 3,56 | 0,46 | | |

The problem solving skills and learned helplessness scores of the participants were examined according to the gender variable. According to the results of independent groups t-test analysis, involving problem solving skills avoidance and approach sub-dimensions and total scale scores, it was determined that there was no statistically significant difference in learned helplessness internal controllability and external uncontrollability sub-dimensions and total scale scores according to the gender variable (p> 0.05).

**Table 2.** Average Scores in Problem Solving Skills and Learned Helplessness Related to Previous Course Taking Factor

| | | Taking a course | n | x | Sd | t | *p* |
|---|---|---|---|---|---|---|---|
| **Problem Solving Skills (PSSS)** | Avoidance | Yes | 786 | 2,34 | 0,74 | -0,80 | 0,43 |
| | | No | 539 | 2,38 | 0,74 | | |
| | Approach | Yes | 786 | 3,86 | 0,58 | 4,53 | **0,01*** |
| | | No | 539 | 3,70 | 0,64 | | |
| | Total | Yes | 786 | 3,44 | 0,44 | 4,13 | **0,01*** |
| | | No | 539 | 3,34 | 0,46 | | |
| **Learned Helplessness (LHS)** | Internal Controllability | Yes | 786 | 3,67 | 0,53 | 0,81 | 0,42 |
| | | No | 539 | 3,65 | 0,56 | | |
| | External Uncontrollability | Yes | 786 | 3,80 | 0,69 | 1,25 | 0,22 |
| | | No | 539 | 3,75 | 0,73 | | |
| | Total | Yes | 786 | 3,57 | 0,45 | 0,75 | 0,45 |
| | | No | 539 | 3,55 | 0,45 | | |

** difference between measurements (p<0.05).*

When Table 2. is examined, there was no significant difference in the problem solving skills avoidance sub-dimension depending on the factor of taking a course before, and in the learned helplessness scores due to the factor of taking a course before (p> 0.05); There was a statistically significant difference in problem solving skills in the approach sub-dimension and the overall total scores of the scale (p<0.05).

**Table 3.** Average Scores in Problem Solving Skills and Learned Helplessness Related to Participation in Sports

| | | Sportsmanship | n | x | Sd | t | *p* |
|---|---|---|---|---|---|---|---|
| **Problem Solving Skills (PSSS)** | Avoidance | Athlete | 902 | 2,38 | 0,76 | 1,36 | 0,16 |
| | | Non athlete | 423 | 2,31 | 0,70 | | |
| | Approach | Athlete | 902 | 3,81 | 0,60 | 1,56 | 0,11 |
| | | Non athlete | 423 | 3,75 | 0,62 | | |
| | Total | Athlete | 902 | 3,42 | 0,44 | 2,15 | **0,03*** |
| | | Non athlete | 423 | 3,36 | 0,46 | | |
| **Learned Helplessness (LHS)** | Internal Controllability | Athlete | 902 | 3,68 | 0,53 | 1,78 | 0,07 |
| | | Non athlete | 423 | 3,62 | 0,57 | | |
| | External Uncontrollability | Athlete | 902 | 3,79 | 0,72 | 1,10 | 0,26 |
| | | Non athlete | 423 | 3,75 | 0,66 | | |
| | Total | Athlete | 902 | 3,58 | 0,46 | 2,04 | **0,04*** |
| | | Non athlete | 423 | 3,52 | 0,43 | | |

** difference between measurements (p<0.05).*

Looking at the Table 3 data, there is no significant difference in avoidance and approach sub-dimensions (p> 0.05); There was variation in the overall total results of the scale (p< 0.05). It was noted that the learned helplessness scores of the participants who were athletes were higher than those who were not athletes (p<0.05).

**Table 4.** Average Scores in Problem Solving Skills and Learned Helplessness Related to Winning Factor

| | | Winning | n | x | Sd | t | *p* |
|---|---|---|---|---|---|---|---|
| **Problem Solving Skills (PSSS)** | Avoidance | Pass | 216 | 2,46 | 0,73 | 2,28 | **0,02*** |
| | | Not Pass | 1109 | 2,34 | 0,74 | | |
| | Approach | Pass | 216 | 3,74 | 0,58 | -1,44 | 0,14 |
| | | Not Pass | 1109 | 3,80 | 0,62 | | |
| | Total | Pass | 216 | 3,39 | 0,44 | -0,38 | 0,70 |
| | | Not Pass | 1109 | 3,40 | 0,46 | | |
| **Learned Helplessness (LHS)** | Internal Controllability | Pass | 216 | 3,59 | 0,55 | -1,98 | **0,04*** |
| | | Not Pass | 1109 | 3,67 | 0,54 | | |
| | External Uncontrollability | Pass | 216 | 3,61 | 0,74 | -3,71 | **0,01*** |
| | | Not Pass | 1109 | 3,81 | 0,69 | | |
| | Total | Pass | 216 | 3,46 | 0,46 | -3,48 | **0,01*** |
| | | Not Pass | 1109 | 3,58 | 0,45 | | |

** difference between measurements (p<0.05).*

In Table 4., there is no statistically significant difference in the approach sub-dimension of problem solving skills related to the winning factor and in the general total results (p> 0.05); There was a significant difference in the avoidance sub-dimension (p< 0.05). When the learned helplessness sub-dimensions and grand total results related to the winning factor were examined, a statistically significant difference was found in the internal controllability and external uncontrollability sub-dimensions and grand total results (p< 0.05).

**Table 5.** Results of First and Last Measurements of Problem Solving Skills and Learned Helplessness of Exam Winners

| | | First and Final Test | n | x | Sd | t | *p* |
|---|---|---|---|---|---|---|---|
| **Problem Solving Skills (PSSS)** | Avoidance | Problem Solving First | 200 | 2,48 | 0,74 | 0,81 | 0,42 |
| | | Problem Solving Final | 200 | 2,43 | 0,72 | | |
| | Approach | Problem Solving First | 200 | 3,75 | 0,59 | 3,55 | **0,01*** |
| | | Problem Solving Final | 200 | 3,58 | 0,63 | | |
| | Total | Problem Solving First | 200 | 3,40 | 0,44 | 3,75 | **0,01*** |
| | | Problem Solving Final | 200 | 3,26 | 0,45 | | |
| **Learned Helplessness (LHS)** | Internal Controllability | Learned Helplessness First | 200 | 3,59 | 0,56 | -1,45 | 0,15 |
| | | Learned Helplessness Final | 200 | 3,66 | 0,48 | | |
| | External Uncontrollability | Learned Helplessness First | 200 | 3,62 | 0,73 | -0,71 | 0,48 |
| | | Learned Helplessness Final | 200 | 3,66 | 0,65 | | |
| | Total | Learned Helplessness First | 200 | 3,46 | 0,47 | -0,33 | 0,74 |
| | | Learned Helplessness Final | 200 | 3,48 | 0,41 | | |

** difference between measurements (p<0.05).*

In Table 5, it was seen that there was no significant difference in the problem solving skills avoidance sub-dimension (p> 0.05); A statistically significant difference was found in the approach sub-dimension and the grand total results (p<0.05). While it was observed that the participants problem solving skills in the general results were higher than the last measurement values (p<0.05), no difference was found in the learned helplessness scores (p> 0.05).

**Table 6.** Problem Solving Skills and Learned Helplessness Values of Winning Women Compared to Losers

| | | Women Who Take the Exam | n | x | Sd | t | *p* |
|---|---|---|---|---|---|---|---|
| **Problem Solving Skills (PSSS)** | Avoidance | Winner Women | 89 | 2,54 | 0,71 | 3,23 | **0,01*** |
| | | Loser Women | 228 | 2,25 | 0,70 | | |
| | Approach | Winner Women | 89 | 3,73 | 0,59 | -1,63 | 0,16 |
| | | Loser Women | 228 | 3,84 | 0,58 | | |
| | Total | Winner Women | 89 | 3,40 | 0,46 | -0,12 | 0,90 |
| | | Loser Women | 228 | 3,41 | 0,44 | | |
| **Learned Helplessness (LHS)** | Internal Controllability | Winner Women | 89 | 3,66 | 0,55 | -0,43 | 0,67 |
| | | Loser Women | 228 | 3,69 | 0,53 | | |
| | External Uncontrollability | Winner Women | 89 | 3,67 | 0,67 | -1,98 | **0,05*** |
| | | Loser Women | 228 | 3,83 | 0,67 | | |
| | Total | Winner Women | 89 | 3,51 | 0,44 | -1,46 | 0,15 |
| | | Loser Women | 228 | 3,59 | 0,43 | | |

** difference between measurements (p<0.05).*

Statistically significant differences were found in the problem solving skills avoidance sub-dimension scores in Table 6, which shows the values of the problem solving skills of the women who won compared to the women who lost (p< 0.05). The women who passed the exam showed significant differences in the avoidance dimension compared to the women who did not. On the other hand, a significant difference was found in the learned helplessness external uncontrollability sub-dimension, and it was observed that the mean scores of women who lost were higher (p<0.05).

**Table 7.** Problem Solving Skills and Learned Helplessness Values of Winning Men Compared to Losers

| | | Men Who Take the Exam | n | x | Sd | t | *p* |
|---|---|---|---|---|---|---|---|
| **Problem Solving Skills (PSSS)** | Avoidance | Winner Men | 127 | 2,41 | 0,73 | 0,70 | 0,48 |
| | | Loser Men | 881 | 2,36 | 0,75 | | |
| | Approach | Winner Men | 127 | 3,75 | 0,58 | -0,83 | 0,41 |
| | | Loser Men | 881 | 3,79 | 0,63 | | |
| | Total | Winner Men | 127 | 3,38 | 0,42 | -0,48 | 0,63 |
| | | Loser Men | 881 | 3,40 | 0,46 | | |
| **Learned Helplessness (LHS)** | Internal Controllability | Winner Men | 127 | 3,54 | 0,56 | -2,43 | **0,02*** |
| | | Loser Men | 881 | 3,67 | 0,54 | | |
| | External Uncontrollability | Winner Men | 127 | 3,56 | 0,78 | -3,55 | **0,01*** |
| | | Loser Men | 881 | 3,80 | 0,70 | | |
| | Total | Winner Men | 127 | 3,43 | 0,48 | -3,45 | **0,01*** |
| | | Loser Men | 881 | 3,58 | 0,45 | | |

** difference between measurements (p<0.05).*

In Table 7, no significant difference was found in the sub-dimensions of problem solving skills, avoidance, approach and general average scores of the scale (p> 0.05). It was observed that there were differences between the learned helplessness scores of the men who passed the exam and those who did not, and the scores of the men who lost in the internal controllability sub-dimension were found to be higher than the men who won the exam (p< 0.05). In the external uncontrollability sub-dimension and overall overall results, it is concluded that the learned helplessness levels of the losers are higher (p< 0.05). In general, it is seen that the win factor causes individuals to differ with each other in the dimension of learned helplessness, and it is seen that the factors of winning and losing can affect the levels of learned helplessness in individuals. The higher level of learned helplessness of the individuals who lost reveals the possibility that these individuals have experienced previous failures that may cause them to experience the feeling of learned helplessness.

## DISCUSSION AND CONCLUSION

This study was carried out to determine whether the problem solving skills and learned helplessness of the candidates who took the special talent exam at Selçuk University Faculty of Sports Sciences differ significantly according to the variables of gender, taking a course before, sportsmanship, winning and losing. This study is the first to examine problem solving skills and learned helplessness in special talent exams.

According to the results of the research, we did not detect a statistically significant difference in the gender factor in Table 1.

In the study of Aydin and Pancar (2021) examined the effect of boxers' self-confidence on their problem solving skills. When the findings were examined, it was determined that the problem solving skills of the individuals did not differ according to gender factor. In a study examining the problem solving skills of individuals, while there was no significant difference in the overall total results of problem solving skills, a significant difference was found in favor of females in the self-control dimension (Akyuz and Hardalac 2021).

On the other hand, Elioz et al. (2013) did not find a significant difference in the gender factor in their study examining the learned helplessness levels of individuals. Barutcu and Collu (2020) found that participants' levels of learned helplessness did not differ significantly according to gender. Bilge and Poyraz (2021) examined the learned helplessness levels of individuals in their study and did not find a significant difference in the gender factor.

The absence of a difference in the gender factor may not indicate that men and women do not have problem solving skills. Responsibilities in social life, business life and family life can bring people face to face with many problems. Therefore, each individual's ability to solve problems can positively affect their own life. Rapid interventions in emergencies or crisis situations can prevent bigger problems. Problem solving skills can enable people to have a chance to try again even in case of failure.

In the study, we found that the problem solving levels of individuals who took exam-oriented courses were high (Table 2). According to these findings, it can be said that students' problem solving skills are affected by taking a course before, and those who take courses can be more solution-oriented towards problems. In the study conducted by Ozen and Celebi (2006) about previous experiences, it was found that mountaineering training did not have a significant effect on the problem solving skill perception level of the participants in terms of gender, extreme sports experience and rock climbing experience. It was determined that the only participants with rock climbing experience have a better perception of problem solving skills than the participants without such experience. It can be said that taking practical training before affects problem solving skills. In the study conducted on the problem solving skills of school administrators depending on the factor of taking a course or educational seminar before, it was determined that the problem solving skills of individuals who attend courses or seminars more differ significantly from those who attend less (Kocak 2010). Accordingly, it can be said that previous education has positive effects on problem solving skills. In their study on high school students, Yildiz and Eksisu (2011) found statistically significant differences in favor of the trainees between the students who participated in the training aimed at improving their problem solving skills and those who did not receive any problem solving skills training. It can be said that individuals who receive education have a more positive approach to problems.

We found that taking an exam-oriented course had no effect on learned helplessness. According to the research findings on learned helplessness of 5th grade students, a significant difference was found between the individuals who received additional support and those who did not. When these results were examined, it was determined that individuals who receive support such as extra courses and private tuitions have lower levels of learned helplessness than individuals who do not receive any support (Dilci and Mermer 2013). When the results were examined, it is thought that the individuals who took preparation courses before the exam had more advanced problem solving skills than the individuals who had no previous experience, and therefore they may be more successful in coping with learned helplessness.

When the effect of the sportsmanship factor on problem solving skills was examined, a statistically significant difference we found in the overall total results of athletes compared to non-athletes (Table 3). Akandere et al. (2005), who examined the problem solving skills of individuals who do and do not do sports,

did not find a significant difference between female students who do sports and those who do not do sports. When the analysis results of the male and female students who do not do sports were examined, it was seen that the problem solving skills scores of the female students who do not do sports are higher than those of the male students who do not do sports. In addition, there was no significant difference between males who do sports and those who do not.

Senduran and Amman (Senduran and Amman 2006), in their study examining the problem solving approaches of secondary school students, both athletes and non-athletes, determined that athletes use a planned and self-confident approach to problems more than non-athletes. There was no significant difference between the students in terms of hasty, avoidant, evaluative and reasoning approaches, which are other problem solving approaches. It was determined that students who are athletes use their problem solving skills more frequently and effectively than non-athletes. In another study on university students, problem solving skills were examined in terms of various variables. Considering the results of the study, significant differences were found in favor of the students who continue their sports activities in terms of reasoning, avoidant, evaluative, self-confident and planned approaches (Tekin et al. 2007). Turkcapar (2009) found that there was no significant relationship between the problem solving skills of the students in the Physical Education department and the types of activities they preferred in their spare time. In a study examining the problem solving skills of individuals who do sports and those who do not do sports have license in secondary education, problem solving skills of students who do sports have license were found to be higher than students who do not do sports (Mirzeoglu et al. 2010). Aydin and Pancar (2021) examined the sports experience variable of boxers in their study. When the results were examined, it was determined that mean values in the confidence factor of problem solving skill of individuals who have been doing sports for 3 years or less compared to individuals who have been doing sports for 4-8 years are higher and show a significant difference. When the findings obtained from a study examining the problem solving skills of secondary school students who do and do not do sports were examined, mean values of the individuals who do sports differ significantly in favor of those who do sports compared to those who do not (Yilmaz 2020).

Akpinar and Akpinar (2017) in their study examining the problem solving skills of individuals according to whether they do sports or not, it was determined that the mean score of hasty and avoidant approach, which is one of the problem solving skills sub-dimensions, of the students who do not actively do sports is higher than the students who actively do sports. In addition, it is seen that the scores of reasoning, evaluative and planned approach, among the problem solving skills sub-dimensions, of the students who actively do sports are higher than the students who do not actively do sports. In general, it can be said that individuals who do sports have high self-confidence and are more successful in the face of problems.

In our study, we found that the problem solving skills of the athletes were high, but the levels of learned helplessness were also high (Table 3). It can be said that the level of learned helplessness of individuals who are athletes may be higher than those who are not athletes due to situations such as not being able to win often in his/her sports branch or not being able to cope with a problem.

Elioz et al. (2013), examining the effect of doing sports on students' learned helplessness levels, did not find a significant difference between the learned helplessness levels of students who do and do not do sports. In a study conducted to predict the learned helplessness levels of adolescents, a positive relationship was found between the learned helplessness scores of adolescents and the factor of doing sports (Buyuksahin 2015).

The state of being unmotivated is similar to the concept of learned helplessness. The conclusion to be drawn from this is that individuals who are not properly motivated may not perceive the situation between their actions and the consequences resulting from these actions. They may see themselves as inadequate and have difficulty controlling themselves. As a result of not being motivated internally or externally, they may not find a reason to motivate themselves to continue their activities. At the end of all these events, they may stop doing their activities. Based on this situation, in a study conducted on individuals competing in university teams, it was determined that the motivating reasons for students to participate in sports were the highest in the sub-dimension of movement/staying active (Yildirim 2017). In the study of Tekin and Sanioglu (2004), in which they examined the success factors of individuals who passed the special talent exam, the effect of motivation on success was determined as 75%. On the other hand, the effect of stress in case of failure was

determined as 70%. According to the data obtained from the findings, it can be said that motivation and the development of problem solving skills can be effective against stress and failure. It was pointed out that the problem solving skills of individuals can be improved with regular and systematic physical activities. With this aspect, it is thought that the social, psychological and physiological effects of sports on people, its integrating and empowering characteristics and its positive aspects that push the person to struggle instead of running away may also have successful effects on the phenomenon of learned helplessness.

Çavuşoğlu based learned helplessness on two basic principles. First, individuals become depressed when they realize that they have lost control over the factors that affect their lives (such as rewards and punishments). Secondly, are they responsible for this state of helplessness? (Cavusoglu 2007).

It turns out that the organism, which cannot control the result with its behaviors, initially remained inactive, became passive (passive) as the trials progressed, and later on, the situation became a complete "desperation" in terms of the "behavior-result" relationship.

This theory supports that learned helplessness may have internal or external causes. In our study, we found that those who lost the exam had higher levels of learned helplessness. In other words, the learned helplessness levels of individuals who could not get accepted can be explained by the fact that they have tried to pass the special talent exams of different schools and failed to achieve success.

Schotte and Clum (1987) revealed that individuals with low problem solving skills and negative life stress are more hopeless than individuals with effective problem solving skills. In some studies in the literature, it has been seen that the concept of hopelessness is in close relationship with the concept of learned helplessness. Therefore, it can be said that there is an inverse relationship between the problem solving skills and the level of learned helplessness in individuals.

On the other hand, Kul et al. (2014) examined the multiple intelligence types of the candidates who received the right to enroll in the exams of school of physical education and sports and the candidates who did not. In the analysis results, statistically significant differences were observed in favor of the individuals who passed the exam in the dimensions of verbal-linguistic intelligence, logical-mathematical intelligence, musical-rhythmic intelligence, bodily-kinesthetic intelligence, and social-interpersonal intelligence. From this point of view, it can be said that talented individuals can be developed and talented in many mental areas, not in a single mental area, and that other intelligence areas can also develop directly and make a difference compared to other individuals. Hence, a study conducted on individuals who took the special talent exam revealed that physical intelligence is mostly developed in students at physical education and sports schools (Bayrak et al. 2005, Hosgorur and Katranci 2007).

As a result of our research, the problem solving skills levels of the students admitted to the school showed a significant decrease in the second results (Table 5). It can be assumed that the reason for this decrease in problem solving skill scores is that they have passed the exam, succeeded and reached their goals.

As a result of study conducted in the form of pre-test and post-test on problem solving skills, it was determined that post-test mean scores of the students in the experimental and control groups were significantly higher than the pre-test mean scores (Turhan 2011). In a study conducted by Ciftci (2006) according to the pre-test and post-test results of individuals' problem solving skills, he concluded that there were no significant differences between students' problem solving skills.

When the first and last values of the learned helplessness levels of the individuals who passed the exam were examined, no significant difference was found in the learned helplessness values of the individuals before and after they got accepted into the school.

In the comparison made between the females who passed the exam and the women who did not, it was concluded that the learned helplessness levels of the females who did not pass the exam were higher.

In a study examining the measurement results of female students who took the sports high school special talent exam according to the variable of passing and failing the exam, statistically significant differences were found between the sportive background, talent and placement scores in favor of the students who passed the exam [56].

On the other hand, Oztürk and İnce (Ozturk and Ince 1993), who examined the analysis results of male students who passed and failed the special talent test, found statistically significant results in favor of the winners in the hand grip strength, leg strength, vertical jump, flexibility, 30 meter sprint, coordination and skill run, and 20 meter shuttle run tests. Agaoglu et al. (2009) found that there was a statistically significant difference in age, height, body weight and Q index factors between males who won and lost the 1500-meter run. Kayapinar et al. (2017) found statistically significant differences in favor of the winning students between the coordination track, 30-meter sprint, standing long jump, sportive background, talent and placement scores of the winning and losing male students.

As a result of the research; When the average values obtained from the research scales of those who participated in the course before, those who did sports and the individuals who won, were examined, it was determined that their problem solving skills were at a high level. It can be said that individuals with high problem solving skills have low levels of learned helplessness and that as their problem solving skills increase, the sense of learned helplessness will decrease. At the same time, it is thought that the research has both theoretical and practical contributions. First of all, the main theoretical contribution of the research is that it has a positive effect in line with the opinions of individuals who are educated, engaged in sports and winning as of today. Its practical contribution is that the psychological health of individuals preparing for special talent exams will be positively affected. In other words, attending the course and doing sports before can be the key to success. There are no studies examining the problem solving skills and learned helplessness of individuals who participated in special talent tests in the available resources. For this reason, it is thought that the relevant results of this research will contribute to the athletes engaged in activities for the exam. In addition, problem solving skills are a very important gain in overcoming the problems that people may encounter in their lives. Learned helplessness is an emotion that makes people psychologically believe in failure. People can be physically and psychologically more vigorous by doing sports. It is also possible for people who experience failure to be individuals who do sports. However, the physical and psychological benefits of doing sports should not be forgotten. It is also very important for each individual to have a goal and to be able to cope with the obstacles on the way to the goal. Behind every success is effort. It can be said that successful individuals also have the characteristics of coping with problems. Developing problem solving skills against negative emotional states such as learned helplessness can be a very important behavior.

Finally, the fact that the research was conducted only in sports science faculties can be considered as a limitation of the research. It is expected that studies with larger sample groups such as faculties of fine arts and conservatories will contribute to the relevant literature.

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# Investigation of Motivation Levels of Volunteers Participating in the 5th Islamic Solidarity Games in Terms of Various Variables

Abdil ARI [1A], Ramazan TOPUZ[1B], Tuncay SARIIPEK[1C]

[1] *Selcuk University, Faculty of Sport Sciences, Department of Sport Management, Konya, TÜRKİYE*
*Address Correspondence to Abdil ARI: e-mail:.* abdilari@selcuk.edu.tr


*Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*

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A: Orcid ID:0000-0002-5915-7761 B: Orcid ID: 0000-0002-7591-4670 C: Orcid ID: 0000-0002-4790-4379

**Abstract**

In this context, the motivation data of the employees in sports organizations and the classified socio-demographic factors (gender, age, marital status, education status, income level, sports branch, taking part in sports organizations) were created based on the connections between the motivations of the forces. The model of the research was the relational survey model, one of the survey models. The sample group of the research consists of 487 sports volunteer students, 288 women and 199 men, participating in the 5th Islamic Solidarity Games, one of the international sports organizations held in Turkey in 2022. In the research "Volunteer Motivation Scale for International Sports Organizations", which is a Demographic information form was used for data collection. While SPSS 25.0 package program was used for statistical analysis evaluation, descriptive and demonstrative statistical techniques were used in the analysis of the data. Volunteers participating in the research were asked to provide data on gender, age, marital status, educational status, income level, sports branch and sports volunteering experiences. In the study, significant differences were found between the motivations of the volunteers and their gender, age, marital status, education level, income level, having a license in a sports branch and taking part in a sports organization voluntarily before. The analysis revealed significant differences between volunteers' motivation and gender, age, marital status, education level, income level, having a license in a sports branch, and previous volunteering experience in a sports event. Based on this situation, it is concluded that when the wishes and needs of the volunteers are met, their motivation will increase.

**Keywords**: international sports organizations, motivation, volunteer motivation, sports volunteers.

**5. İslami Dayanışma Oyunlarına Katılan Gönüllülerin Motivasyon Düzeylerinin Çeşitli Değişkenler Açısından İncelenmesi**

**Özet**

Bu kapsamda spor organizasyonlarında çalışanların motivasyon verileri ile sınıflandırılmış sosyo-demografik faktörler (cinsiyet, yaş, medeni durum, eğitim durumu, gelir düzeyi, spor dalı, spor organizasyonlarında görev alma) arasındaki bağlantılardan yola çıkılarak oluşturulmuştur. kuvvetlerin motivasyonları. Araştırmanın modeli tarama modellerinden biri olan ilişkisel tarama modelidir. Araştırmanın örneklem grubunu, 2022 yılında Türkiye'de düzenlenen uluslararası spor organizasyonlarından 5. İslami Dayanışma Oyunları'na katılan 288 kadın ve 199 erkek olmak üzere 487 spor gönüllüsü öğrenci oluşturmaktadır. Verilerin toplanmasında Demografik bilgi formu olan " formu kullanılmıştır.

İstatistiksel analizlerin değerlendirilmesinde SPSS 25.0 paket programı kullanılırken, verilerin analizinde tanımlayıcı ve kanıtlayıcı istatistiksel teknikler kullanılmıştır. Araştırmaya katılan gönüllülerden cinsiyet, yaş, medeni durum, eğitim durumu, gelir düzeyi, spor branşı ve spor gönüllülüğü deneyimlerine ilişkin veriler istendi. Araştırmada gönüllülerin motivasyonları ile cinsiyet, yaş, medeni durum, eğitim düzeyi, gelir durumu, bir spor dalında lisans sahibi olma ve daha önce gönüllü olarak bir spor organizasyonunda yer alma durumları arasında anlamlı farklılıklar bulunmuştur. Analiz, gönüllülerin motivasyonu ile cinsiyet, yaş, medeni durum, eğitim düzeyi, gelir düzeyi, spor dalında lisans sahibi olma ve daha önce bir spor etkinliğinde gönüllülük deneyimi arasında anlamlı farklılıklar olduğunu ortaya çıkardı. Gönüllülerin istek ve ihtiyaçları karşılanırsa motivasyonları artacaktır.

**Anahtar Kelimeler:** Uluslararası spor organizasyonları, motivasyon, gönüllü motivasyonu, spor gönüllüleri.

## INTRODUCTION

Today, sports is a sector that affects the lives of communities with many big events. There is a very large manpower behind the management of these activities. As some of these human resources may be paid, volunteers can also take part in these organizations.

Although the period when today's Olympic volunteer model began to emerge covers the period from the Lake Placid Games in 1980 to the Seoul Olympics in 1988 [1], the concept first appeared in the Official Report of the 1992 Barcelona Olympic Games.

Volunteering is an activity linked to skills development, socialization and fun. Volunteering can provide positive benefits for the person or society served, as well as for the volunteer [2]. It is put forward that volunteering is approached in terms of recreational activities, which may be a desire to "make a job with others and have a good time while doing it" [3; 4].

In this respect, the participation of volunteers in sports events has become more important in recent years. Volunteers are known as an essential component of sports service delivery [5] and have become an important element in the functioning of sports events. Because they provide sports managers with the ability to present, maintain and even expand the quantity, quality and diversity of sports organizations [6].

In addition, the increasing costs of sports events at national and international levels mean higher budgets for managers [7]. Especially considering the human resource costs of large-scale international sports events, the importance of volunteers becomes even more apparent, and the absence of volunteers in sports events would often result in significant expenses [8]. Organizers of mega sports events like the Olympic Games work with a large number of volunteers to save costs and contribute to economic development [9].

In the context of volunteering, according to the model proposed by Pauline and Pauline [10], based on the functional approach, they argue that volunteers participate with the aim of satisfying their diverse psychological needs.

Sports volunteers take on various roles such as coaches, administrators, and fundraisers. Volunteers participate in local community and sports programs, world or continental championships, national and international sports organizations, and events. While individuals' motivations for volunteering may vary, there are some common reasons such as developing positive emotions associated with volunteering, having the opportunity to help others, and socializing. Additionally, these activities will increase motivation by allowing volunteers to acquire new skills and provide social benefits, leading to the acquisition of positive attitudes and behaviors [11].

International sports organizations are complex and involve numerous tasks, including logistics and security, often relying on a large number of volunteers. The contribution of volunteers in these events is recognized in social, cultural, political, and economic dimensions. Volunteers are considered a fundamental component in delivering services and managing sports events, and their participation can create a range of long-term and sustainable positive impacts, contributing to the ultimate success of the event. In this regard, volunteerism is crucial in helping organizers reduce the costs of tournament organization within the scope of sports events. This study aims to examine the motivation levels of volunteers participating in the 5th Islamic Solidarity Games from various perspectives. Thus, more effective strategies for recruiting, managing, and retaining volunteers can be implemented by Olympic organizing committees.

Islamic Solidarity Games

Islam teaches people to respect and honor one another, to care for each other, to promote cooperation, solidarity, and to share both in good and bad times [12]. In line with this, the Organization of Islamic Cooperation (OIC) was established in 1969 with the aim of bringing together Islamic countries under one umbrella and safeguarding the interests of the Islamic world [13]. The Islamic Solidarity Games is a large-scale sports event held every four years, with the participation of member countries [14]. The 5th edition of the games took place in Konya in 2022.

## METHOD

### The Model of the Study

The model of the study is the correlational survey model. This model is one of the quantitative research methods and is a descriptive method that depicts a past or present situation as it is [15].

### Study Group

The study group of the research consisted of 487 volunteers (288 females and 199 males) who participated in the 5th Islamic Solidarity Games, an international sports event held in Turkey in 2022.

### Data Collection Tool

The data collection tool used in the study included a personal information form prepared by the researcher and the International Volunteer Motivation Scale for International Sports Organizations, developed to examine the motivation factors of volunteers involved in international sports organizations.

### Personal Information Form

In this section, the participants of the research were asked seven questions regarding their gender, age, marital status, educational background, income level, possession of a license in a sports discipline, previous experience of volunteering in a sports organization, years of work experience, and occupation.

### International Volunteer Motivation Scale for International Sports Organizations

The "International Volunteer Motivation Scale for International Sports Organizations" was used in this research to examine the motivation factors of volunteers involved in international sports organizations. The scale was adapted into Turkish by Fişne and Karagöz [16]. It consists of 25 items and 6 sub-dimensions, measured on a 7-point Likert scale (1=strongly disagree, 7=strongly agree). The scale was developed specifically to examine the motivational factors of volunteers in international sports organizations. The internal reliability coefficients of the scale's sub-dimensions range from 0.75 to 0.92, with a total internal reliability coefficient of 0.89.

### Data Collection

The data collection process of the research was conducted by applying an online survey method to the volunteers who were selected through simple random sampling among all the volunteers participating in the 5th Islamic Solidarity Games held between August 9 and August 18, 2022. The selection of participants was based on their voluntary participation in the research.

### Research ethics

The decision regarding the ethical compliance of the study was obtained during the meeting of the Selcuk University Non-interventional Clinical Research Ethics Committee, held on May 2, 2023, with reference number E.511309.

### Data analysis

The data obtained from the scale applications were evaluated using the SPSS 25.0 software package at a 95% confidence interval and a significance level of 0.05. Since the number of observations was more than 70, the normal distribution of the data was tested using the Kolmogorov-Smirnov test. As it was found that the data followed a normal distribution and the assumptions for parametric tests were met, parametric tests were used for statistical analyses. The significance of the difference between the means of two independent groups

for a continuous variable specified by measurement was determined using the Independent Samples T-Test. The significance of the means for three or more independent groups was tested using One-Way Analysis of Variance (ANOVA). Post-hoc tests, specifically the Tukey HSD test, were used for multiple comparisons between groups to determine which specific groups differed from each other, considering the homogeneity of variances.

**FINDINGS**

**Table 1.** Comparison of Motivation in International Sports Organizations by Gender

| **Sub-dimensions** | Gender | n | X̄ | Ss± | Shata | t Test | |
|---|---|---|---|---|---|---|---|
| | | | | | | t | p |
| **Patriotism** | Woman | 288 | 27,22 | 4,74 | 0,279 | -0,445 | 0,657 |
| | Man | 199 | 27,42 | 5,17 | 0,367 | | |
| **The expression of values** | Woman | 288 | 19,96 | 2,50 | 0,148 | 0,393 | 0,694 |
| | Man | 199 | 19,87 | 2,27 | 0,161 | | |
| **Love of sports** | Woman | 288 | 19,25 | 2,72 | 0,161 | 1,728 | 0,085 |
| | Man | 199 | 18,79 | 3,07 | 0,218 | | |
| **Career guidance** | Woman | 288 | 30,59 | 5,31 | 0,313 | 0,002 | 0,999 |
| | Man | 199 | 30,59 | 5,36 | 0,380 | | |
| **Interpersonal relationships** | Woman | 288 | 11,87 | 2,57 | 0,152 | 1,123 | 0,262 |
| | Man | 199 | 11,59 | 2,76 | 0,196 | | |
| **Physical characteristic** | Woman | 288 | 11,45 | 3,13 | 0,185 | 3,609 | *0,000*** |
| | Man | 199 | 10,33 | 3,68 | 0,261 | | |
| **Total Scale Score** | Woman | 288 | 143,81 | 19,40 | 1,144 | 0,861 | 0,390 |
| | Man | 199 | 142,19 | 21,71 | 1,540 | | |

**p<0.01

According to Table 1, there is a statistically significant difference between male and female participants in terms of the sub-dimension of Extrinsic Factors ($p < 0.05$). However, no statistically significant differences were observed between male and female participants in terms of the sub-dimensions of Patriotism, Expression of Values, Love of Sports, Career Orientation, Interpersonal Relations, and the overall scale score ($p > 0.05$).

**Table 2**. Comparison of Motivation in International Sports Organizations by Age

| Sub-dimensions | Age Group | | n | X̄ | Ss± | F | p | Difference |
|---|---|---|---|---|---|---|---|---|
| **Patriotism** | 1 | 18-23 age | 338 | 27,06 | 5,01 | 3,333 | *0,037** | 1-2 |
| | 2 | 24-29 age | 75 | 28,64 | 3,96 | | | |
| | 3 | 30 age and above | 74 | 27,01 | 5,21 | | | |
| | | Total | 487 | 27,30 | 4,92 | | | |
| **The expression of values** | 1 | 18-23 age | 338 | 19,94 | 2,27 | 0,989 | 0,373 | |
| | 2 | 24-29 age | 75 | 20,17 | 2,17 | | | |
| | 3 | 30 age and above | 74 | 19,62 | 3,12 | | | |
| | | Total | 487 | 19,93 | 2,41 | | | |
| **Love of sports** | 1 | 18-23 age | 338 | 19,07 | 2,62 | 2,682 | 0,069 | |
| | 2 | 24-29 age | 75 | 19,57 | 2,54 | | | |
| | 3 | 30 age and above | 74 | 18,49 | 4,02 | | | |
| | | Total | 487 | 19,06 | 2,87 | | | |
| **Career guidance** | 1 | 18-23 age | 338 | 30,40 | 5,37 | 3,250 | *0,040** | 1-2 |
| | 2 | 24-29 age | 75 | 32,00 | 4,56 | | | |
| | 3 | 30 age and above | 74 | 30,05 | 5,62 | | | |
| | | Total | 487 | 30,59 | 5,32 | | | |
| **Interpersonal relationships** | 1 | 18-23 age | 338 | 11,74 | 2,73 | 4,201 | *0,016** | 2-3 |
| | 2 | 24-29 age | 75 | 12,41 | 2,20 | | | |
| | 3 | 30 age and above | 74 | 11,16 | 2,58 | | | |
| | | Total | 487 | 11,76 | 2,65 | | | |
| **Physical characteristic** | 1 | 18-23 age | 338 | 11,38 | 3,15 | 17,155 | *0,000*** | 1-3 |
| | 2 | 24-29 age | 75 | 11,29 | 3,18 | | | 2-3 |
| | 3 | 30 age and above | 74 | 8,92 | 4,01 | | | |
| | | Total | 487 | 10,99 | 3,41 | | | |
| **Total Scale Score** | 1 | 18-23 age | 338 | 143,16 | 20,33 | 5,036 | *0,007*** | 2-3 |
| | 2 | 24-29 age | 75 | 148,35 | 16,93 | | | |
| | 3 | 30 age and above | 74 | 137,84 | 22,56 | | | |
| | | Total | 487 | 143,15 | 20,37 | | | |

According to Table 2, it can be observed that there is a statistically significant difference among participants based on age in terms of the sub-dimensions of Patriotism, Career Orientation, Interpersonal Relations, Extrinsic Factors, and the overall scale score ($p < 0.05$). However, no statistically significant differences were observed among participants based on age in terms of the sub-dimensions of Expression of Values and Love of Sports ($p > 0.05$).

**Table 3.** Comparison of International Sports Organizations Motivation by Marital Status

| Sub-dimensions | Marital Status | n | X̄ | Ss± | Shata | t Test | |
|---|---|---|---|---|---|---|---|
| | | | | | | t | p |
| **Patriotism** | Single | 448 | 27,29 | 4,99 | 0,23 | -0,081 | 0,936 |
| | Married | 39 | 27,36 | 4,02 | 0,64 | | |
| **The expression of values** | Single | 448 | 19,92 | 2,43 | 0,11 | -0,338 | 0,736 |
| | Married | 39 | 20,05 | 2,08 | 0,33 | | |
| **Love of sports** | Single | 448 | 19,04 | 2,89 | 0,13 | -0,387 | 0,699 |
| | Married | 39 | 19,23 | 2,72 | 0,43 | | |
| **Career guidance** | Single | 448 | 30,61 | 5,34 | 0,25 | 0,224 | 0,823 |
| | Married | 39 | 30,41 | 5,21 | 0,83 | | |
| **Interpersonal relationships** | Single | 448 | 11,81 | 2,68 | 0,12 | 1,413 | 0,158 |
| | Married | 39 | 11,18 | 2,33 | 0,37 | | |
| **Physical characteristic** | Single | 448 | 11,27 | 3,20 | 0,15 | 6,392 | *0,000*** |
| | Married | 39 | 7,77 | 4,10 | 0,65 | | |
| **Total Scale Score** | Single | 448 | 143,52 | 20,59 | 0,97 | 1,376 | 0,170 |
| | Married | 39 | 138,85 | 17,29 | 2,76 | | |

According to Table 3, it can be observed that there is a statistically significant difference between single and married participants in terms of the sub-dimension of Extrinsic Factors ($p < 0.05$). However, no statistically significant differences were observed between single and married participants in terms of the sub-dimensions of Patriotism, Expression of Values, Love of Sports, Career Orientation, Interpersonal Relations, and the overall scale score ($p > 0.05$).

**Table 4.** Comparison of Motivation in International Sports Organizations by Education Level

| Sub-dimensions | Education Level | | n | X̄ | Ss± | F | p | Difference |
|---|---|---|---|---|---|---|---|---|
| **Patriotism** | 1 | High School | 38 | 27,11 | 5,04 | 0,102 | 0,903 | |
| | 2 | Associate/ Bachelor's degree | 396 | 27,35 | 4,80 | | | |
| | 3 | Master | 53 | 27,08 | 5,72 | | | |
| | | Total | 487 | 27,30 | 4,92 | | | |
| **The expression of values** | 1 | High School | 38 | 18,95 | 3,34 | 4-971 | *0,007*** | 1-2 |
| | 2 | Associate/ Bachelor's degree | 396 | 20,08 | 2,12 | | | |
| | 3 | Master | 53 | 19,47 | 3,30 | | | |
| | | Total | 487 | 19,93 | 2,41 | | | |
| **Love of sports** | 1 | High School | 38 | 18,74 | 3,21 | 0,658 | 0,518 | |
| | 2 | Associate/ Bachelor's degree | 396 | 19,13 | 2,75 | | | |
| | 3 | Master | 53 | 18,75 | 3,47 | | | |
| | | Total | 487 | 19,06 | 2,87 | | | |
| **Career guidance** | 1 | High School | 38 | 29,50 | 5,89 | 0.895 | 0,409 | |
| | 2 | Associate/ Bachelor's degree | 396 | 30,71 | 5,18 | | | |
| | 3 | Master | 53 | 30,53 | 5,91 | | | |
| | | Total | 487 | 30,59 | 5,32 | | | |
| **Interpersonal relationships** | 1 | High School | 38 | 11,26 | 2,78 | 1,564 | 0,210 | |
| | 2 | Associate/ Bachelor's degree | 396 | 11,74 | 2,69 | | | |
| | 3 | Master | 53 | 12,25 | 2,26 | | | |
| | | Total | 487 | 11,76 | 2,65 | | | |
| **Physical characteristic** | 1 | High School | 38 | 11,11 | 2,99 | 0,799 | 0,450 | |
| | 2 | Associate/ Bachelor's degree | 396 | 10,91 | 3,46 | | | |
| | 3 | Master | 53 | 11,53 | 3,30 | | | |
| | | Total | 487 | 10,99 | 3,41 | | | |
| **Total Scale Score** | 1 | High School | 38 | 140,11 | 22,55 | 0,470 | 0,625 | |
| | 2 | Associate/ Bachelor's degree | 396 | 143,46 | 19,87 | | | |
| | 3 | Master | 53 | 143,00 | 22,62 | | | |
| | | Total | 487 | 143,15 | 20,37 | | | |

According to Table 4, it can be observed that there is a statistically significant difference among participants based on education level in terms of the sub-dimension of Expression of Values ($p < 0.05$). However, no statistically significant differences were observed among participants based on education level in terms of the sub-dimensions of Patriotism, Love of Sports, Career Orientation, Interpersonal Relations, Extrinsic Factors, and the overall scale score ($p > 0.05$).

**Table 5.** Comparison of Motivation in International Sports Organizations by Income Level

| Sub-dimensions | Income Level | | n | $\bar{X}$ | Ss± | F | p | Difference |
|---|---|---|---|---|---|---|---|---|
| **Patriotism** | 1 | Bad | 160 | 27,22 | 5,26 | 0,119 | 0,888 | |
| | 2 | Medium | 305 | 27,37 | 4,79 | | | |
| | 3 | Good | 22 | 26,91 | 4,13 | | | |
| | | Total | 487 | 27,30 | 4,92 | | | |
| **The expression of values** | 1 | Bad | 160 | 19,59 | 2,88 | 2,618 | 0,074 | |
| | 2 | Medium | 305 | 20,12 | 2,13 | | | |
| | 3 | Good | 22 | 19,68 | 1,98 | | | |
| | | Total | 487 | 19,93 | 2,41 | | | |
| **Love of sports** | 1 | Bad | 160 | 18,56 | 3,36 | 4,339 | *0,014** | 1-2 |
| | 2 | Medium | 305 | 19,35 | 2,57 | | | |
| | 3 | Good | 22 | 18,64 | 2,64 | | | |
| | | Total | 487 | 19,06 | 2,87 | | | |
| **Career guidance** | 1 | Bad | 160 | 30,07 | 5,66 | 1,371 | 0,255 | |
| | 2 | Medium | 305 | 30,90 | 5,12 | | | |
| | 3 | Good | 22 | 30,14 | 5,39 | | | |
| | | Total | 487 | 30,59 | 5,32 | | | |
| **Interpersonal relationships** | 1 | Bad | 160 | 11,59 | 2,74 | 0,465 | 0,629 | |
| | 2 | Medium | 305 | 11,83 | 2,65 | | | |
| | 3 | Good | 22 | 11,95 | 1,98 | | | |
| | | Total | 487 | 11,76 | 2,65 | | | |
| **Physical characteristic** | 1 | Bad | 160 | 11,05 | 3,20 | 1,468 | 0,231 | |
| | 2 | Medium | 305 | 11,05 | 3,49 | | | |
| | 3 | Good | 22 | 9,77 | 3,65 | | | |
| | | Total | 487 | 10,99 | 3,41 | | | |
| **Total Scale Score** | 1 | Bad | 160 | 141,43 | 21,84 | 1,427 | 0,241 | |
| | 2 | Medium | 305 | 144,31 | 19,74 | | | |
| | 3 | Good | 22 | 139,50 | 17,24 | | | |
| | | Total | 487 | 143,15 | 20,37 | | | |

According to Table 5, it can be observed that there is a statistically significant difference among participants based on income level in terms of the sub-dimension of Love of Sports ($p < 0.05$). However, no statistically significant differences were observed among participants based on income level in terms of the sub-dimensions of Patriotism, Expression of Values, Career Orientation, Interpersonal Relations, Extrinsic Factors, and the overall scale score ($p > 0.05$).

**Table 6.** Comparison of Motivation in International Sports Organizations by Having a License in a Sports Branch

| Sub-dimensions | Having a License in a Sports Branch | n | $\bar{X}$ | Ss± | $S_{hata}$ | t Test | |
|---|---|---|---|---|---|---|---|
| | | | | | | t | p |
| **Patriotism** | Yes | 173 | 28,29 | 4,68 | 0,35 | 3,354 | *0,001*** |
| | No | 314 | 26,75 | 4,96 | 0,28 | | |
| **The expression of values** | Yes | 173 | 19,70 | 3,00 | 0,22 | -1,543 | 0,124 |
| | No | 314 | 20,05 | 2,00 | 0,11 | | |
| **Love of sports** | Yes | 173 | 18,96 | 3,22 | 0,24 | -0,569 | 0,570 |
| | No | 314 | 19,11 | 2,67 | 0,15 | | |
| **Career guidance** | Yes | 173 | 31,63 | 5,23 | 0,39 | 3,219 | *0,001*** |
| | No | 314 | 30,02 | 5,29 | 0,29 | | |
| **Interpersonal relationships** | Yes | 173 | 12,39 | 2,34 | 0,17 | 3,950 | *0,000*** |
| | No | 314 | 11,41 | 2,76 | 0,15 | | |
| **Physical characteristic** | Yes | 173 | 11,45 | 3,21 | 0,24 | 2,194 | *0,029** |
| | No | 314 | 10,74 | 3,49 | 0,19 | | |
| **Total Scale Score** | Yes | 173 | 146,35 | 20,77 | 1,58 | 2,586 | *0,010** |
| | No | 314 | 141,39 | 19,96 | 1,12 | | |

According to Table 6, it can be observed that there is a statistically significant difference among participants based on whether they have a license in a sports branch in terms of the sub-dimensions of Patriotism, Career Orientation, Interpersonal Relations, Extrinsic Factors, and the overall scale score ($p < 0.05$). However, no statistically significant differences were observed among participants based on whether they have a license in a sports branch in terms of the sub-dimensions of Expression of Values and Love of Sports ($p > 0.05$).

**Table 7.** Comparison of Motivation in International Sports Organizations by Previous Volunteering Experience in a Sports Event

| Sub-dimensions | Volunteering | n | X̄ | Ss± | Shata | t Test | |
|---|---|---|---|---|---|---|---|
| | | | | | | t | p |
| **Patriotism** | Yes | 253 | 27,74 | 4,60 | 0,28 | 2,047 | *0,041** |
| | No | 234 | 26,82 | 5,21 | 0,34 | | |
| **The expression of values** | Yes | 253 | 20,28 | 1,96 | 0,12 | 3,373 | *0,001*** |
| | No | 234 | 19,55 | 2,76 | 0,18 | | |
| **Love of sports** | Yes | 253 | 19,45 | 2,60 | 0,16 | 3,113 | *0,002*** |
| | No | 234 | 18,64 | 3,10 | 0,20 | | |
| **Career guidance** | Yes | 253 | 31,30 | 4,66 | 0,29 | 3,090 | *0,002*** |
| | No | 234 | 29,82 | 5,86 | 0,38 | | |
| **Interpersonal relationships** | Yes | 253 | 11,96 | 2,65 | 0,16 | 1,738 | 0,083 |
| | No | 234 | 11,54 | 2,65 | 0,17 | | |
| **Physical characteristic** | Yes | 253 | 10,98 | 3,34 | 0,21 | -0,037 | 0,970 |
| | No | 234 | 11,00 | 3,49 | 0,22 | | |
| **Total Scale Score** | Yes | 253 | 145,52 | 18,67 | 1,17 | 2,690 | *0,007*** |
| | No | 234 | 140,58 | 21,82 | 1,42 | | |

According to Table 7, it can be observed that there is a statistically significant difference among participants based on their previous volunteering experience in terms of the sub-dimensions of Patriotism, Expression of Values, Love of Sports, Career Orientation, and the overall scale score ($p < 0.05$). However, no statistically significant differences were observed among participants based on their previous volunteering experience in terms of the sub-dimensions of Interpersonal Relations and Extrinsic Factors ($p > 0.05$).

## DISCUSSION AND CONCLUSION

International sports events are characterized by time, location, and unity of action, and they require a significant human resource for successful organization. In today's world, volunteers have become one of the most important components of these organizations. Sports volunteers provide a great financial advantage. With the increasing importance of volunteers within the Olympic movement, the significance of research that examines the specific characteristics and experiences of individuals who dedicate their time and efforts to the Olympic Games is growing day by day.

This study focused on examining the motivation levels of volunteers participating in the 5th Islamic Solidarity Games and determining the relationship between their personal characteristics and volunteer motivation. The aim was to investigate the relationships between various socio-demographic factors and the motivation of individuals who volunteered for the event. The study analyzed whether the motivation of sports volunteers differed based on gender, age, marital status, education level, income level, having a license in a sports branch, and previous volunteering experience in a sports event. The analysis revealed significant differences between volunteers' motivation and gender, age, marital status, education level, income level, having a license in a sports branch, and previous volunteering experience in a sports event.

When examining volunteer motivation factors by gender, a statistically significant difference was found between female and male participants in the sub-dimension of extrinsic factors. However, no statistically significant differences were observed between female and male participants in terms of patriotism, expression

of values, career orientation, interpersonal relations sub-dimensions, and the overall scale score. In the sub-dimension of love of sports, the average scores of female participants were found to be higher than those of male participants. This finding differs from the study conducted by Yıldız [17], where male volunteers had higher scores compared to female volunteers, and the studies by Atçı et al. [18] and Bülbül [19], where female participants had higher average scores compared to males. These results show a difference compared to this study. However, studies conducted by Chun [20], Pauline and Pauline [10], and Fişne [21] found no significant difference in volunteer motivation levels between male and female volunteers in sports. These results are similar to this study. It is believed that these differences in the literature stem from the different individual motivations, needs, and desires of males and females [22].

Examining volunteer motivation factors by age, it was found that there were statistically significant differences in the sub-dimensions of patriotism between the age group of 18-23 and the age group of 24-29, in the sub-dimension of career orientation between the age group of 18-23 and the age group of 24-29, in the sub-dimension of interpersonal relations between the age group of 24-29 and participants aged 30 and above, in the sub-dimension of extrinsic factors between the age group of 18-23 and participants aged 30 and above, and between the age group of 24-29 and participants aged 30 and above. In terms of the overall scale score, there was a statistically significant difference between the age group of 24-29 and participants aged 30 and above. However, no statistically significant differences were observed in the sub-dimensions of expression of values and love of sports based on age. Pauline and Pauline [10] and Bektaş [23] found no significant differences in volunteer motivation among different age groups in their studies. These results differ from the findings of this study. Akbaş [24], in a study conducted on volunteer participants in sports events, found significant differences based on age. These results are similar to the findings of this study. The literature suggests that these differences may be attributed to older volunteers having higher motivation in terms of solving societal problems and helping others compared to younger volunteers [25].

When examining volunteer motivation factors by marital status, it was found that there were statistically significant differences in the sub-dimension of extrinsic factors between single and married participants. However, no statistically significant differences were observed in the other sub-dimensions and the overall scale score based on marital status. Bang and Ross [3] found that married volunteers had higher motivation compared to single volunteers in their study, while Fişne [21] found that single volunteers showed higher motivation compared to married volunteers. These results differ from the findings of our study. It is thought that this difference between our study and other studies may be due to the higher number of single volunteers (448) in our sample group compared to the number of married volunteers (39).

When examining volunteer motivation factors by educational level, it was found that there was a statistically significant difference in the sub-dimension of expression of values between participants with a high school education and participants with an associate's/bachelor's degree. However, no statistically significant differences were observed in the other sub-dimensions and the overall scale score based on educational level. Sertbaş [26] and Bülbül [19], in their studies on volunteer motivation, did not find significant differences in overall scale scores based on educational level. These results are similar to the findings of our study.

When examining volunteer motivation factors by income level, it was found that there was a statistically significant difference in the sub-dimension of love of sports between participants with low and moderate income. However, no statistically significant differences were observed in the other sub-dimensions and the overall scale score based on income level. Berber [27] and Bektaş [23], in their studies on volunteer motivation, found significant differences in volunteers' income levels, which differ from the findings of our study. However, Karacaoğlu [28], in a study on motivation, found that employees with the lowest income level were more motivated. Akbaş [24], in a study on volunteer participants in sports events, did not find significant differences based on income level. These results are similar to the findings of our study. The difference between our study and other studies may be attributed to the prominence of the sub-dimension of love of sports as the most important factor, given that the majority of volunteers are university students and young people [18], indicating their high interest in sports.

When examining volunteer motivation factors based on having a license in a sports branch, it was found that there was a statistically significant difference in the sub-dimensions of patriotism, career orientation, interpersonal relations, external characteristics, and the overall scale score. However, no statistically significant differences were observed in the other sub-dimensions. Busser and Carruthers [29], Berber [27], Fişne [21], in their studies on volunteer motivation, found that volunteers involved in sports or licensed athletes had statistically significant analysis results. These relevant findings are similar to the results of our study. This can be interpreted as a result of individuals involved in sports having higher levels of motivation.

According to the previous experience of volunteering in a sports organization, there was a statistically significant difference among participants in terms of patriotism, expression of values, love of sports, career orientation, and the overall scale score. However, no statistically significant differences were observed in the other sub-dimensions. Pauline and Pauline [10] and Berber [27], in their studies on volunteer motivation, found statistically significant differences among participants based on their previous experience of volunteering in a sports organization. These findings support the results of our study.

This study provides important findings regarding volunteers involved in international sports organizations. Additionally, our study presents information about the relationship between volunteers' demographic characteristics and volunteer motivation. According to the study results, the volunteer motivation of individuals participating in sports organizations varies based on their demographic characteristics. When examining previous studies in the literature [29; 27; 30; 23], it is concluded that volunteers' motivation increases when their desires and needs are fulfilled. In line with the shared information and data in our study, it can be suggested that meeting the desires and needs of volunteers will motivate them and lead to increased productivity, ultimately resulting in successful event organization.

In this study, volunteers' motivations and their relationships with demographic characteristics were compared. In future studies:

Different criteria that influence volunteer motivation can be evaluated, and research can be conducted on different age groups and in different organizations.

In addition to volunteer motivation, their achievements and satisfaction can be evaluated in different dimensions, and the relationships between these factors can be examined.

Observation and interview techniques can be used to study volunteer managers who play important roles in processes such as volunteer selection and training.

These suggestions aim to further explore the factors influencing volunteer motivation and improve the processes related to volunteer management.

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# Effect of Boldenone Administration on Some Organ Damage Markers in Trained Rats

Batuhan KARADUMAN[1A], Sefa LÖK[2B]

[1] *Karamanoğlu Mehmet bey University, Faculty of Sports Sciences, Coaching Department, Karaman, TÜRKİYE*
[2]*Konya Selçuk University, Faculty of Sports Sciences, Coaching Department, Konya, TÜRKİYE*
*Address Correspondence to Sefa LÖK: e-mail: sefalok@selcuk.edu.tr*


*Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*

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A: Orcid ID: 0000-0002-0487-1618 B: Orcid ID: 0000-0001-9632-2888

**Abstract**

The aim of this study was to examine the effects of Boldenone administration on skeletal muscle, liver and heart organs in exercised rats. Rats were divided into 4 groups as Control(C), Exercise (E), Boldenone(B) and Boldenone + Exercise (BE). There are 6 rats in the C and E groups and 7 rats in the other groups. The rats in groups E and BE were given a 45-minute treadmill exercise 5 days a week at a speed of 1.5km/hour for 8 weeks. In the statistical evaluation of the data, the results were given as mean±SD using the SPSS 22 package program. ANOVA and Duncan tests were used to compare the data between groups. At the end of the 8-week study, blood samples taken from rats were found to be significantly higher in AST and CK-MB values in B and BE groups than in C and E groups as a result of the statistical analysis (p0,05), it was observed that the mean values of the B and BE groups were higher than the mean values of the C and E groups in both parameters. LDH values were significantly higher in E, B and BE groups compared to C group ($p<0.05$). With the result obtained from the findings; It has been observed that the use of AAS increases liver enzyme levels (ALT, AST, ALP, LDH) and CK-MB levels, which is a marker of heart muscle damage. With these findings, it can be said that the use of Anabolic Androgenic Steroids has negative effects on the heart and liver. In addition, the fact that the mean values of the BE group were higher than the other groups in all parameters, as exercise did not reduce the amount of these negative side effects of AASs, indicates that exercise may increase these side effects even more.

**Keywords:** Anabolic androgenic steroids, Boldenone, Exercise, Heart, Skeletal muscle.

**Boldenon Uygulamasının Egzersiz Yaptırılan Sıçanlarda Bazı Organ Hasarı Belirteçlerine Etkileri**

**Özet**

Bu çalışmanın amacı boldenon uygulamasının egzersiz yaptırılan sıçanlarda iskelet kası, karaciğer ve kalp organlarına etkilerini incelemektir. Ratlar, kontrol (C), egzersiz (E), boldenon (B) ve boldenon + egzersiz (BE) olmak üzere 4 gruba ayrıldı. C ve E gruplarında 6, diğer gruplarda ise 7'şer sıçan vardı. E ve BE gruplarındaki sıçanlara 8 hafta boyunca 1.5km/saat hızda olacak şekilde haftada 5 gün 45 dakikalık koşu egzersizi yaptırıldı. Buna ek olarak B ve BE grubundaki sıçanlara haftada 10mg/kg dozda Boldenon uygulaması yapıldı. Verilerin istatistiki değerlendirilmesinde SPSS 22 paket programı kullanılarak sonuçlar ort±SS olarak verildi. Verilerin gruplar arası karşılaştırılmalarında ANOVA ve Duncan testi uygulandı. 8 Haftalık çalışmanın sonunda sıçanlardan alınan kan örneklerinde Yapılan istatistiki inceleme sonucunda Aspartat Aminotransferaz (AST) ve Kreatin fosfokinaz (CK-MB) değerlerinin B ve BE gruplarında C ve E gruplarına göre anlamlı ölçüde yüksek çıktığı görülmüştür ($p<0,05$). Alanin Aminotransferaz (ALT) ve Alkalen Fosfataz (ALP)

değerlerinin ise diğer gruplarla kıyaslandığında E grubunda anlamlı ölçüde düşük çıktığı gözlemlenmiştir ($p<0,05$), her iki parametrede de B ve BE grubu ortalama değerlerinin C ve E grubu ortalama değerlerinden daha yüksek çıktığı görülmüştür. Laktat dehidrogenaz (LDH) değerleri ise E, B ve BE gruplarında C grubuna göre anlamlı ölçüde yüksek çıkmıştır ($p<0,05$). Bulgulardan elde edilen sonuçla; Anabolik-androjenik steroid (AAS) kullanımının karaciğer enzim seviyelerini (ALT, AST, ALP, LDH) ve kalp kası hasarının belirteci olan CK-MB seviyelerini artırdığı gözlemlenmiştir. Bu bulgularla AAS kullanımının kalp ve karaciğer üzerine olumsuz etkileri olduğu söylenebilir. Ayrıca egzersiz yapmanın AAS'lerin bu olumsuz yan etkilerinin miktarını azaltmadığı gibi, BE grubunun ortalama değerlerinin tüm parametrelerde diğer gruplardan daha yüksek çıkması, egzersizin bu yan etkileri daha da artırıyor olabileceğini gösterebilmektedir.

**Anahtar Kelimeler:** Anabolik androjenik steroidler; Boldenon; Egzersiz; İskelet kası; Kalp.

## INTRODUCTION

Anabolic androgenic steroids (AAS), is a very wide group of androgen molecules that contain testosterone and its synthetic derivatives (1). AAS's are widely used worldwide to achieve an aesthetic appearance by promoting muscle growth and to enhance the performance of athletes (2). Also, AAS increases the thickness of muscle fibers and causes an increase in muscle strength (3). For this reason, the use of AAS, which was initially common only among bodybuilders, has become widespread among athletes over time (4). AAS, particularly due to its long-term detrimental effects on the cardiovascular system, poses adverse impacts on all body organs, tissues, bodily functions, and fertility. Consequently, the usage of AAS is considered a matter of public health concern (5, 6). Diseases of the cardiovascular system are the most prevalent kind of health threats to humans and represent a societal health concern (7, 8).

Boldenone is an anabolic steroid widely used in the sports world. It was first developed for animals, especially horses, but over time it has also begun to be used by humans for bodybuilding and performance enhancement. Boldenone is a compound with anabolic and androgenic effects. Its anabolic effects are manifested by properties such as increased muscle mass, increased protein synthesis, and increased nitrogen retention. Its androgenic effects are associated with the development of male sexual characteristics. Boldenone use can lead to many potential side effects. These include acne, hair loss, deepening of the voice, changes in libido, and cardiovascular problems. In addition, long-term and high-dose use can have negative effects on liver and kidney health (4,9).

Creatine kinase MB (CK-MB) is the enzyme that plays a pivotal role in generating ATP, the primary energy source within the heart and skeletal muscles. CK-MB facilitates energy supply to the cell by transforming creatine in the muscle into creatine phosphate as required. Hence, CK-MB assumes a critical role particularly for high-energy-demand tissues like muscles. Given that CK-MB constitutes a key cellular component of the heart and skeletal muscle, any damage inflicted on these tissues could potentially lead to a surge in the serum CK-MB levels within the heart and skeletal muscles (10). Troponin I and Troponin T are distinct isoforms present in cardiac and skeletal muscles, respectively. Troponin I is located within the cardiac muscle, whereas Troponin T is incorporated into the skeletal muscle's architecture (11). Just as with CK, Troponins can also exhibit a rise in serum levels as a result of tissue damage (12). Creatine Kinase is a form of protein primarily located in cardiac and skeletal muscles. It's recognized that CK concentrations rise following circumstances that inflict damage on the muscle, like muscle traumas and physical exertion (13, 14). Enzymes in the liver, including alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), lactate dehydrogenase (LDH), and gamma glutamyl transpeptidase (GGT), serve as crucial indicators for diagnosing liver damage. Reports suggest that in individuals who consume AAS, these enzymes can elevate to levels that are 2-3 times higher than the standard values (15, 16). Despite the serious and permanent damage that AAS can cause to human health, they are used unconsciously and widely among athletes to enhance performance. The current study is important in terms of revealing the disadvantages of these substances being used for doping by athletes and contributing to the field of sports sciences. The aim of this study was to examine the effects of Boldenone administration on skeletal muscle, liver and heart organs in exercised rats.

## METHOD

### Experimental Animals

The research was conducted on 27 rats (Male, Wistar) that were 30 days old (106.8 g), obtained from the Experimental Medicine Research and Application Center of Selcuk University (The study was completed with 26 rats due to the death of 1 rat in the Exercise group). The trial period lasted 8 weeks. The procurement, care, feeding, and experimental application of the rats were carried out at the Experimental Medicine Research and Application Center of Selcuk University. The rats were housed in plastic rat cages in the animal trial unit, at a room temperature of 23±2°C, in an environment with 50±10% relative humidity, under a 12/12 night/day light period, and were fed ad libitum. Fresh water, which the rats could always drink, was kept in front of them and refreshed daily. The animals were grouped as follows.

**Group C (Control group) (n:6):** The rats in this group were given standard rat feed and drinking water ad libitum throughout the study period.

**Group E (Exercise group) (n:7):** Rats in this group were given standard rat feed and drinking water ad libitum throughout the study. They were made to exercise on a treadmill at a speed of 25m/min for 45 minutes a day, 5 days a week, for 8 weeks. As a result of the death of 1 (one) rat in this group, the study continued with 6 rats

**Group B (10 mg Boldenone group) (n:7):** The rats in this group will be given standard rat feed and drinking water ad libitum throughout the study period. Boldenone undecylenate has been administered at a dose of 10 mg/kg/rat, diluted in 100 µl of peanut oil, intraperitoneally once a week for a duration of 8 weeks.

**Group BE (10 mg Boldenone + Exercise group) (n:7):** The rats in this group will be given standard rat feed and drinking water ad libitum throughout the study period. This group received an intraperitoneal injection of Boldenone undecylenate at a dose of 10 mg/kg, diluted in 100 µl of peanut oil, once a week, administered one hour before starting exercise. The rats in this group have been exercised for a duration of 8 weeks.

**Boldenone supplementation:** For 8 weeks, rats in the B and BE groups were administered Boldenone (EQUIPOISE (Boldenona-E) Boldenone undecylenate 200 mg/ml, SP Laboratories) at a dose of 10 mg/kg/rat (17), diluted in 100 mcl of peanut oil, intraperitoneally. The body weights of the rats were measured at the beginning of the study and every week for the following 8 weeks on the same day, and the weekly dose (10 mg/kg/rat) for Boldenone application was adjusted

**Exercise program:** An 8-lane treadmill, specifically designed for rats, was used for the exercise application. Following a 1-week (5 days) acclimatization period, the groups to which exercise would be applied were made to exercise on the treadmill for 45 minutes at a speed of 25m/min (1.5 km/hour) (17), 5 days a week, for 8 weeks.

**Warm-up protocol:**

Day 1: 10 m/min, 10 min

Day 2: 20 m/min, 10 min

Day 3: 25 m/min, 10 min

Day 4: 25 m/min, 20 min

Day 5: 25 m/min, 30 min

**Measurements:** At the end of the trial, the necessary biochemical parameters were measured from the serum obtained by taking blood from the hearts of the rats. The levels of serum LDH, AST, CK, ALT, and ALP were determined on an autoanalyzer (Ilab 300 Plus, Milan, Italy), while the levels of Troponin I and CK-MB were determined with an ELISA (BT LAB) kit. The biochemical analyses in the study were conducted at Konya System Laboratory, a competent laboratory.

**Data Analysis:** For the statistical evaluation of the research data, the SPSS 22.0 (SPSS 22.0 for Windows/ SPSS® Inc, Chicago, USA) package program was used. The data of the study were evaluated in a computer environment, using mean and standard deviation for descriptive statistics, and the One Way ANOVA test was

used for comparing the average scores between groups. The Duncan test was preferred as a post hoc test to find out which groups the difference originated from. The level of statistical significance was accepted as $p<0.05$.

**Ethical approval and institutional permission**

In order to conduct the research, ethical approval was received from Selçuk University Experimental Medicine Application and Research Center Animal Experiments Ethics Committee (Decision number: 2021-52, Meeting Date: 30.07.2021). In addition, the researcher had a Certificate for the Use of Experimental Animals approved by the university.

## FINDINGS

**Table 1.** Comparison of Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), Lactate Dehydrogenase (LDH), and Alkaline Phosphatase (ALP) Biochemical Parameters of the C (Control), E (Exercise), B (Boldenone), and BE (Boldenone+Exercise) Groups.

| Grups | ALT (μ/L) | AST (μ/L) | LDH (μ/L) | ALP (μ/L) |
|---|---|---|---|---|
| **C (n=6)** | 25,00±3,28 [b] | 41,16±6,73[a] | 305,83±118,84 [a] | 164,66±34,94 [b] |
| **E (n=6)*** | 21,75±1,03 [a] | 42,33±3,28[a] | 363,50±52,56 [b] | 134,41±24,82 [a] |
| **B (n=7)** | 25,57±2,50 [b] | 47,85±4,77[b] | 351,07±92,43 [b] | 174,85±21,69 [b] |
| **BE (n=7)** | 26,78±4,59 [b] | 55,14±8,37[b] | 392,71±116,51 [b] | 187,42±34,23 [b] |
| **Test value, p** | F:2,870<br>p:0,030 | F:7,034<br>p: 0,001 | F: 2,017<br>p: 0,02 | F: 3,755<br>p: 0,026 |

Different letters (a, b) in the same column are statistically significant ($p<0.05$). F: One Way ANOVA

*: As a result of the death of one rat in the E (Exercise) group, the study continued with 6 rats.

When comparing the liver enzyme levels (ALT, AST, LDH, and ALP) between groups, a statistically significant difference was found in the AST and LDH levels of the B and BE groups compared to the C group ($F=7.034$; $P<0.001$; $F=2.017$; $P<0.02$). While no statistical difference was found in any parameter between the B and BE groups ($P>0.05$), it was found that the ALT and ALP levels of the E group were statistically different when compared with other groups ($F=2.870$; $P<0.03$; $F=3.755$; $P<0.026$). In addition to these results, when the B and BE groups were compared with the C and E groups, a non-statistical difference was found in all parameters ($P>0.05$).

**Table 2.** Comparison of CK (Creatine Kinase), CK-MB and cTn-I Biochemical Parameter of C (Control), E (Exercise), B (Boldenone), and BE (Boldenone+Exercise) Groups.

| Groups | CK-MB | cTn-I (Troponin-I) | CK (μ/L) |
|---|---|---|---|
| **C (n=6)** | 6,30±0,76[a] | 291,07±39,86[a] | 263,75±84,35[a] |
| **E (n=6)*** | 6,55±0,45[a] | 298,67±17,79[a] | 236,85±79,95[a] |
| **B (n=7)** | 7,56±0,64[b] | 317,39±43,65[a] | 306,33±111,86[a] |
| **BE (n=7)** | 7,63±0,90[b] | 334,35±56,88[a] | 320,00±132,62[a] |
| **Test value, p** | F: 5,831<br>p: 0,004 | F: 1,343<br>p: 0,28 | F:1,203<br>p:0,319 |

Different letters (a, b) in the same column are statistically significant ($p<0.05$). F: One Way ANOVA

When comparing the CK, CK-MB, and cTn-I parameters between groups, no statistically significant difference was found in the levels of CK and cTn-I ($F=1.203$; $P=0.319$; $F=1.343$; $P=0.28$). However, when looking at the levels of CK-MB, it was observed that the B and BE groups were statistically significantly higher than the C and E groups ($F=5.831$; $P=0.004$).

## DISCUSSION AND CONCLUSION

In this study, 26 rats were subjected to running exercise for 8 weeks and treated with Boldenone at a dose of 10 mg/kg. The effects on the heart, skeletal muscle, and liver were examined after the application. It was found that the levels of AST and LDH, which are biomarkers of liver damage, were higher in the B and BE groups compared to the C group, and this difference was statistically significant ($p<0.05$).

Similarly to the findings in the current study, Karbasi et al. (2018) reported in their study with 28 adult male rats that the use of testosterone enanthate for 8 weeks increased the levels of AST and LDH in the rats' blood (19). In their study examining bodybuilding athletes who have been using AAS for at least 1 year, Urhausen et al. (2004) reported that AAS use caused an increase in AST levels (20). In another study demonstrating the effects of AAS on the liver, Kulaksız (2017) found that the LDH levels of rats injected with AAS were significantly higher compared to the control group (21).

In the current study, when the effects of exercise and boldenone application on AST, ALT, ALP, and LDH enzymes, which are significant biomarkers of liver damage, were examined, it was found that the ALT and ALP levels in the E group were significantly lower than the C group, while no significant difference was observed in AST levels. In addition, the LDH levels in the E group were significantly higher than the C group. When academic studies investigating the effects of exercise on liver enzymes were reviewed, they found that these effects vary depending on the intensity of the exercise. There are academic studies showing that exercise intensity, which causes oxidative stress, leads to an increase in liver enzymes, while exercises at lower intensities do not have an effect on liver enzymes (22, 23, 24, 25, 26). In the current study, the fact that there is no clear increase or decrease in liver enzymes between the E group and the C group, and that no significant result was found in any parameter between the B and BE groups, may indicate that the exercise applied is not intense enough to cause oxidative stress. In future studies where the effects of exercise on the liver will be examined, importance should be given to ensure that the intensity of the applied exercise is sufficient to cause oxidative stress.

In the current study, no significant difference was found in CK levels among the groups. However, it was observed that the average CK levels of the E and BE groups were numerically higher compared to the C and B groups. When the literature is reviewed, there are many studies indicating that the use of AAS in conjunction with exercise leads to an increase in CK levels (14, 27, 28, 29). On the other hand, while there are many experimental studies reporting that AASs cause an increase in the CK parameter measuring skeletal muscle damage, there are also studies showing the opposite (27, 30). When these studies are reviewed, it can be said that the effects of AASs and exercise on CK levels vary depending on the dose of AASs used and the intensity of the exercise performed.

In the current study, while no statistically significant difference was observed in cTn-I levels among the groups, it was found that the average cTn-I values of the B and BE groups were higher compared to the C and B groups. Similar to these findings, some studies have shown that the use of AAS increases cTn-I levels (19, 28).

In the current study, when CK-MB levels were compared between groups, it was observed that the CK-MB levels in the B and BE groups were significantly higher than those in the C and E groups. When looking at other studies examining the effect of AAS use on CK-MB levels, it has been observed that AAS use increases CK-MB levels, which is a significant indicator of heart muscle damage (19, 29)

In the current study, it was observed that the application of boldenone at a dose of 10mg/kg per week for 8 weeks increased the levels of biomarkers of liver, heart, and skeletal muscle damage. Based on these results, it can be said that the use of AAS causes damage in the heart and liver. Furthermore, the fact that no significant difference was observed in any parameter between the B and BE groups indicates that exercise does not reduce the negative effects of AAS. The majority of academic studies conducted in this field, similar to the findings in our study, report that the use of AAS may cause vital damage to human health, primarily the cardiovascular system. (8, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29,30). Afshin et al (2009) reported that treadmill exercises and steroid use caused heart muscle damage in rats (30). Studies on treadmill exercises have reported that running exercises are related to exercise intensity and duration, and that heart damage is greater with additional steroid use (31,32,33).

AAS's are used indiscriminately and widely among athletes to enhance performance, despite causing serious and permanent damage to human health. These doping substances, which are used in low doses as a drug in the treatment of many different diseases, have been widely researched in the field of Health Sciences for their side effects. However, it has been observed that academic studies in the field of Sports Sciences regarding the side effects of these drugs at high doses are not at an adequate level. Majority of the academic studies in this field are conducted in the field of Health Sciences, analyzing the side effects resulting from the

use of Anabolic Androgenic Steroids (AAS) as a drug to combat diseases caused by testosterone deficiency. The AAS dose used in these studies is significantly lower than the AAS dose used by athletes. Especially in the field of Sports Sciences, studies conducted using AAS at higher doses and in conjunction with exercise should contribute to the literature. Athletes, coaches, and scientists should be enlightened about the side effects of the use of AAS at supraphysiological doses, and societal awareness should be developed about the harms of AAS.

**Limitations of the Study**

The fact that this study was conducted on rats indicates that although rats have many similarities to human physiological processes, there are also fundamental differences. For example, factors such as metabolic rate, organ size, immune system responses, and hormonal regulations may differ between rats and humans. These differences may make it difficult to directly apply the results obtained to humans. This situation also shows the limitations of the study.

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# Investigation of The Effects of Physical Education and Sports Activities on The Motor Skills of Preschool Children in Terms of Gender Differences

Hatice MEHTAP [1A], Bekir MEHTAP [2B], İbrahim Bülent FİSEKCİOĞLU [3C]

[1]*Selcuk University, Institute of Health Sciences, Department of Sports Management, Konya, TÜRKİYE*
[2]*Selcuk University, Faculty of Sports Science, Department of Coaching Education, Konya, TÜRKİYE*
[3]*Selcuk University, Faculty of Sport Science Faculty, Department of Sports Management, Konya, TÜRKİYE*
*Address Correspondence to Bekir MEHTAP: e-mail: bekirmehtap@selcuk.edu.tr*


*Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*

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A: Orcid ID: 0009-0002-3468-0131-1618 B: Orcid ID: 0000-0002-8639-1983 C: Orcid ID: 0000-0001-8356-4001

**Abstract**

In the study, the effects of physical education and sports activities on the motor skills of preschool children were examined in terms of gender differences. Physical education and sports activities in the form of educational games were applied to 30 pre-school students aged 5-6, boys (n=15) and girls (n=15), 2 days a week and 30 minutes for 12 weeks. Physical education and sports activities; While it included walking, running, jumping and balance exercises, materials such as balls, ropes, funnels and hoops were used. The study was organized according to the pretest and posttest method. Children's motor skills were evaluated by applying motor performance tests developed by Morris, Atwater Williams and Wilmore (1980) that included balance, agility, running, catching, standing long jump and throwing criteria. The data obtained with the pretest and posttest method were analyzed by using the SPSS 23.0 statistical program and applying the t test (Paired-Sample t test) for dependent samples between the tests. According to the findings, the performances of both boys and girls in motor skill tests were found to be statistically significant ($p<0.01$). It can be said that physical education and movement training have a positive effect on motor performance in children aged 5-6. When the data were examined in terms of gender differences, it was concluded that female students made 3.03% more improvement in the balance test and 2.62% more improvement in the agility test than male students. With the development in other parameters, it was in favor of male students. Accordingly, male students were 2.78% more successful in the running test, 13.77% in the catching test, 5.33% in the standing long jump test and 6.48% in the throwing test. In conclusion; It can be said that physical education and sports activities can positively contribute to the development of motor skills of 5-6 years old preschool boys and girls. However, it should be examined whether the positive development observed in children's motor performance occurs as a result of the natural course of growth processes or as the positive contribution of physical education and sports movements.

**Keywords:** Physical education and sports, gender differences, motor skills, motor performance, pre-school education.

**Beden Eğitimi ve Spor Etkinliklerinin Okul Öncesi Dönemdeki Çocukların Motor Becerilerine Etkisinin Cinsiyet Farklılıkları Açısından İncelenmesi**

**Özet**

Çalışmada, beden eğitimi ve spor etkinliklerinin okul öncesi çocukların motor becerilerine etkisi cinsiyet farklılıkları açısından incelenmiştir. 5-6 yaş gurubu erkek(n=15) ve kız(n=15) 30 okul öncesi eğitim gören öğrenciye, 12 hafta boyunca haftada 2 gün v e 30 dakika süren, eğitsel oyun formunda beden eğitimi ve spor aktiviteleri uygulanmıştır. Beden eğitimi ve spor aktiviteleri; yürüyüş, koşu, atlama ve denge egzersizleri içerirken, top, ip, hunu ve çember gibi materyaller kullanılmıştır. Çalışma ön test ve son test metoduna göre düzenlenmiştir. Çocukların motor becerileri Morris, Atwater Williams ve Wilmore (1980) tarafından geliştirilmiş, denge, çabukluk, koşu, yakalama, durarak uzun atlama ve fırlatma kriterleri içeren motor performans testleri uygulanarak değerlendirilmiştir. Öntest ve sontest yöntemi ile elde edilen veriler SPSS 23.0 istatistik programı kullanılarak, testler arasındaki bağımlı örneklemler için t testi (Paired-Sample t test) uygulanarak analiz edilmiştir. Elde edilen bulgulara göre, hem erkek hem de kız çocukların motor beceri testlerindeki performansları istatistiksel olarak anlamlı bulunmuştur ($p<0,01$). Beden eğitimi ve hareket eğitiminin 5-6 yaş grubu çocuklarda motor performansa olumlu etki ettiği söylenebilir. Veriler cinsiyet farklılıkları açısından incelendiğinde, kız öğrencilerin erkek öğrencilere göre denge testinde %3,03, çabukluk testinde ise %2,62 daha fazla gelişim sağladığı sonucuna ulaşılmıştır. Diğer parametrelerdeki gelişimle ise erkek öğrenciler lehine oluşmuştur. Buna göre erkek öğrenciler koşu testinde %2,78, yakalama testinde %13,77, durarak uzun atlama testinde %5,33 ve fırlatma testinde %6,48 daha başarılı olmuşlardır. Sonuç olarak; beden eğitimi ve spor aktivitelerinin 5-6 yaş grubu okul öncesi erkek ve kız çocukların motor becerilerinin gelişimine olumlu katkı sağlayabileceği söylenebilir. Fakat, çocukların motor performanslarında gözlenen olumlu gelişmenin, büyüme süreçlerinin doğal seyri içerisindeki bir durum olarak mı yoksa beden eğitimi ve spor hareketlerinin olumlu katkısı olarak mı ortaya çıktığı incelenmelidir.

**Anahtar Kelimeler:** Beden eğitimi ve spor, cinsiyet farklılıkları, motor beceri, motor performans, okul öncesi eğitim.

## INTRODUCTION

In childhood, when activity is quite intense, it is very important to meet the movement requirements and needs of children in this period in order for their development periods to proceed healthily. Studies involving basic movement skills are extremely important in the development of biomotor skills such as endurance, strength, flexibility and coordination of children in this period. Physical education, movement skills and sports activities performed during this period have positive effects on physiological parameters such as the circulatory system, skeletal and muscular system, and respiratory system. Physical activity is one of the basic needs in the development process for children in this period. So, it is thought that regular and periodic physical activities for children in this period to improve their movement skills will positively affect their development processes (8, 23). Motor development is the changes in motor behavior over a period of time that includes the entire lifespan. Motor development is also evaluated in terms of both duration and result. Process evaluation; While defining the factors that affect changes in motor skills throughout life; Changes in motor behaviors and skill performances over a period of time are defined as results (14). It is known that the experiences gained in the first years of childhood affect the child's values, attitudes and behaviors in his future life (4, 13, 15). Preschool period is the period when the child's development accelerates. It includes many critical periods that children go through until they start basic education, and it is important because the development rate of children is very high during this period (7).

By implementing pre-school education programs that include physical education and sports activities in children in this period, it is aimed to support the physiological development of small and large muscles of children, and it is evaluated that it will contribute to the development of features such as correct and healthy posture development and skills. In many studies; reported that physical education and sports-based training programs provide improvement not only in movement skills but also in small and large muscle groups, and supported these predictions (16, 20, 26). The purpose of this study is to examine the effects of regular physical education and sports activities on the motor development of 5-6 year old preschool children. However, the main purpose of the study is to examine this effect in terms of gender differences based on pretest and posttest data within the experimental group.

## METHOD

In the study, the effects of physical education and sports activities on the motor skills of preschool children were examined in terms of gender differences. A total of 30 preschool students [females (n=15), males (n=15)] aged 5-6 who were enrolled in a preschool program and had at least a 1-year preschool education background participated in the study. In the research, a pretest-posttest experimental design without a control group was used. The research was conducted using a two-group pretest-posttest experimental design, one of the quantitative research approaches.

In the study, a physical education and sports activity including movement training was applied to a total of 30 pre-school students in the 5-6 age group, consisting of boys and girls, for 30 minutes, 2 days a week, for 12 weeks. In order for the training process to run more smoothly, the participants were divided into age groups (15 students in the 5-year-old group and 15 students in the 6-year-old group) and were subjected to the same movement training on separate days and hours. Within the scope of movement training, exercises including warm-up movements were applied to the children in the form of educational games for the first 10 minutes from the beginning of the study, followed by walking exercises, jogging exercises, jumping exercises and balance exercises, exercises using balls and ropes, rings, hoops, funnels and so on. Exercises using similar materials were applied. In the final parts of the study, static stretching exercises were applied.

### Motor Skills Tests

Motor skill tests were developed by Morris et al. (1980) to determine the motor performance of preschool children (15). The validity and reliability study of the test was tested in the study titled "Examination of the Motor Performance of Preschool Children" conducted by Sevimay (1986) with the participation of 205 children in the 3-6 age group (20). Skills tests; It includes 6 evaluation criteria: balance, quickness, running, catching, standing long jump and throwing tests (8). Motor skill tests were administered to two experimental groups of preschool students, consisting of 15 boys and 15 girls, in accordance with the protocol.

**Balance test;** It measures how long it takes the child to complete the starting and finishing point on a 2-meter rope by walking and maintaining balance. The child is asked to walk as fast as possible on a rope on flat ground. The best time is recorded after three attempts.

**Agility Test;** This test measures agility performance. The child is asked to lie on his/her back on a flat and non-slip surface. Then, when the command is given, he/she is asked to stand up, run forward the specified distance of 3.05 meters, pick up the tennis ball on the ground at the end of the test area, turn around and run back to his/her previous position. Once the child has collected the tennis ball and crossed the center line, the clock is stopped. Then the best time is recorded after three attempts.

**Running Test;** It determines how long it takes the child to run forward a distance of 12 meters within the test area. The child is asked to run as fast as possible between the start and finish points of the test area on a flat and non-slip surface. Then the best time is recorded after three attempts.

**Catching Test;** It determines the child's ability to catch a ball thrown high from the air while standing steadily. First, a tennis ball is thrown from the air to a child standing at a fixed point. Then, the child is asked to catch the ball. Then, it is determined how far back he/she moves from the fixed point while trying to catch the ball. After three attempts, the best distance is recorded.

**Standing long jump Test;** It determines how far the child can jump forward with both feet, bending his knees, while standing on a stable surface with the soles of his feet on the ground. After three trial, the average distance is taken into statistical evaluation.

**Throwing Test;** It determines the child's throwing skills. The child is asked to take the tennis ball and throw it as far as possible when he/she feels ready. Then the point where the ball lands is marked. The distance between the throwing point and the point where the ball lands is measured and recorded. The same procedure is repeated 3 times. The best distance is recorded.

### Data Analysis

The data obtained was analyzed using the SPSS 23.0 package program. In descriptive statistical methods, parameters such as mean values and standard deviation are determined. It was determined that

pretest/posttest measurements showed normal distribution (P> 0.05) using Kolmogorov-Smirnov and Shapiro-Wilk tests.. Then, Paired-Samples T Test was applied for intra-group comparisons and related measurements. With this test, it is determined whether the difference between the averages of the tests is significant after two tests are applied to a single group (24). Statistical significance was evaluated at p<0.05 and p<0.01 levels.

**Ethical approval and institutional permission**

It was unanimously decided that the research protocol complies with the Ethics Committee Directive with the decision of Selcuk University Faculty of Sports Sciences Ethics Committee dated 30.01.2024 and numbered 2024/21.

## FINDINGS

The data obtained after the motor performance tests applied to 30 male and female pre-school students aged 5-6 studying in a pre-school education institution are in table 1. and is presented in table 2.

**Table 1.** Comparison of motor performance tests of preschool males according to pre-test and post-test results

| | | Male (n=15) | | | |
|---|---|---|---|---|---|
| **Variables** | **Test** | **Mean** | **SD** | **t** | **P** |
| **Balance (sec)** | Pre | 8,32 | 0,64 | 8,492 | 0,000* |
| | Post | 7,59 | 0,44 | | |
| **Agility (sec)** | Pre | 5,38 | 0,28 | 4,596 | 0,000* |
| | Post | 5,22 | 0,18 | | |
| **Running (sec)** | Pre | 4,53 | 0,56 | 7,362 | 0,000* |
| | Post | 3,87 | 0,36 | | |
| **Catching (m)** | Pre | 2,48 | 0,37 | 8,537 | 0,000* |
| | Post | 2,02 | 0,25 | | |
| **Long Jumping (cm)** | Pre | 80,15 | 6,09 | -17,232 | 0,000* |
| | Post | 93,44 | 4,48 | | |
| **Throwing (m)** | Pre | 5,21 | 0,63 | -5,913 | 0,000* |
| | Post | 6,05 | 0,39 | | |

*P<0,01, P<0,05. SD: standart deviation, sec:second, m:meter, cm:centimeter

Table 1 includes pretest and posttest data for boys. In all performance tests applied, statistical significance emerged in favor of the post-tests (p<0.01). It was observed that the performance criteria improved and better results were obtained in terms of time and distance when compared to the data obtained in the preliminary tests.

**Table 2.** Comparison of motor performance tests of preschool females according to pre-test and post-test results

| | | Female (n=15) | | | |
|---|---|---|---|---|---|
| **Variables** | **Test** | **Mean** | **SD** | **t** | **P** |
| **Balance (sec)** | Pre | 10,52 | 0,51 | 15,021 | 0,000* |
| | Post | 9,28 | 0,51 | | |
| **Agility (sec)** | Pre | 6,08 | 0,35 | 6,563 | 0,000* |
| | Post | 5,74 | 0,33 | | |
| **Running (sec)** | Pre | 5,27 | 0,60 | 15,072 | 0,000* |
| | Post | 4,65 | 0,57 | | |
| **Catching (m)** | Pre | 2,52 | 0,37 | 4,028 | 0,001* |
| | Post | 2,39 | 0,36 | | |
| **Long Jumping (cm)** | Pre | 68,30 | 4,46 | -6,441 | 0,000* |
| | Post | 75,97 | 5,49 | | |
| **Throwing (m)** | Pre | 4,02 | 0,54 | -6,919 | 0,000* |
| | Post | 4,41 | 0,51 | | |

*P<0,01, P<0,05, SD: standart deviation, sec:second, m:meter, cm:centimeter

Table 2 includes pretest and posttest data for girls. In all performance tests applied, statistical significance emerged in favor of the post-tests (p<0.01). It was observed that the performance criteria improved and better results were obtained in terms of time and distance when compared to the data obtained in the preliminary tests.

When the performance criteria of balance, agility, running, catching, standing long jump and throwing tests are examined in general; When the data obtained in the posttests of the motor performance tests of both

boys and girls were compared with the pretest results, it was determined that there was a positive improvement in each parameter. This improvement shows statistical significance ($p<0.05$).

**Table 3.** Comparison of motor performance test results of boys and girls in terms of gender.

| Variables | Gender | Test | Mean | SD | Df (mean) | % | Df (%) |
|---|---|---|---|---|---|---|---|
| **Balance (sec)** | Male | Pre | 8,32 | 0,63 | 0,74 | -8,85 | 3,03 |
| | | Post | 7,58 | 0,44 | | | |
| | Female | Pre | 10,52 | 0,5 | 1,25 | -11,88 | |
| | | Post | 9,27 | 0,51 | | | |
| **Agility (sec)** | Male | Pre | 5,38 | 0,27 | 0,16 | -2,97 | 2,62 |
| | | Post | 5,22 | 0,18 | | | |
| | Female | Pre | 6,08 | 0,35 | 0,34 | -5,59 | |
| | | Post | 5,74 | 0,33 | | | |
| **Running (sec)** | Male | Pre | 4,53 | 0,55 | 0,66 | -14,57 | 2,78 |
| | | Post | 3,87 | 0,35 | | | |
| | Female | Pre | 5,26 | 0,59 | 0,62 | -11,79 | |
| | | Post | 4,64 | 0,57 | | | |
| **Catching (m)** | Male | Pre | 2,48 | 0,37 | 0,46 | -18,55 | 13,77 |
| | | Post | 2,02 | 0,24 | | | |
| | Female | Pre | 2,51 | 0,37 | 0,12 | -4,78 | |
| | | Post | 2,39 | 0,36 | | | |
| **Long Jumping (cm)** | Male | Pre | 80,15 | 6,09 | 13,29 | 16,58 | 5,33 |
| | | Post | 93,44 | 4,47 | | | |
| | Female | Pre | 68,29 | 4,45 | 7,68 | 11,25 | |
| | | Post | 75,97 | 5,49 | | | |
| **Throwing (m)** | Male | Pre | 5,21 | 0,63 | 0,83 | 15,93 | 6,48 |
| | | Post | 6,04 | 0,39 | | | |
| | Female | Pre | 4,02 | 0,54 | 0,38 | 9,45 | |
| | | Post | 4,4 | 0,51 | | | |

* SD: standart deviation, sec:second, m:meter, cm:centimeter, Df: difference, %:percent

Table 3 shows the comparison of motor performance test results of boys and girls in terms of gender. According to the table, it is seen that the post-test data of boys and girls are better and the movement training process contributes to the performances of both groups.

When the data obtained is examined in terms of gender; It is understood that girls show more improvement in percentage terms than boys in balance and agility tests. While girls developed at a rate of 11.88%, this development occurred at a rate of 8.85% for boys. Similarly, girls achieved better results in percentage terms compared to boys in their agility performance. Girls improved by 5.59% and boys improved by 2.97%. Girls improved 3.03% more than boys in balance performance. A similar result was found in agility performance. It was observed that girls achieved 2.62% better results than boys. Contrary to the results obtained in balance and agility performances, it was determined that boys showed more improvement in running, catching, standing long jump and throwing performance compared to girls. Boys achieved better results by 2.78% in the running test, 13.77% in the catching test, 5.33% in the long jump test and 6.48% in the throwing test.

However, it is seen that the largest percentage difference between genders occurs in catching performance (13.77%), while the smallest percentage difference occurs in quickness data (2.62%).

## DISCUSSION AND CONCLUSION

This study was conducted to examine the effects of physical education and sports activities on the motor skills of preschool children in terms of gender differences. In the study, the motor skills of a total of 30 preschool children, 15 boys and 15 girls aged 5-6, were tested. Pretest and posttest data of the movement training program, which lasted 12 weeks, 2 days a week and 30 minutes a day, and included physical education and sports movements, were compared. To evaluate motor performance criteria, balance, agility, running, catching, long jump and throwing tests were applied.

According to the research results, the study process involving physical education and sports movements in preschool children had a positive effect on the motor skill performances of both male (8.85%) and female students (11.88%). In similar studies examining balance performance, it was reported that girls showed more development compared to boys, and the results were in favor of girls (12, 21, 22). Our study is parallel to the

study conducted by Şen (2004) in which static balance performance was examined (23). In another study comparing the balance performances of the control and experimental groups, it was reported that the results obtained were significant in favor of the experimental group (1). Durukan et al. (2016), in their study examining the effect of gymnastics training on balance performance in preschool children, concluded that the post-test data improved the balance parameter of the experimental group (8). Çelebi et al. (2018) similarly reported that the post-test results were in favor of the experimental group (5). These results are parallel to the results obtained in our study. Accordingly, it can be said that the applied movement training program can have a positive effect on balance skills in preschool children and that this development is more in girls than in boys (3.03%).

Data on agility performance indicate that the study, which includes physical education and sports movements, provides improvement in both male (2.97%) and female (11.88%) preschool children. When the results obtained from the data were examined in terms of gender differences, it was shown that the positive change observed in the agility skills of girls was higher than that of boys (2.62%). Yıldırım (2023) noted that there was a statistically significant improvement in agility skills after basic movement training applied 2 days a week (26). In other studies, examining agility performance, it was reported that the improvement in the control groups was less than the experimental groups, but the improvement in the experimental groups was significant ($p < 0.05$). In the study conducted by Avcu (2016), it was reported that the game-based training program improved the agility performance in 5-year-old preschool children (2).

The post-test data obtained in our study indicate that the training program, which includes physical education and sports movements, improves running performance in male and female preschool children. However, it was revealed that the running performance of boys was higher than girls (2.78%). The improvement in the post-test data obtained in boys (14.57%) was greater than the development in girls (11.79%). In studies examining the motor performance of preschool children, there are generally studies in which the post-test data obtained from the experimental groups are better than the pre-test data, running times decrease, and this is expressed as an improvement in performance (1, 2, 25). The results obtained in our study are parallel to similar studies. On the other hand, Çelebi et al. (2018), in their study where they applied the 9 m running test, reported that there was no significant difference in the pre-test and post-test data of the control group (5). It can be said that the contradiction of this situation with the positive development in our study may be due to the different running test applied (9m).

The data obtained in our study on catching, standing long jump and throwing tests indicate that physical education and sports movement training provides positive development in male and female preschool children. However, when gender differences were examined, contrary to the results obtained in balance and agility performances, boys improved more than girls in other parameters. Compared to girls, the improvement in boys was 13.77% in catching performance, 5.33% in long jump performance and 6.48% in throwing performance. When the literature was examined, Avcu (2016) reported that although the game-based education program had a positive effect on the catching performance of 5-year-old preschool children, it did not contribute to long jump and throwing skills (2). There are different studies reporting that physical education and sports activities provide improvement in catching performance (9, 10, 18). Erol (2022), in his study examining the effects of movement training on children aged 4-6, reported that a positive improvement was achieved in throwing performance (9). Durukan (2016) similarly noted that the movement training program made a positive contribution to the development of the standing long jump performance of preschool children (8).

In general, it can be said that educational program applications that include physical education and sports movements can have a positive impact on the balance, agility, running, catching, standing long jump and throwing performance of preschool children. This interpretation is similar to the data obtained in various studies. In addition, it should be evaluated whether the development in children's motor performance is a situation that occurs within the natural course of their growth period or is a result of the contribution of physical education and sports activities.

For this reason, conducting more comprehensive studies in which physical education and sports movements are regularly applied in different and large groups will contribute to the literature.

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# Impact of Life Kinetic Training on Hand-Eye Coordination in Taekwondo Athletes

Ayse Hazal BOYANMIŞ [1A], Manolya AKIN [2B]

[1] *Mersin University, Institute of Education Sciences, Department of Physical Education and Sports, Mersin/ TÜRKİYE* [2]
*Mersin University, Department of Physical Education and Sports, Mersin/ TÜRKİYE*
*Address Correspondence to Ayse Hazal BOYANMIS: e-mail: hazalboyanmis@gmail.com*
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**Abstract**

Objective: This study explored the impact of Life Kinetic training on hand-eye coordination in taekwondo players aged 11 to 14 years ($\bar{x}$=12.67± 1.01) who had achieved a red belt rank or higher. Materials and Methods: To investigate the effects of Life Kinetic training on hand-eye coordination, an experimental group of athletes (n=15) engaged in 45 minutes of these exercises twice a week for 8 weeks in addition to their regular taekwondo training. A control group (n=15) continued with only their taekwondo training. Hand-eye coordination was assessed using the Purdue Pegboard hand dexterity test before the intervention. Data analysis involved a two-factor mixed ANOVA with repeated measures. The Shapiro-Wilk test and skewness assessment were employed to verify the normality of the dependent variables. A p-value less than 0.05 indicated a statistically significant difference between the variables. Results: Based on the results of hand-eye coordination measurements, group-measurement interaction significantly impacted the outcomes ($p<0.05$) of right-hand placement, left-hand placement, pair-hand placement, and the combination test. Conclusion: Based on these results, it was found that the results of hand-eye coordination measurements of the experimental group, in which LK exercises were applied, showed more improvement than the control group performing traditional taekwondo training, and it was seen that Life Kinetic training improved hand-eye coordination. For this reason, it is considered useful to include Life Kinetic training in the routine of taekwondo athletes in addition to traditional taekwondo training.

**Keywords:** Life Kinetik, Purdue Pegboard, Taekwondo.

**Life Kinetik Egzersizlerinin Taekwondo Sporcularında El-Göz Koordinasyonu Üzerine Etkileri**

**Özet**

Bu çalışmanın amacı 11-14 ($\bar{x}$=12.67± 101) yaşları arasında bulunan, kırmızı kuşak ve üzeri taekwondocularda Life Kinetik egzersizlerinin el-göz koordinasyonu üzerine etkilerini araştırmaktır. Gereç ve Yöntem: Bu amaçla deney grubu sporcuları (n=15), taekwondo antrenmanlarına ek olarak 8 hafta boyunca haftada iki gün süre ile 45 dakikalık Life Kinetik egzersizleri uygulamışlardır. Kontrol grubu (n=15) ise taekwondo antrenmanlarına devam etmiştir. Deneysel işleme başlamadan önce el-göz koordinasyonu, Purdue Pegboard el beceri testi ile ölçülmüştür. Verilerin analizi, tekrarlı ölçümlerde iki faktörlü karma ANOVA analizi ile yapılmıştır. Bağımlı değişkenlerin normal dağılıp dağılmadığı, normallik testlerinden Shapiro-Wilk testi ve çarpıklığın standart değeri hesaplanarak incelenmiştir. P değerinin 0.05'ten küçük olduğu durumlarda değişkenler arasındaki fark anlamlı kabul edilmiştir. Bulgular: El-göz koordinasyonu ölçüm sonuçlarına göre ise sağ el yerleştirme, sol el yerleştirme, çift el yerleştirme ve birleştirme testi sonuçları üzerinde grup-ölçüm etkileşiminin etkisi ve ölçüm faktörünün etkisi anlamlıdır($p<0.05$). Sonuç: Bu sonuçlardan hareketle, LK

egzersizlerinin uygulandığı deney grubunun, el-göz koordinasyonu ölçüm sonuçlarının, geleneksel taekwondo antrenmanı yapan kontrol grubuna göre daha fazla gelişim gösterdiği bulgusuna ulaşılmıştır ve Life Kinetik antrenmanlarının El-göz koordinasyonunu geliştirdiği görülmüştür. Bu sebeple Life Kinetic antrenmanının geleneksel taekwondo antrenmanına ek olarak taekwondo sporcularının rutinine dahil edilmesi yararlı görülmektedir.

**Anahtar Kelimeler:** Life Kinetik, Purdue Pegboard, Taekwondo

## INTRODUCTION

Life Kinetic (LK) exercises are a training program with origins in Germany that has found worldwide recognition. The program is built to enhance neuronal learning, create new brain networks, reduce neural symptoms, and improve the concentration and performance of the visual system (15, 17, 22). This program aims to provide a multidimensional training regimen that combines coordinative, cognitive, and visual tasks. It integrates these elements in a manner that challenges participants cognitively while they engage in physical exercises (6). LK's effectiveness stems from its adaptability; exercises scale in difficulty along with individual ability, constantly challenging the brain to advance. The LK exercise model is remarkably versatile, applicable across age groups and even to athletic training. Elite athletes, from Olympic champions to world-renowned competitors, now regularly incorporate LK into their routines. This trend is mirrored by growing academic research on Life Kinetic – studies consistently demonstrate that just one weekly hour of LK training boosts concentration and significantly enhances physical and motor skills (15, 19, 22). Besides, recent research offers a breakthrough discovery: dedicating the same small amount of time to Life Kinetic exercises can noticeably delay the onset of dementia, simultaneously promoting physical and mental well-being through heightened concentration (9).

High-level athletic performance is achieved through a meticulously planned, implemented, and controlled training system grounded in scientific principles (16). Athletes attain excellence by training and honing their technical, tactical, physical, coordinative, cognitive, and other requisite skills (16). The speed and stability of skill acquisition are directly contingent on the level of various coordinative abilities. These skills must be effectively coordinated to optimize the utilization of technical and tactical skills (15, 16). Successful sports performance is predicated on the compatibility and integration of motor coordinative capacities (23,24). Regarding the underlying cognitive processes, it is believed that these are not merely mental acts, but are also intrinsically linked to the physical movements of the individual (18). This understanding suggests a bidirectional relationship, wherein cognitive processes mediate and modulate motor processes, and vice versa. Life Kinetic is a training method rooted in the findings of in-depth brain science research, drawing upon kinetic psychomotor and kinematic principles (10). This method adopts a training approach that simultaneously combines visual tasks, cognitive elements, and diverse movement patterns. Maintaining an element of enjoyment and playfulness during exercise, the visual system and coordination-based exercises contribute by stimulating and enhancing brain function. This approach also strengthens the structure of neural networks and promotes overall brain health by facilitating the creation of new neural connections, thereby enhancing cognitive and motor performance (10).

Education consists of concurrent exercises combining motor activities and cognitive elements with various movement patterns, along with training in visual perception, particularly peripheral visual field perception (6, 17). A key focus of the Life Kinetic exercise model is the visual perception system (16,23). It is estimated that visual perception constitutes a substantial portion of human sensory perception. Therefore, it is evident that training this fundamental sensory modality in an optimal manner is of paramount importance (16,17). This encompasses training continuous eye movements, target acquisition and fixation, peripheral vision, three-dimensional depth perception, and the estimation of distances and speeds (27). Visual-spatial perception is of great significance in the sport of taekwondo. During competition or training, the ability to perceive the movements of one's opponent and adopt appropriate attack or defense positions is a critical skill. The Life Kinetic approach recognizes the central role of visual perception in human sensory experience and seeks to enhance this modality through targeted training. By improving the dynamic interplay between the oculomotor system, the visual environment, and the cortical visual processing centers, the model aims to optimize visual-spatial awareness and perceptual-motor integration – capacities that are particularly salient in the context of dynamic sports like taekwondo.

The physiological definition of coordination refers to the harmonious functioning of muscles or muscle groups in executing movements. Hand-eye coordination, therefore, denotes the synchronized working of the hand and eye muscles during movement execution. Coordinating eye and arm movements is a central aspect of our natural behavior. Hand-eye coordination relies on a combination of retinal and extra-retinal signals necessary for accurate movement (4, 28, 29). Numerous sports disciplines demand excellent hand-eye coordination, which is directly related to visual reaction time and motor response speed (26). Hand-eye coordination is particularly crucial in individual sports that heavily utilize motor manipulative skills (e.g., taekwondo, boxing, karate), team sports such as handball, basketball, volleyball, and sports involving rackets. Motor coordination capacity encompasses the coupling of the nervous and musculoskeletal systems, producing a rapid, precise, and balanced motor reaction that can be assessed by measuring and comparing the reaction time of hand-eye or eye-foot coordination skills (3,14). Visual-motor coordination is essential for obtaining visual information from the environment about incoming objects (e.g., ball, kick, punch) during training, necessitating a high level of hand-eye coordination for athletes to react efficiently and quickly to external stimuli. Besides, they can develop adaptive movements required for specific situations on the field (25).

The competitive structure of taekwondo has traditionally been characterized as emphasizing physical attributes such as strength and endurance. However, with evolving competition rules, scoring systems, and advancements in training science, there has been an increased emphasis on the importance of factors like enhanced coordination skills and perceptual abilities, in addition to strength, within the competitive domain. This shift has provided a more holistic focus on developing the comprehensive capabilities of athletes. Taekwondo competitions necessitate the execution of intricate movement combinations, which demand high levels of perception, peripheral vision, and coordination. Given these requirements, it is imperative to investigate the effects of Life Kinetic exercises on taekwondo performance. As such, empirically evaluating the potential benefits of incorporating Life Kinetic exercises into taekwondo training regimens could yield valuable insights into optimizing athletes' preparedness for the multifaceted demands of competition. For these reasons, this study aimed to examine the effects of Life Kinetic exercises on hand-eye coordination among taekwondo practitioners aged 11-14 years with red belt and above.

## METHOD

The present investigation employed a pretest-posttest control group design. The participants were red belt and above taekwondo athletes who have been in active training at Toros Sports Club and Mezitli Sports Hall for at least two years. All athletes and parents participating in the study were informed about the study and measurements. In addition, all participants and their parents read and signed the ethics committee approved 'Informed Voluntary Consent Form' and 'Informed Parental Consent Form'. From a predetermined pool of subjects, two groups were formed through random assignment. One group was randomly designated as the experimental group, while the other served as the control group. Before and after the intervention, baseline measurements of the dependent variable (hand-eye coordination) were taken using standardized assessment tools for all participants in both groups.

### Research Group

The study sample comprised 30 healthy volunteer taekwondo athletes (15 girls, 15 boys) between 11 and 14 years of age ($\bar{x}$=12,67± 1,01). Participants were randomly assigned to either the Life Kinetic training group (n=15; 7 boys, 8 girls) or the control group (n=15; 8 boys, 7 girls) using a random sampling method. In experimental studies, attention was paid to randomisation assignment in order to reveal the effect of the procedure and to purify the group from possible confounding variables. In addition, measures such as balancing, equalisation and stabilisation were taken to ensure balance in the groups. The participants consisted of athletes who have been practising taekwondo for at least two years, red belt and above. Red belt and above athletes were determined as the sample of the study in order to ensure that the Taekwondo competencies of the participants were at the appropriate level and to adapt to the training programme applied. Age, training year, height and body weight information of the athletes are shown in Table 1 depending on group and gender variables.

**Table 1.** Descriptive data of the experimental and control groups

| Groups | Gender | n | Age | | Years of Training | | Height (cm) | | Weight (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| **Experiment** | Female | 8 | 12.75 | 1.28 | 4.13 | 1.8 | 159.87 | 6.51 | 46.01 | 5.9 |
| | Male | 7 | 13.29 | 0.75 | 4.86 | 1.77 | 161.85 | 7.49 | 47.27 | 6.09 |
| **Control** | Female | 7 | 12.29 | 0.95 | 3.29 | 1.38 | 154.85 | 7.9 | 41.82 | 6.25 |
| | Male | 8 | 12.38 | 1.06 | 3.25 | 1.03 | 155.5 | 10.95 | 48 | 12.23 |

**Data Collection**

This study was designed in accordance with the Helsinki criteria and an informed consent form including the purpose, materials and methods of the study was used. Since the participants were younger than 18 years of age, a parental consent form was prepared and signed by the parents. Participants who voluntarily agreed to participate in the study were included in the study. Demographic and training history data were collected from each participant, including height, weight, age, belt rank, and years of taekwondo experience. Baseline assessments were completed and then all participants began an 8-week training period. The experimental group participated in the Life Kinetic training program for 45 minutes two days per week in addition to their regular taekwondo training 4 days per week. The Life Kinetic program was developed and implemented by the researcher who had received formal training in this methodology. Life kinetic training programme; Special LK exercises such as coordinated ball throwing, directional changes, parallel ball dance, jumping, cross movements with sample demonstration, target throwing, throwing the ball by indicating the hand to catch, forward line jumps, cloth in one hand, ball in the other hand, throwing the ball after rotation, controlled directional changes, playing with the ball on the badminton racket, rope drills, cross small ball throwing from the front and back of the body, throwing the ball by indicating the hand to hold. These exercises were applied to the athletes from simple to complex for eight weeks. Simultaneously, the control group continued their typical taekwondo training 4 days a week for a period of 8 weeks. Upon completion of the eight-week period, all participants underwent post-intervention assessments using the same measurement protocols as the baseline test.

Figure 1. Life Kinetic Exercises

**Data Collection Tools**

**Purdue Pegboard Test**

Hand-eye coordination was assessed using the Purdue Pegboard Test, a widely utilized instrument designed to evaluate dexterity against age-normed data. The Purdue Pegboard apparatus consists of a rectangular wooden board with two parallel rows of 25 holes spaced 1 cm apart, accompanied by four cups along the top to hold small cylindrical pins, washers, and collars. It was originally designed by Joseph Tiffin of Purdue University, West Lafayette, IN, in 1948 (13). The test comprises four distinct subtasks administered in a standardized sequence:

1. Participants inserted as many pins as possible into the row of holes on the right side using only their right hand within 30 seconds.

2. The same procedure was then performed with the left hand on the left row of holes.

3. Participants were instructed to bi-manually insert pins into the parallel rows simultaneously for 30 seconds.

4. In the assembly task, participants constructed "pin-washer-collar-washer" assemblies by alternating between hands for 60 seconds, with each complete assembly scoring 4 points.

For each subtask, the respective score (number of pins, assemblies) was recorded on the measurement form. This multifaceted assessment evaluates distinct components of hand-eye coordination, including unilateral and bilateral dexterity, as well as motor sequencing skills integral to many activities of daily living and sports.

**Figure 2.** Purdue Pegboard Test

**Data Analysis**

Two-factor mixed design ANOVA with repeated measures was used to evaluate the effects of Life Kinetic training on hand-eye coordination. The normality of the dependent variable was tested at each level of the independent variables using the Shapiro-Wilk test and standard skewness values (5), and the data were found to be normally distributed. Levene's test was conducted to assess the assumption of homogeneity of variances. In cases where this assumption was violated, Pillai's Trace test results were interpreted for mixed ANOVA models (11). An alpha level of 0.05 was used as the significance criterion for all statistical tests. In addition, effect size values showing how much of the variance in the dependent variable is explained by the independent variable are also given in the study. In $\eta 2$ value, 0.02 is considered as low effect size, 0.13 as average effect size and 0.26 and above as large effect size (5).

**Ethical approval and institutional permission**

Prior to commencing the study, ethics approval was obtained from the Mersin University Sports Sciences Ethics Committee (approval number: 08/08/2022-011).

## FINDINGS

The hand-eye coordination assessment comprised four distinct subtests: right-hand placement, left-hand placement, bimanual placement, and assembly. Therefore, descriptive statistics of the findings are presented in separate tables as placement and combination tests.

**Table 2.** Descriptive statistics of the right, left and pair hand placement scores (number of pins) of the groups

| Subtests/Tests | | | Right Hand Placement | Left Hand Placement | Pair Hand Placement |
|---|---|---|---|---|---|
| | **Group** | **N** | **Mean±SD** | **Mean±SD** | **Mean±SD** |
| **Pre-test** | **Experiment** | 15 | 13.80±1.32 | 13.00±1.51 | 21.20±1.82 |
| | **Control** | 15 | 13.40±2.13 | 12.67±1.58 | 20.80±2.11 |
| | **Total** | 30 | 13.60±1.75 | 12.83±1.53 | 21.00±1.94 |
| **Post-test** | **Experiment** | 15 | 15.80±1.65 | 15.20±2.07 | 23.73±2.40 |
| | **Control** | 15 | 14.06±1.79 | 13.60±1.18 | 21.80±2.14 |
| | **Total** | 30 | 14.93±1.91 | 14.40±1.81 | 22.77±2.44 |

Descriptive statistics indicated comparable pretest mean scores between the experimental and control groups across all four subtests, suggesting no initial group differences. Following the 8-week intervention period where the experimental group underwent Life Kinetic exercise training, descriptive data revealed a marked increase in mean scores for the experimental group coupled with a relatively smaller increase for the control group. To evaluate the statistical significance of these observed differences in mean scores, a series of mixed analysis of variance (ANOVA) models were conducted separately for each of the four subtest measures, with time (pretest vs. posttest) as the within-subjects factor and group (experimental vs. control) as the between-subjects factor. The ANOVA results are summarized below:

**Table 3.** Mixed design ANOVA results for the difference in right, left and pair hand placement scores of the experimental and control groups

| **Subtests** | **Right Hand Placement** | | | **Left Hand Placement** | | | **Pair Hand Placement** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Factors** | **F** | **p** | **Eta square** | **F** | **p** | **Eta square** | **F** | **p** | **Eta square** |
| **Group** (Experimental/control) | 3.575 | 0.069 | 0.113 | 3.255 | 0.082 | 0.104 | 2.799 | 0.105 | 0.091 |
| **Measurement** (pretest/posttest) | 19.823 | **0.000*** | 0.415 | 45.474 | **0.000*** | 0.619 | 26.287 | **0.000*** | 0.484 |
| **Group*Measurement** | 4.956 | **0.034*** | 0.150 | 7.436 | **0.011*** | 0.210 | 4.951 | **0.034*** | 0.150 |
| **p<0.05** | | | | | | | | | |

According to the Table 3, for the right hand placement subtest, the mixed ANOVA revealed a significant interaction between time and group ($F(1,28) = 4.956$, $p<0.05$, $\eta2 = 0.15$). This indicates that Life Kinetic exercises had a differential effect on right hand placement over time based on group membership. When the eta squared value is examined, the moderate effect size ($\eta2 = 0.15$) suggests a meaningful impact. Furthermore, a significant main effect of time was observed ($F(1,28) = 19.823$, $p<0.05$, $\eta2 = 0.415$), demonstrating that right hand placement scores changed significantly across the study period. This finding supports the effectiveness of Life Kinetic exercises in improving right hand placement. Overall, both groups demonstrated improvements in right hand placement over time, the degree of improvement was significantly greater for the experimental group that received Life Kinetic exercise training compared to controls. This provides evidence that Life Kinetic exercises facilitated enhanced visuomotor dexterity specific to the right hand.

Analysis of left hand placement test, demonstrated a significant interaction between group assignment and time (pre- vs. post-intervention) on left hand placement scores ($F(1,28) = 7.436$, $p<0.05$, $\eta2 = 0.21$). This suggests that Life Kinetic exercises produced a differential effect on left hand placement over time, dependent on group membership. The effect size ($\eta2 = 0.21$) indicates a moderate impact of the intervention. Additionally, a significant main effect of time was found ($F(1,28) = 45.474$, $p<0.05$, $\eta2 = 0.619$), demonstrating a substantial change in left hand placement scores across the study period. These finding highlights that approximately 62% of the variance in performance can be attributed to the time factor (pre- vs. post-intervention).

The ANOVA results regarding the difference in the pair hand placement scores revealed that there was a significant interaction between group assignment (experimental vs. control) and time (pre-intervention vs. post-intervention) ($F(1,28) = 4.951$, $p<0.05$, $\eta2=0.15$). Life Kinetic exercises showed a moderate level of effectiveness on the double hand placement test ($\eta2=0.15$). When the effect of the measurement factor was analyzed, the difference was significant ($F(1,28) = 26.287$, $p<0.05$, $\eta2=0.484$). In addition, the measurement factor explained 48% of the performance change. It can be suggested that Life Kinetic exercises were effective in increasing the double hand placement test scores. The group variable alone was not an effective factor on the double hand placement test ($F(1,28) = 2.799$, $p>0.05$).

**Table 4.** Descriptive statistics of the groups' combination test scores (number of pins)

| Test | Group | N | Mean±SD |
|---|---|---|---|
| **Pre-test** | Experiment | 15 | 30.07±2.89 |
| | Control | 15 | 28.13±3.22 |
| | Total | 30 | 29.10±3.16 |
| **Post-test** | Experiment | 15 | 34.00±3.09 |
| | Control | 15 | 29.20±3.93 |
| | Total | 30 | 31.60±4.24 |

The experimental group demonstrated a greater increase in the number of placements from pre-test to post-test (approximately 13%) compared to the control group (approximately 4%). ANOVA results (see table 4) were used to determine the statistical significance of this difference.

**Table 5.** Mixed design ANOVA results for the difference in the combination test scores of the experimental and control groups

| Factors | F | p | Eta square |
|---|---|---|---|
| **Group** (Experiment/control) | 8.783 | **0.006*** | 0.239 |
| **Measurement** (pretest/posttest) | 37.000 | **0.000*** | 0.569 |
| **Group*Measurement** | 12.163 | **0.002*** | 0.303 |
| **p<0.05** | | | |

Analysis of the combination test scores revealed a significant interaction effect between group assignment (experimental vs. control) and time (pre- vs. post-intervention) ($F(1.28) = 12.163$, $p<0.05$, $\eta2=0.303$). This indicates that Life Kinetic exercises produced a differential effect on combination test performance depending on group membership. Life Kinetic exercises showed a high level of effectiveness on the unification test ($\eta2=0.303$). The measurement factor also shows a significant difference within the groups ($F(1,28) = 37.00$, $p<0.05$, $\eta2=0.569$). This finding suggests a substantial change in combination test scores across the study period, with approximately %57 of the variance in performance attributable to the time factor (pre- vs. post-intervention).

## DISCUSSION AND CONCLUSION

The present study aimed to investigate the effects of Life Kinetic training on hand-eye coordination in youth taekwondo athletes, as assessed by the multidimensional Purdue Pegboard test. Analyses revealed significant interactive effects between group and time for right hand placement, left hand placement, bimanual placement, and the combination assembly task (all $p<.05$). These statistically significant interactions indicate that improvements in hand-eye coordination skills from pre- to post-test differed meaningfully between the Life Kinetic training group and control group across all test components. Specifically, while modest improvements were observed in the control group over the 8-week period, the experimental group that received supplemental Life Kinetic exercises demonstrated markedly greater gains in hand-eye coordination performance. The interaction effect sizes ranged from moderate to large, highlighting the substantial impact of the Life Kinetic intervention.

The study findings align with previous research demonstrating the efficacy of Life Kinetic (LK) training for enhancing hand-eye coordination abilities in youth populations. For instance, Büyüktaş (2) observed improvements in coordination skills among 10-14 years old tennis athletes after a 12-week LK training intervention. Similarly, Yaşar et al. (3) found partial positive effects of a 10-week LK program on hand-eye

coordination in young archers. Orhan (20) also concluded that kinetic brain exercise protocols including LK activities benefited hand-eye coordination and academic achievement in 9-10 years old children. This study builds upon existing research investigating the benefits of LK exercises for motor skills development. In another study by Duda (7), the effects of applying the Life Kinetic method to football education on the effectiveness of football teaching were examined. The research group consisted of 48 football players aged 14-15 years and the study was conducted between 2010-2014. The results of the study showed that football training with the Life Kinetic method increased the motor efficiency of the players. This finding suggests that long-term Life Kinetic exercises can support physical development in athletes. In another study, athletes with an average age of 12.25 years and studying at a football school were included in the study to examine the effect of 8-week Life Kinetic training on coordinative abilities. The results showed that Life Kinetic training was effective on balance, rhythm and orientation, but not on differentiation ability (23). Özşengezer and Top (21) examined the impact of LK exercises on coordination skills in 18 middle school students (aged 10-14 years) with mild intellectual disabilities. Their findings demonstrated that regular LK training over a 10-week period yielded positive contributions to coordination development. These findings from the extant literature provide support for the potential effectiveness of LK exercises in our own study. Collectively, this body of evidence highlights the potential for LK training to facilitate visuomotor coordination development during critical periods of motor skill acquisition and neural plasticity in youth.

The hand-eye coordination process proceeds in a highly structured way. It involves initial visual localization of the target, focused attention to it, perceptual recognition of its spatial location, cognitive processing, schema development for reaching, and finally activation of limb muscles to perform the movement (8). Given this complex sequence, attention and concentration play a critical role in successful hand-eye coordination. Therefore, this section reviews existing research examining the effects of Life Kinetic exercises on attention and concentration. In a study by Komarudin (12), the effect of Life Kinetics exercises on the concentration of athletes in various team (basketball, soccer, volleyball) and individual (karate, archery, badminton) sports was investigated. After 11 weeks of training, a significant improvement was observed in the concentration levels of both team and individual athletes (12). These findings align with Awwaludin et al. (1), who examined the influence of diverse brain training models on concentration in basketball players. Their research suggests that such training programs can indeed impact concentration, with this effect potentially interacting with an individual's inherent intelligence. In a study conducted on taekwondo athletes similar to our study, Wijaya et al. (30) reported that Life Kinetic exercises improved the technical skills of athletes with low and high concentration levels in taekwondo athletes. Further supporting evidence comes from Yıldırım (32), whose study evaluated the effects of Life Kinetic training on volleyball players' attention and concentration. Their findings demonstrated a notable increase in these cognitive skills within the Life Kinetic training group. Similarly, Sugandi et al. (28) investigated the impact of learning models incorporating Life Kinetics on elementary school students' concentration levels. Their results emphasized the effectiveness of such models in enhancing student concentration. Grünke (9) explored the influence of Life Kinetic training on attention and fluid intelligence in children with severe learning disabilities. This study revealed a significant advantage in attention and cognitive processing speed for the group receiving Life Kinetic training compared to the control group. These findings highlight a potential link between children's coordination skills and cognitive performance speed (9). Therefore, a review of the literature reveals a convergence of results with our own study. These studies collectively suggest that Life Kinetic exercises offer positive benefits for concentration development in athletes, students, and individuals with learning disabilities.

In conclusion, although previous research has focussed on other sports, this study extends these findings to taekwondo. When evaluated together with other studies in the literature, it can be said that Life Kinetic exercises can be an important tool to improve the performance of athletes, students and disadvantaged individuals. The findings provide evidence that incorporating Life Kinetic (LK) training into taekwondo practice can provide significant benefits for athletes' hand-eye coordination. Improvements in multiple skill components suggest that LK training can potentially enhance overall taekwondo performance. Educators, coaches and therapists can improve participants' coordination, attention and concentration skills by integrating Life Kinetic exercises into their programmes. This can lead to noticeable improvements in both the physical and cognitive performance of individuals. Further research should investigate the potential mechanisms underlying these improvements and explore the long-term benefits of LK integration in various sport disciplines.

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# The Relationship Between Horizontal Push-Off and Land-Based Vertical Jump During Tumble Turns in Freestyle Swimming

Yıldız ÖZ [1A], İrfan GÜLMEZ [2B], Semih YILMAZ [3C], Cansel CUMBUR [2D], Göktuğ ŞANLI [2E], Zeynep BOZDOĞAN KURT [2F], Fatih SANİ [2G], Nejla GERÇEK [2H], Nusret RAMAZANOĞLU [2I]

[1] *Marmara University, Faculty of Sport Science, İstanbul/ TÜRKİYE*
[2]*Marmara University, Faculty of Sport Science, Department of Coaching Education İstanbul/TÜRKİYE*
[3]*Marmara University, Faculty of Sport Science, Department of Physical Education and Sports Teaching, İstanbul, TÜRKİYE*
*Address Correspondence to Nusret RAMAZANOĞLU: e-mail: nramazanoglu@marmara.edu.tr*

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A: Orcid ID: 0000-0002-1018-9930 B: Orcid ID: 0000-0001-8117-1845 C: Orcid ID: 0000-0001-6774-1047
D: Orcid ID: 0000-0002-7479-2093 E: Orcid ID: 0000-0003-1024-4394 F: Orcid ID: 0000-0001-8710-2525
G: Orcid ID: 0000-0002-7437-7420 H: Orcid ID: 0000-0002-0845-0394 I: Orcid ID: 0000-0002-8056-8194

**Abstract**

The aim of this study was to investigate the relationship between the horizontal push-off against the pool wall and the land-based vertical jump performance during the tumble turn in freestyle swimming technique. Twenty-one young male swimmers (age:15.7±1.53 years; height:176.3±7.07 cm; body weight:63.7±7.61 kg) with at least four years of swimming training experience were participated in the study. In this study, the swimmers were tested on land and in the water. To examine the land based vertical jump performance, the countermovement jump, and the drop-jump (25 cm height) tests were performed. In the pool tests, the swimming times at 20 m, 25 m and, 5 m after the tumble turn were recorded. The relationship between land based and in water performance were analyzed using Pearson Correlation Test. A significant relationship was found between the tuck index and the drop jump height ($p<0.05$). A strong positive correlation was found between the tuck index angle, the 25 m swimming time, and the average speed for the last 5 m before the turn ($p<0,05$). As a result, it was investigated that increasing the vertical jump training and the land-based training can also increase the swimming performance. It is recommended that swimming coaches include lower extremity vertical strength training exercises on land in training programs.

**Keywords:** Acceleration, Tuck Indeks, Countermovement-jump, Drop jump, Plyometric jump

*Yıldız ÖZ Orcid ID: 0000-0003-2345-8383/ İrfan GÜLMEZ Orcid ID: 0000-0001-8117-1845/ Semih YILMAZ Orcid ID: 0000-0001-6774-1047*
*Cansel CUMBUR Orcid ID: 0000-0007-7479-2093/ Goktuğ ŞANLI Orcid ID: 0000-0002-6524-9128/ Zeynep BOZDOĞAN KURT Orcid ID: 0000-0001-8710-2525*
*Fatih SANİ Orcid ID: 0000-0002-7437-7420/ Nejla GERÇEK Orcid ID: 0000-0002-0845-0394/ Nusret RAMAZANOGLU Orcid ID: 0000-0002-8056-8194*

**Serbest Stil Yüzmede Takla Dönüşleri Sırasındaki Yatay İtiş ve Karada Yapılan Dikey Sıçrama Arasındaki İlişkinin İncelenmesi**

**Özet**

Bu çalışmanın amacı, serbest stil yüzme tekniğinde takla dönüşü sırasında havuz duvarına karşı yapılan yatay itiş ile karada yapılan dikey sıçrama performansı arasındaki ilişkiyi araştırmaktır. Çalışmaya en az dört yıllık yüzme antrenman deneyimi olan 21 genç erkek yüzücü (yaş:15.7±1.53 yıl; boy:176.3±7.07 cm; vücut ağırlığı:63.7±7.61 kg) dahil edilmiştir. Bu çalışmada yüzücüler karada ve suda test edilmiştir. Karada dikey sıçrama performansını incelemek için countermovement-jump ve drop-jump (25 cm yükseklik) testleri yapılmıştır. Havuz testlerinde, 20 m, 25 m ve takla dönüşünden sonraki 5 m yüzme süreleri kaydedilmiştir. Karadaki ve sudaki performans arasındaki ilişki Pearson Korelasyon Testi kullanılarak analiz edilmiştir. Tuck indeksi ile drop jump yüksekliği arasında anlamlı bir ilişki bulunmuştur ($p<0,05$). Tuck indeks açısı, 25 m yüzme süresi ve dönüşten önceki son 5 m'deki ortalama hız arasında güçlü bir pozitif korelasyon bulunmuştur ($p<0,05$). Sonuç olarak, dikey sıçrama antrenmanının ve kara antrenmanının artırılmasının yüzme performansını da artırabileceği tespit edilmiştir. Yüzme antrenörlerinin antrenman programlarına karada alt ekstremite dikey kuvvet antrenmanı egzersizlerini dahil etmeleri önerilmektedir.

**Anahtar Kelimeler:** İvmelenme, Tuck indeksi, Countermovement-jump, Drop jump, Plyometric jump

## INTRODUCTION

Swimming races are examined under the following four main headings: start, clean swim, turn and finish (23, 25). The push-off or wall contact during the turn phase plays a direct role in determining the speed at which the swimmer leaves the wall (6, 37). The most preferred turning technique in freestyle swimming is the tumble turn. The tumble turn phase consists of five stages: wall approach, tumble, wall contact, wall push-off, and underwater phase (31). The underwater phase divided into two phases: the glide and the underwater propulsion phase (30, 32, 20). According to the results of Lyttle et al's (19) study, there is an effective time saving in turns by using the wall push-off and glide phases. Previous literature has reported that turns account for up to 30-56% of the race and that turn times affect the performance of the race (3, 38).

Well-developed muscles and muscular strength play an important role in the development of swimming performance (7). Maximal explosive muscle strength of the lower extremities is one of the important parameters affecting athletic performance (40). The progression of the swimmer's speed in freestyle is also related to the improvement of the swimmer's strength to push-off during the turns. Therefore, determining the lower extremity strength and preparing the training programs of the athletes in this direction is of great importance in terms of increasing athletic performance (16).

Studies have reported that effective and coordinated work of arm stroking, leg kicking, and trunk movements increase the propulsive force (10, 28). Although it has been demonstrated that swimmers' start and turning abilities increase with the increase in leg extensor muscle strength, it is recommended for swimming coaches to give priority to strength training during their training sessions (12). In order to improve swimming performance with strength training, there must be a well-planned combination between applied swimming training and dryland training (34). Born et al. (3) reported an increase in total turn time, measured from 5 to 10 meters after pushing off the wall, as the race distance increases. This increase in turn time also corresponds to a greater contribution to the overall swim time.

The start and the first 15 m start time influence the finish times of the race (27). Similarly, turns in swimming are important in determining the outcome of the swimming competition; the improvement of the turns has an effect on the shortening of the swimmer's final time (26). It has been reported that improving the turn technique to an excellent level can lead to a reduction of 0.20 s per turn in competitions (21).

Fifty-meter freestyle swimming is based on anaerobic power generation system, which requires a high level of strength and speed (4, 14). The start strategy in swimming competitions is characterized by the athlete moving away from the starting block as quickly as possible and with the greatest possible acceleration. Therefore, the departure from the starting block can be viewed as an explosive event with a motion pattern that requires high power generation for a short period of time (29). In a study, a significant correlation between swimmers' lower extremity strength and output performance indicated (17). Vertical jump performance is associated with grab, swing, track start (1) and kick start (2, 23). The link mechanisms between strength and

output performance (e.g., power) are naturally multifactorial. Strength or maximum force production is an important component of sprint swimming. West et al. (39) revealed that lower extremity strength, maximum vertical strength, and maximum horizontal strength have an important role in power production at the beginning of swimming. Leg strength is as important in the start technique as it is in turning technique in water.

The vertical jump test is an easy test for both trainers and athletes in terms of applicability. Land exercises are generally aimed at increasing the leg strength of an athlete. The increase in leg strength, especially the strengthening of the knee extensor muscles, positively affects the vertical jump (9, 33). It is thought that the vertical jump and plyometric exercises performed on land will affect the acceleration of the tumble turn in water and the initial acceleration after the turn. Therefore, in this study, the aim is to examine the relationship between horizontal push-off against the wall and land-based vertical jump performance in freestyle tumble turn technique.

## METHOD

### Research Model

This research is carried out using experimental study design to determine the relationship between tumble turn kinematics and jumping performance.

### Characteristics of the subjects

Twenty-one male swimmers (age: 15.7±1.53 years; height: 176.3±7.07 cm; weight: 63.7±7.61 kg; BMI: 20.52±1.49), who have 4 years of training experience and have been performing swimming training for 6 days a week, were participated in the study.

### Ethical approval and institutional permission

This study was evaluated with the protocol code of 09.2019.115 from Marmara University Faculty of Medicine, Clinical Research Ethics Committee. Informed consent to the experimental procedure was obtained from the participants before the beginning of the study as required by the Helsinki declaration (1964).

### Procedures

Warm-up protocol: Before starting the tests, a warm-up protocol was applied to all swimmers on land and in water. After 10 minutes exercise on land (cross-runs, short sprints, heel and toe walking, squat, etc.), they swam 100 m freestyle in the pool.

Countermovement jump (CMJ): The participants were asked to bend their knees, not exceeding 90 degrees, and jump as high as possible from this position, while the body was in an upright position on the force platform, with their feet bare and shoulder-width apart and hands at their waist. This test was repeated three times, a rest period of 15 seconds was given between the repetitions, and the average of the three repetitions was recorded as the countermovement jump value.

Drop jump (DJ) from a 25 cm height: The participants, ready by standing upright on the 25 cm high springboard, with their feet bare and shoulder-width apart, were asked to land on the force platform in front of them with both feet, jump after falling and land on the force platform again. This test was repeated three times, a rest period of 15 seconds was given between the repetitions, and the average of the three repetitions was recorded as the drop-jump value (from a 25 cm height). Dryland tests of countermovement jump and drop-jump from 25 cm were measured using the Tekscan MatScan® System force platform (Boston, USA).

In order to detect the acceleration during the vertical jump, the accelerometer (Xsens, Technologies B. V. Netherlands) sensor was placed in a waterproof case and fixed to the lumbar region of the participants with the help of an elastic band. Data from Xsens system were recorded at a sample frequency of 100 Hz. After the vertical jump tests were completed, in-water measurements were recorded.

For the in-water tests, the participants were asked to swim freestyle in a 25 m pool at 50 m race pace and maintain this pace until the 10th meter after tumble turn. Participants were asked to use track start technique and starts were performed in accordance with the international competition protocols.

The 20 m, 25 m, and 5 m (before and after tumble turn) swimming times of the freestyle-swimming participant were determined with a hand chronometer, and the tumble turns were recorded with the GoPro Hero 6 (GoPro®, Inc, , CA). The last 5 m average speed before the turn, 5 m average speed and 25 m average speed after the turn, tuck index (distance between the hip and the pool wall during the turn), and knee joint flexion angle during the turns were recorded and calculated with the recorded time and image data. The acceleration created by the participants in the horizontal plane after the tumble turn was recorded triaxially (x, y, z) with Xsens, which was also used during the vertical jump tests, and calculations were made with the obtained data.

**Data analysis**

Three-axis data obtained from the Xsens accelerometer placed in the lumbar region of the participants were normalized with the formula =√ax2 + ay2 + az2 and calculated as combined acceleration. Evaluations were made based on combined acceleration (18).

Reactive strength index (RSI) from 25-cm drop jump (DJ) data were calculated using the following formulas: (RSI = leap height/ground contact time) and leap height = (0.00980665*(airtime/2)2) /2.

**Statistical analysis**

The first step was to assess the normality of distribution of the variables using the Shapiro-Wilk test ($p < 0.05$). Data were normally distributed. The relationship between drop-jump contact time, drop-jump hover time, drop-jump height, drop-jump reactive strength index (RSI), countermovement-jump average time, countermovement-jump height, turn acceleration, last 5 m average speed, last 5m average turn speed, and 25 m average speed were evaluated by using the Pearson Correlation test.

## FINDINGS

Descriptive statistics of on land and in-water test results were shown on Table 1 and Table 2.

**Table 1.** On land test results

| N=21 | Drop Jump | Countermovement Jump |
|---|---|---|
| | **Mean±SD** | **Mean±SD** |
| **Hang time (s)** | 466.01±90.24 | 512.38±62.53 |
| **Height (cm)** | 40.71±8.40 | 32.63±7.83 |
| **Knee flexion angle (º)** | 80.37±8.48 | 83.43±9.91 |
| **Acceleration (m/s²)** | 3.28±0.89 | 4.27±2.03 |
| **Reactive strength index (m/s)** | 0.477±0.108 | ---- |
| **Time on ground during landing (s)** | 530.85±59.82 | ---- |

CMJ: Countermovement Jump; DJ: Drop Jump

On land drop jump and countermovement jump test kinematic parameters' mean and standard deviations are shown in the table above (Table 1).

**Table 2.** In-water test results

| N=21 | Tumble Turn |
|---|---|
| | **Mean±SD** |
| **25 m swimming time (s)** | 13.16±0.62 |
| **Time of the last 5 m before turn (s)** | 3.419±0.19 |
| **Time of the first 5 m after turn (s)** | 2.404±0.44 |
| **25 m average speed (m/s)** | 1.81±0.40 |
| **Average speed of the last 5 m before turn (m/s)** | 1.46±0.07 |
| **Average speed of the first 5 m after turn (m/s)** | 2.08±0.27 |
| **Tuck index (cm)** | 70.50±11.57 |
| **Turn acceleration (m/sn²)** | 1.88±0.25 |

In water tumble turn test kinematic parameters' mean and standard deviations are shown in the table above (Table 2).

**Table 3.** The relationship between the tumble turn data and, on-land and in-water test results

| | N=21 | r | p |
|---|---|---|---|
| **Turn acceleration (m/s²)** | **25 m swimming time (s)** | -.597** | .003 |
| | **DJ reactive strength index (m/s)** | .445* | .025 |
| | **DJ acceleration (m/s²)** | .560** | .006 |
| | **CMJ height (cm)** | .548** | .006 |
| | **CMJ knee flexion angle (º)** | .543** | .010 |
| | **CMJ acceleration (m/s²)** | .795** | .000 |
| | **Tuck index (cm)** | -.781** | .000 |
| | **Average speed of the last 5 m before turn (m/s)** | .563** | .005 |

CMJ: Countermovement Jump; DJ: Drop Jump; *: p< 0.01, **: p<0.05

Pearson correlation tests showed that tumble turn acceleration was correlated with 25 m swimming performance and both on land and in water test kinematic parameters (r= 445-781; p<0.05) (Table 3).

**Table 4.** The relationship between tuck index and, on-land and in-water test parameters

| | N=21 | r | p |
|---|---|---|---|
| **Tuck Index (cm)** | **25 m swimming time (s)** | .589** | 0.00 |
| | **DJ height (cm)** | -.374* | .048 |
| | **DJ reactive strength index (m/s)** | -.449* | .011 |
| | **DJ acceleration (m/sn²)** | -.734** | .000 |
| | **CMJ height (cm)** | -.513** | .009 |
| | **CMJ acceleration (m/s²)** | -.676** | .000 |
| | **Turn acceleration (m/s²)** | -.781** | .000 |
| | **Average speed of the last 5 m before turn (m/s)** | -.425* | .020 |
| | **Average speed of the first 5 m after turn (m/s)** | .512** | .009 |

CMJ: Countermovement Jump; DJ: Drop Jump; *: p< 0.01, **: p<0.05

Pearson correlation tests showed that tuck index was correlated with 25 m swimming performance and both on land and in water test kinematic parameters (r= 374-781; p<0.05) (Table 4).

## DISCUSSION AND CONCLUSION

This study was conducted to determine the relationship between the horizontal push-off during a tumble turn in the water and land-based vertical jump performance. Jumping is an important performance determinant in swimming. In addition, it is known to be a valid ability identification mark that has the potential to distinguish between elite and non-elite athletes (24). In the present study, the CMJ height, CMJ and DJ acceleration, and DJ reactive strength index increased the turn acceleration and thus positively influenced swimming performance. Also, increasing the average swimming speed in the 5 m before the turn increased the turn acceleration. Furthermore, decrease in the turn acceleration also decreased the tuck index. The increase in DJ height, acceleration, reactive strength index and CMJ height and acceleration decreased the tuck index, indicating that tuck index is decreased in swimmers with greater leg power. Similarly, the fact that the increase in tuck index increased the 25 m swim time suggests that the tuck index should be decreased by increasing leg power to improve performance.

Turn performance in swimming contributed up to 30-56% of the total race time, with the effect on the performance remaining consistent as the race distance increased (3, 38). A similar effect of the turn performance was found in the present study, whereby an increase in turn acceleration resulted in a decrease in the 25 m swimming time. These findings has led researchers to investigate the kinetic and kinematic parameters that affect turning performance. In the literature, it has been reported that the lower extremity strength is an important predictor of turning and swimming performance (13, 15). A study by Jones et al. (13) revealed that elite swimmers demonstrated superior strength and power characteristics and better the swimming turn performance compared to less experienced swimmers. These findings indicated a very large differences which were evident in squat jump peak velocity (elite swimmers: 2.9±0.5 m.s-1, subelite swimmers: 2.3±0.2 m.s-1), suggesting that elite male swimmers with enhanced swimming turn abilities were 30-50% more powerful than subelite males. These results are similar to our findings in which a moderate to high correlation has been found between jump and turning performance (Table 3). However, in this study, the evaluation of

lower extremity power with a different jump test (squat jump) and the lack of correlation statistics between power and turn performance do not allow numerical comparison.

In another study by Keiner et al. (15), the relationships between lower extremity strength, jump performance, and swimming performance as well as start and turn performances were examined. They found that 1 RM squat strength (r= -0.54), SJ height (r=-0.65) and CMJ height (r=-0.75) has moderate to high correlation with turn time. In the present study the turn performance also found to have moderate to high correlations with both drop jump and CMJ parameters (Table 3) with a similar CMJ height (Keiner et al. CMJ : 32.93±7.00 cm; our study: 32.63±7.83 cm). The positive correlations that has been found in the present study between turn and jump performances is consistent with the results of the aforementioned study.

In the light of the data obtained in this study, a significant relationship was found between the turn acceleration, the vertical jump height and the drop jump reactive strength index (RSI). Therefore, it is thought that the vertical jump and plyometric exercises performed in land training will affect the acceleration of the turning in the water and the initial acceleration after the turn. Although the number of turns in the short course competitions vary according to the branches, the fact that it is three times more than the long course reveals the importance of the turn acceleration and the high average speed in the first 5 meters after the turn. The swimmers' ability to demonstrate these characteristics suggests that a training program incorporating leg power exercises can be efficient for improving turning performance. Studies by Hermosilla et al. (11) and Jones et al. (13), Sammoud et al. (34), Canas et al. (5) that shows lower extremity strength training improves turning and swimming performance also supports this suggestion. Furthermore, In the study conducted by Yapıcı and Cengiz (40), a relationship was found between 50 meters swimming time and 30 meters sprint time on land (40). It was stated that in order to swim 50 meters fast, one must be also fast on land. The correlation of the test results measured on land and in water in their study is similar to our study in terms of the correlation between power test results on land and in water. Moreover, in addition to enhancing jump performance, the tuck index, which is the angular degree of the lower extremity during the turn, was found to improve both turn performance and 25 m swimming time.

Puel et al. (31) reported that when the phases of the turn technique in freestyle swimming were evaluated, the important factors were found to be wall approach, tumble, wall contact, push-off, and glide. They reported that the performance of the turn increases when a higher horizontal force is created during the push-off phase of the tumble turn (31). In the light of the findings of the present study, the significant relationship between the turn acceleration, tuck index and the drop jump and CMJ performance, and the average speed of the first 5 m after the turn is in parallel with their data. Furthermore, Nichol et al. (26) found that the average speed of approaching the wall, especially 5 m before the wall, has strong positive correlation (r=0.854) with male swimmers' freestyle total turn time (26). We also found that turn acceleration has moderate correlation with the average speed of the last 5 m before turn (r=0.563). Born et al. (3) also reported that in freestyle tumble turns, the last 5m times approaching the wall were correlated with faster swimming velocities, based on the results obtained from the 2019 European Short Course Swimming Championships. These results show that faster male swimmer are able to perform better turn and swimming performance. Additionally, they also stated that the 5m gliding time after the wall push-off is correlated with turn and swim performance. In our study, the average speed of the first 5 m after the turn was not found to be correlated with turn acceleration. In addition, the time for the last 5 m before the turn found to be 2.29-2.93 seconds (3, 25) which is lower than our results. It has been found that gliding phase after push-off is mainly determined by the horizontal force applied to the wall (26, 35) and the elite swimmers showed higher on-wall force production than sub-elite swimmers (13). As the swimmers in the aforementioned studies has higher level of swimming experience (i.e., European championship competitors, Olympics, or World Championships), this may have caused the results to be different.

In the light of the data obtained in this study, a significant relationship was found between the turn acceleration, the vertical jump height and the calculated jump strength index (RSI). Therefore, it is thought that the vertical jump and plyometric exercises performed in land training will affect the acceleration of the turning in the water and the initial acceleration after the turn. Although the number of turns in the short course competitions vary according to the branches, the fact that it is three times more than the long course reveals the importance of the turn acceleration and the high average speed in the first 5 meters after the turn.

Weimar et al. (38) reported a speed of 1.90 m/s in water during a study that includes countermovement-style horizontal push movements both in and out of the water. It is thought that this propulsion speed from the wall is lower than the first 5 m speed after the turn in this study due to the arrival speed to the wall.

During turn execution, feet depth and tuck index are critical kinematic parameters that influence turn quality. Therefore, it is essential to analyze the effect of these variables on the characteristics of the turn (36). In the present study, it has been found that there is a negative correlation between the tuck index and the turn acceleration during tumble turn. In the study by David et al. (8) no significant relationship was found between the tuck index and the 5m time after the tumble turn, which is inconsistent with the results of the present study. In this study, we have found that swimmers who tucks from a longer distance from the wall achieve faster average speed of the first 5 m after turn (Table 4). Longer wall distance during tuck, which means less range of knee joint angle, reduces the time to extent lower limbs and swimmers turn further away from the wall, thus have to cover a shorter distance (8). But, the longer the tuck index increased 25 m swim time. This can be due to the fact that there is also gliding and stroking phases during 25 m swim which may affect the swim time. Whereas Skyriene et al. (36) reported a positive correlation between tuck index and swim time 7.5 m before the turn, which is in parallel showing that faster swimmers get closer to the wall before the tuck. Studies in the literature that consider the optimal Tuck Index to be around 0.7 (36). But, the tuck index in the present study is the distance of the hip from the wall, and it is not normalized to leg length as the aforementioned studies. Therefore, no numerical comparison could be conducted.

## CONCLUSIONS

It is found that there is a direct correlation between the vertical jump values obtained in this study and the horizontal push-off values during the tumble turn. Therefore, it is thought that improving the vertical jump performance will increase the horizontal propulsion performance in water. Vertical jumps that are made during on-land exercises will have a positive effect on horizontal push-off during in-water rotation or turn. It is recommended for swimming coaches to incorporate lower extremity vertical strength exercises to be performed on land into their athletes' daily training programs.

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# Examination of E-Learning Readiness Levels of University Students for Theoretical and Practical Courses

Hüdaverdi MAMAK [1A] Ahmet TEMEL [2B]

[1] *Niğde Ömer Halisdemir University, Sport Science Faculty, Recreation Department, Niğde, TÜRKİYE*
[2] *T.R. Ministry of National Education, Eskil 75. Years Anatolian High School, Aksaray, TÜRKİYE*
*Address Correspondence to Ahmet TEMEL: e-mail: dr.ahmettemel@gmail.con*


*Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*

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A: Orcid ID: 0000-0002-0842-5949 B: Orcid ID: 0000-0001-9215-6106

**Abstract**

This research was conducted to examine the e-learning readiness levels of university students who were subjected to distance education during the COVID-19 pandemic process regarding the theoretical and applied courses. The sample of the study consisted of 65 sports sciences faculty students studying in the spring semester of the 2020-2021 academic year. In the experimental study, students who took applied "athletics" and theoretical "sports sociology" courses formed the experimental group. The "Readiness for E-learning self-assessment scale" was used as data collection tool. Frequency, t tests, and Kruskal Wallis tests were used to analyze the data. According to the research findings, a positive increase was seen in the attitudes of university students with technology access, online relationships, online skills, technical skills, motivation, and the importance of success. The attitudes of the students who studied the theoretical "sociology of sports" course were high compared to those who took a meaningfully practical "athletics" course. As a result of the research; it was understood that attitudes towards distance education increased, there was no difference according to gender and it was more effective in theoretical course contents. In line with these results, it can be suggested that theoretical courses can be taught via distance education.

**Keywords:** E-learning, self-assessment, theoretical course, applied course, distance education.

**Üniversite Öğrencilerinin Teorik ve Uygulamalı Derslere Yönelik E-Öğrenmeye Hazırbulunuşluk Düzeylerinin İncelenmesi**

**Özet**

Bu araştırma, COVID-19 pandemisi sürecinde uzaktan eğitime tabi tutulan üniversite öğrencilerinin teorik ve uygulamalı derslere ilişkin e-öğrenmeye hazırbulunuşluk düzeylerinin incelenmesi amacıyla yapılmıştır. Araştırmanın örneklemini 2020-2021 eğitim-öğretim yılı bahar döneminde öğrenim gören 65 spor bilimleri fakültesi öğrencisi oluşturmuştur. Deneysel çalışmada deney grubunu uygulamalı "atletizm" ve teorik "spor sosyolojisi" derslerini alan öğrenciler oluşturmuştur. Veri toplama aracı olarak "E-öğrenmeye Hazırbulunuşluk Öz Değerlendirme Ölçeği" kullanılmıştır. Verilerin analizinde frekans, t testleri ve Kruskal Wallis testleri kullanılmıştır. Araştırma bulgularına göre üniversite öğrencilerinin teknolojiye erişim, çevrimiçi ilişkiler, çevrimiçi beceriler, teknik beceriler, motivasyon ve başarının önemi ile ilgili tutumlarında olumlu bir artış görüldü. Teorik "spor sosyolojisi" dersini alan öğrencilerin tutumları, anlamlı düzeyde uygulamalı "atletizm" dersini alan

öğrencilere göre daha yüksek çıkmıştır. Araştırma sonucunda; uzaktan eğitime yönelik tutumların arttığı, cinsiyete göre farklılık olmadığı ve teorik ders içeriklerinde daha etkili olduğu anlaşılmıştır. Bu sonuçlar doğrultusunda teorik derslerin uzaktan eğitim yoluyla işlenmesi önerilebilir.

**Anahtar Kelimeler:** E-öğrenme, öz değerlendirme, teorik ders, uygulamalı ders, uzaktan eğitim.

## INTRODUCTION

COVID-19 illness produced by the new type of coronavirus (SARS-CoV-2) emerged in Wuhan, China in December 2019. The virus, with a high transmission rate, has affected the whole world, especially European countries (31). In this process, to reduce the spread of infectious diseases in society by breaking the significant chains of transmission, the suggestions of educational institutions not to continue education face-to-face were considered. In this context, to reduce the spread of the COVID-19 pandemic, formal and non-formal education institutions in most countries have temporarily suspended education. T.R. Ministry of Health after their formal education in schools that had seen the first cases of coronavirus in Turkey on March 11, 2020 was closed temporarily as of March 25, 2020 on Thursday (16). While universities made their existing distance education systems available to all students during the coronavirus pandemic, educational institutions that did not have a distance education system tried to interchange with distance education by developing a new infrastructure. In this regard, primary, secondary, and higher education institutions completed the 2nd semester of the 2019-2020 academic year with the distance education model. The distance education method was used mainly for theoretical lessons in the term before the coronavirus pandemic. For this reason, while the theoretical lessons conducted after the pandemic can be easily performed; it has been a bit difficult to carry out in practical courses (18). With the decision of the senate, Niğde Ömer Halisdemir University decided to maintain the teaching with distance education in the 2020-2021 academic year.

Since education is a service that the state will provide fairly to all its citizens, it is an important process that must be continued without interruption. Especially in primary and secondary education where compulsory education is applied, different methods such as bussed education, boarding school or distance education can be used when educational institutions cannot be opened or when individuals cannot go to educational institutions. The easiest of these methods is the distance education model (18). Distance education is a model that requires a student-centered, independent learning and management culture based on information and communication technologies. Different information communication has to take place between students, teachers, administrators and even technical staff. The success of a student in face-to-face education does not mean that he/she will be successful in the distance education process. Internet-based distance education has started to become widespread recently, and many experts have begun to question whether or not distance learning students are prepared to be successful in this ambiance (29).

Distance education is an innovative education model that is independent of time and place, and entirely carried out in virtual environments, where students and teachers do not have to be together. Distance education can be used for all education levels (11, 28). In this education model, students and teachers are not in the same environment. Learning and teaching activities can be carried out with tools such as classical postal services and communication technologies (17). Lessons conducted with distance education can be conducted interactively or without interaction. When the lessons are conducted interactively, the students and the teacher can make live questions and answers with each other in the virtual class environment. When the lessons are conducted without interaction, the student can access the lessons from anywhere, anytime, and use the course materials such as video and audio recording previously uploaded to the system (25). Distance education has become a part of the current education system in the current period. Distance education enables teachers to transfer information to students and was brought in a position to support the development of students by all stakeholders (23). Soon, it is thought that distance education will become the main body of education rather than an alternative or supportive role to face-to-face education (27).

There is much research in the literature that examines students' views on distance education. Doğan & Tatık (10) stated in their research that students' views were mostly negative about distance education. The students stated that they were not technologically supported by their teachers and they could not receive feedback on their learning. In another study, Barış (4) stated that students who have access to computers and the internet have more favorable attitudes toward distance education compared to students who do not.

When the studies on different disciplines are examined; Serçemeli & Kurnaz (25) determined that although students studying accounting did not have any problems in using distance education, they did not adopt distance education much. Re-watching video recordings, saving time, and flexible education opportunities are considered positive aspects of distance education. It has been determined that distance education also includes problems such as not being able to access technological devices and teachers and feeling excluded from the social environment. When the studies in the field of sports sciences are examined, Aras & Karakaya (3) investigated the perspectives of instructors in the field of sports sciences on distance education. As a result, academicians have come to the view that distance education is not an choice to formal education but a complementary nature. They stated that it eliminates the disadvantages of especially national team athletes who cannot attend the classes. It has been important to increase the knowledge level of academicians in this education system, which is effective in teaching theoretical subjects.

Due to the continuation of the pandemic process, teaching will be continued with distance education. Based on this, it is aimed to investigate the level of e-learning readiness of students studying at the Faculty of Sports Sciences according to the theoretical and practical content of the course. When the literature is investigated, it is seen that distance education has benefits and damages. The most striking feature of these is that distance education is more applicable in theoretical courses (2-3, 13, 18, 21, 32). Aras & Karakaya (3) think that distance education is complementary to face-to-face education, and Telli & Altun (27) think that distance education can be an alternative to face-to-face education. Studies in the literature have been conducted using scanning or qualitative methods. It is thought that the findings obtained from this experimental research will be important.

## METHOD

### Research Model

This research is a pre-test – post-test quasi-experimental model without control group (7). It is a research pattern that is frequently preferred in educational research and where it is not possible to equalize the participants (12). The experimental groups consisted of 3rd grade students of physical education teaching who took sports sociology course and 3rd grade students of the coaching education department who took athletics course. The experiment process lasted 14 weeks depending on the academic calendar. The lessons were conducted interactively on the "Microsoft Teams" platform.

### Research Group

The students who attended the "athletics" course, conducted practically at the undergraduate level, and the "sports sociology" course, conducted theoretically, were selected purposively. 65 students were included in the study conducted in the 2020-2021 spring semester. It is an appropriate experimental approach to have 30 individuals in research experimental groups (8). Since the experimental groups meet this criterion, the sample was found to be sufficient.

**Table 1.** Characteristics of the participants

| Variable | Sub categories | n | % | Total (n) |
|---|---|---|---|---|
| **Experimental group** | Practical course | 32 | 49.2 | 65 |
| | Theoretical course | 33 | 50.8 | |
| **Gender** | Male | 40 | 61.5 | |
| | Female | 25 | 38.5 | |
| **Licensed athlete** | Yes | 24 | 36.9 | |
| | No | 41 | 63.1 | |
| **Income rate** | Below 1100 TL | 28 | 43.1 | |
| | 1101 – 2400 TL | 20 | 30.8 | |
| | 2401 – 4500 TL | 13 | 20.0 | |
| | Over 4501 TL | 4 | 6.2 | |

### Data Collection Tools

In the research, knowledge form including socio-demographic characteristics and E-learning readiness scale were used.

**Readiness Self-Assessment Scale for E-Learning**

The scale developed by Watkins, Leigh, and Triner (30) was adapted to Turkish by Kalelioğlu and Baturay (19). The 25-item scale consisting of positive statements includes 6 dimensions in total. These are technology access, online relationships, online skills, technical skills, motivation, and the importance of success. While the scores that can be obtained from the scale based on the total score are 25-125, the average score varies between 1-5. Cronbach's alpha internal consistency coefficients of the scale were found as .80 for technology access, .78 for technical skills, .80 for online relationships, .84 for motivation, .75 for online skills, and .64 for the importance of success. The variance explained by the scale as a result of the eigenvalues of the factors is 61.54%. Scale factor loads range between .575 - .797.

**Collection of Data**

The work was started by the acquisition of an ethical report from the Scientific Research and Publication Ethics Committee of Niğde Ömer Halisdemir University University (DECISION-2020 / 12-04 dated 31.12.2020 and numbered 86837521-050.99-E.58969). The data were collected electronically by mail.

**Data Analysis**

Data was tested with reference values of -1.96 and +1.96 for normal distribution, which was loaded into the SPSS (Ver: 21.0) statistical package program (6). "Pre-test" (skewness .496; kurtosis - .614) and "post-test" (skewness .565; kurtosis -. 293) findings are compatible with normal distribution. While frequency, percentage, standard deviation, and arithmetic mean ($\bar{x}$) values were taken into account in the analysis of the data, the error level was determined as .05. Since the data showed a normal distribution, a t-test was used to compare the experimental groups. In the comparison of gender, the non-parametric Mann-Whitney U test was used since there were not 30 people in the groups. In addition to the normal distribution of the data, parametric tests provide more meaningful results if there are at least 30 people in the groups (9).

## FINDINGS

**Table 2.** E-learning readiness levels of students

| E-learning readiness scale | n | pre-test | | post-test | | t | p |
|---|---|---|---|---|---|---|---|
| | | $\bar{x}$ | sd | $\bar{x}$ | sd | | |
| **Technology access** | 65 | 3.261 | 0.741 | 3.323 | 0.716 | -2.824 | 0.006* |
| **Technical skills** | 65 | 3.123 | 1.053 | 3.476 | 0.776 | -5.204 | 0.000* |
| **Online relationships** | 65 | 4.372 | 0.437 | 4.553 | 0.380 | -5.227 | 0.000* |
| **Motivation** | 65 | 3.253 | 0.744 | 3.823 | 0.615 | -8.048 | 0.000* |
| **Online skills** | 65 | 3.276 | 0.898 | 3.882 | 0.599 | -7.792 | 0.000* |
| **The importance of success** | 65 | 3.220 | 0.948 | 3.694 | 0.699 | -6.440 | 0.000* |
| **E-learning readiness** | 65 | 3.452 | 0.717 | 3.830 | 0.524 | -7.941 | 0.000* |

While there is a positive attitude in the online relationships dimension in Table 2 pre-test findings, the students have a moderate attitude in the other dimension and the scale. In the post-test findings, attitudes increased significantly in all dimensions and throughout the scale. Students are moderate in technology accessibility. They have positive attitudes on motivation, good technical skills, online skills, the importance of success, and overall scale. They have a very good attitude towards online relationships.

**Table 3.** Comparison of e-learning readiness levels according to experimental groups

| | Experimental group | n | $\bar{x}$ | sd | t | p |
|---|---|---|---|---|---|---|
| **Pre-test** | Practical course | 32 | 3.515 | 0.710 | 0.691 | 0.492 |
| | Theoretical course | 33 | 3.391 | 0.729 | | |
| **Post-test** | Practical course | 32 | 3.690 | 0.600 | -2.182 | **0.033*** |
| | Theoretical course | 33 | 3.966 | 0.741 | | |
| **Difference** | Practical course | 32 | 0.175 | 0.033 | -4.893 | **0.000*** |
| | Theoretical course | 33 | 0.574 | 0.073 | | |

***p<0.05**

There is no difference in the scores of the student groups according to the pre-test conclusions (p>.49). There was a meaningful rise in the scores of the groups after the training provided (p <.03). When the groups

were compared with each other, the scores of the students who took courses with theoretical content were significantly higher than those who took lessons with applied content (p<.00).

**Table 4.** Comparison of e-learning readiness levels by gender

| Variable | Gender | n | Average rank | Rank sum | U | p |
|---|---|---|---|---|---|---|
| **Pre-test** | Male | 40 | 36.03 | 1441.00 | 379.00 | .102 |
| | Female | 25 | 28.16 | 704.00 | | |
| **Post-test** | Male | 40 | 35.45 | 1418.00 | 402.00 | .186 |
| | Female | 25 | 29.08 | 727.00 | | |
| **Difference** | Male | 40 | 31.23 | 1249.00 | 429.00 | .337 |
| | Female | 25 | 35.84 | 896.00 | | |

***p<0.05**

When Table 4 is investigated; according to the pre-test results, there is no difference in e-learning readiness attitudes according to gender (p>.10). At the end of the experiment, there was no significant change in attitudes according to gender within the group (p>.18). There was no meaningful change in the attitudes of students in the groups taking applied and theoretical courses (p>.33).

## DISCUSSION

Before the education, it was observed that the students were very good at the level of online relations and in other dimensions they were at medium and good levels. In general, students have a favorable attitude towards e-learning above the intermediate level. In the evaluation made after the spring term distance education courses, there was a favorable increase in students' attitudes. There was a favorable change in the students' attitudes towards the conduct of two different courses with distance education and the students benefited from the education at a good level. Teachers participating in Tekin's (26) study expressed a positive opinion by emphasizing the flexible, individual and learner-centered features of distance education. In distance education, teachers stated that they teach in a comfortable, fun, interesting, exciting and free environment. In addition, teachers also expressed negative opinions, emphasizing the shortcomings of distance education, such as limited communication and interaction, and the passive role of the participants (26). Keskin & Özer Kaya (21) examined university students' views on web-based learning during the pandemic process. During this period, the time spent by students with technological devices increased 2 times. It is concluded that it has different effects for theoretical and practical courses. The majority of students defended that distance education is not as efficient as face-to-face education. In addition, although students claim that they can learn at their own pace during this education process, they stated that the permanence of this is not at a good level. Similar to the results of this study, there was a positive rise in the attitudes of the students who participated in our study. Still, the students' attitudes are not very well. This situation shows that distance education may have limits. It is thought that the limitations may arise from the quality and content of the courses. Since the practical courses are skill-based, the targeted skill will not develop with distance education. Considering that the self-awareness of university students may be high, it is normal for them not to create a positive attitude towards an educational approach where their skill level is not developed.

The attitudes of the students were similar in the test results before the experiment process. After the training, there was a favorable change in the attitudes of the students in both experimental groups. Especially, there was a significant increase in the attitudes of the students who took "sports sociology" course with a theoretical content. With the presentation of rich data sources to students, it has been shown that distance education has positive impacts on the learning of theoretical lessons. In the study of Keskin & Özer Kaya (21), while the theoretical knowledge level of the students increased at a moderate level with distance education, less improvement occurred in their knowledge based on professional practice skills. Keser & Karahoca (20) argued that engineering students successfully continue their project preparation course through distance education. Gürsul & Keser (15) found that university students studying mathematics online are more successful than those who receive face-to-face education in terms of task sharing, problem-solving, cooperation, and solution cooperation. Metin et al., (22) found that foreign language education through distance education was not beneficial for university students. In the study managed by Barış (4) with university students, the perspectives of students studying in health and technical sciences, including applied education, towards distance education are negative. In a study they conducted on the students studying at a

vocational school, Gömleksiz & Pullu (13) stated that while theoretical courses are beneficial in distance education, field and applied courses are not appropriate. In Yıldız's (32) study, university students, who continue their education with distance education during the pandemic process, achieve the purpose in the teaching of theoretical courses, while the same is not the case for practical courses. The inability to provide materials in applied courses where distance education is provided is an important problem. Due to the restrictions imposed by the COVID-19 outbreak measures, it has become difficult for students to obtain course materials. However, since the ban on going out is not always an event, it will not always be an obstacle to prevent distance education. For example, it is very difficult for students of chemistry or biology departments to collect experimental setup and equipment at home. Therefore, every applied course will not be able to be continued with distance education (18). In the research Altun Ekiz (2) conducted with students of physical education and sports schools, students welcomed the continuation of education during the pandemic process. However, they stated that this educational scope is more suitable for theoretical courses. Bayram et al., (5) found that health school students' attitudes towards the benefits of distance education were higher than physical education and sports school students. Aktaş et al., (1) in their study with students studying in sports sciences, concluded that the exams conducted with the distance education system did not rise their proficiencies, but the lecturers supported the students in this process. Three quarters of the students stated that if they were not in the isolation process, they would not prefer distance education. It is observed that sports science students who receive applied education are prone to face-to-face education. Unlike the literature, it can be said that the students participating in the research are prone to learning for both contents. Still, the study findings showed that attitudes in theoretical education are at a more positive level.

In our research pre-test findings, no significant difference was found in terms of gender, and the same situation was maintained at the end of the training process. There has been a positive increase in the attitudes of male and female university students towards e-learning. Although the scores of male students were high, the scores of women increased more after the training. Rather than gender in distance education, the variables such as the content of the course and students' having technology are important in success. Therefore, there are no significant differences of opinion in examining the attitudes of university students towards distance education (4, 14, 24). There is also a study that argues that female students have a more favorable attitude (5). Similar to these results, the scores of female students increased more in our study. All these results revealed that gender is not an important variable for distance education.

## CONCLUSION

As a result of the research; with the exposure of students to distance education, students evaluated the process positively and their e-learning readiness attitude increased. No meaningful difference was found in terms of gender regarding distance education. University students who took the "sports sociology" course, whose course content was theoretical, had more positive opinions about distance education. Based on these results, it seems that interactive distance education can be an alternative to face-to-face education in theoretical courses. Distance education is complementary to practical courses rather than being an alternative to face-to-face education. It is thought that the distance education process, which started during the COVID-19 pandemic process, will continue to increase its effectiveness in the Turkish education system.

## SUGGESTIONS

In this process, it is suggested that by determining the students' incomplete learning, if necessary, the negativities, can be eliminated via face-to-face training, and the study can be done on different samples and in multiple experimental groups. It is recommended that studies be conducted on different courses and larger samples to increase the generalizability of the findings of 65 students who attended two different courses.

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# Examining the Relationship Between Narcissistic Personality Traits and Self-Efficacy Levels of Volleyball Coaches

**Onur AKYÜZ** [1A]

[1] *Dicle University, School of Physical Education and Sports, Diyarbakır, TÜRKİYE*
*Address Correspondence to Onur AKYÜZ: e-mail: onurakyuz1986@gmail.com*


*Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*

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A: Orcid ID: 0000-0002-7631-460X

**Abstract**

This research aims to examine the narcissistic personality traits and self-efficacy levels of volleyball coaches in terms of different variables and to determine the relationship between these two variables. The sample group of this research consisted of a total of 277 volleyball coaches, 71 female and 206 male. Survey model was used in the research. Narcissistic Personality Inventory and Coach Competence Scale-II, along with the Personal Information Form, were used as data collection tools. According to the findings of the research, it was determined that the narcissistic personality traits and self-efficacy levels of volleyball coaches were above the medium level. It has been observed that the narcissistic personality traits of volleyball coaches do not differ according to gender, educational status, coaching year and coaching category variables. It was observed that the self-efficacy levels of volleyball coaches did not differ according to gender, educational status, coaching year, and coaching category variables. As a result, it was determined that there was a weak and positive relationship between narcissistic personality traits and self-efficacy levels of volleyball coaches.

**Keywords:** Volleyball Coach, Narcissism, Self-Efficacy

**Voleybol Antrenörlerinin Narsistik Kişilik Özellikleri ile Öz-Yeterlik Düzeyleri Arasındaki İlişkinin İncelenmesi**

**Özet**

Bu araştırmanın amacı voleybol antrenörlerinin narsistik kişilik özelliklerini ve öz-yeterlik düzeylerini farklı değişkenler açısından incelemek ve bu iki değişken arasındaki ilişkiyi belirlemektir. Araştırmanın örneklem grubunu 71'i kadın, 206'sı erkek olmak üzere toplam 277 voleybol antrenörü oluşturmuştur. Araştırmada tarama modeli kullanılmıştır. Veri toplama aracı olarak Narsistik Kişilik Envanteri ve Koç Yetkinlik Ölçeği-II ile Kişisel Bilgi Formu kullanılmıştır. Araştırmanın bulgularına göre voleybol antrenörlerinin narsistik kişilik özelliklerinin ve öz yeterlik düzeylerinin orta düzeyin üzerinde olduğu tespit edilmiştir. Voleybol antrenörlerinin narsistik kişilik özelliklerinin cinsiyet, eğitim durumu, antrenörlük yılı ve antrenörlük kategorisi değişkenlerine göre farklılık göstermediği görülmüştür. Voleybol antrenörlerinin öz yeterlik düzeylerinin cinsiyet, eğitim durumu, antrenörlük yılı ve antrenörlük kategorisi değişkenlerine göre farklılık göstermediği görülmüştür. Sonuç olarak voleybol

antrenörlerinin narsistik kişilik özellikleri ile öz yeterlik düzeyleri arasında zayıf ve pozitif bir ilişkinin olduğu tespit edilmiştir.

**Anahtar Kelimeler:** Voleybol Antrenörü, Narsisizm, Öz-yeterlik

## INTRODUCTION

Within the framework of sports, investigating the group or individual behavior of sports workers is a valuable and enlightening study. However, there are very few studies investigating the relationship between narcissistic personality traits and self-efficacy levels of volleyball coaches. In volleyball, the coach is one of the most important factors that uses his knowledge and experience for the profile of a high-performance athlete and uses this knowledge and experience for sports skills and purposes (20). Almost all coaches have characteristic features such as emotional intelligence, establishing and directing relationships, competence, personality, confidence and courage, which attract the attention of the athletes and regulate their perspective on life (7).

Narcissism, which has been discussed by many researchers, has been intensively discussed in two main structures: normal and pathological (22, 27, 35, 36). In light of all these discussions, there are findings that narcissism benefits the psychological health of the individual and may also have positive emotional consequences (16). Wallace and Baumeister (42) observed in their study that narcissists showed higher performance than other individuals in difficult and stressful tasks. The desire to overcome difficulties and the desire to improve oneself in order to be more successful than other individuals are important characteristics of narcissistic people (33). Narcissistic personality, which uses all kinds of tools to gain self-worth and increase this self-worth, also affects individuals in terms of motivation and gaining power (3). Kohut (26) saw narcissism as a factor in a healthy development process and stated that development could be healthier as a result of correcting the problems experienced in this process. It is stated that having a positive self-perception and gaining the ability to empathize and solve problems produces positive emotional results, which is beneficial for psychological health (2, 12). In light of this information, narcissism can be seen as a valuable and necessary need, unless it reaches dangerous levels. From another perspective, features such as social communication, motivation, competence, being a champion, courage, taking risks, proving oneself and self-confidence are valuable in the sports environment. Therefore, coaches with narcissistic personality traits may be effective in evaluating many opportunities and taking advantage of them in order to nourish these traits (8).

Self-efficacy theory; It argues that functional, emotional, motivational and cognitive processes are governed and controlled by individual beliefs (5). Findings obtained as a result of studies conducted in the literature show that a high level of self-efficacy is positively related to high motivation, high goal setting, positive self-esteem, mood and thoughts (38). If you look at it in the light of this information, the value of the coaches' self-efficacy levels will be more clearly understood.

External experiences and the individual's own perception of the outcome of many situations affect self-efficacy. Self-efficacy also significantly affects an individual's success and motivation. Studies argue that self-confidence is task-specific and contextual (6, 24). Individuals with strong self-efficacy believe in their ability to control the outcomes of events in their lives. This belief develops different perspectives in individuals with high self-efficacy levels compared to individuals with low self-efficacy levels. The reason for this is that this emotion has a direct effect on behavior. Therefore, self-efficacy can be a crucial factor in failure and success throughout an individual's life (28). Self-efficacy theory states that the individual's belief in his own abilities to achieve the goals he wants directs him to beneficial behaviors and motivates him to work extra hard (35). When the literature is examined, it is observed that as a result of the studies conducted on coaches, the performance of the teams of coaches with high self-efficacy increases and the team becomes more effective (4, 8, 11, 14, 15, 21, 25, 31, 32, 41).

Volleyball is one of the most followed and loved sports branches in our country, both due to the international successes and the increasing interest in sports day by day. Volleyball, played professionally on

the beach and in the hall, is an entertaining sport that can be played in almost every social environment by the public. In order for the volleyball sport, which has such a high level of interest, to become more successful and to move to a higher level in terms of quality, the education standards of the individuals working in this field need to be raised and more supported. The most prioritized among these individuals should be the coaches who assume the leadership role in the teams (11).

For this reason, examining the relationship between narcissistic personality traits and self-efficacy levels of volleyball coaches reveals that they will need to acquire a more democratic leadership style and reach a higher level of self-efficacy, and therefore more need for personal and professional training. From another perspective, these studies reveal new information to develop the training programs and models needed by volleyball coaches. The purpose of this research is to examine the relationship between narcissistic personality traits and self-efficacy levels of volleyball coaches.

## METHOD

### Model of the Research

This research was designed as a relational survey model, one of the quantitative research designs. With this research, narcissistic personality traits and self-efficacy levels of volleyball coaches were determined and it was revealed whether narcissistic personality traits and self-efficacy levels differ according to some demographic characteristics.

### Research Group

The population of the research consisted of volleyball coaches who were actively working within TVF (Turkish Volleyball Federation) in the 2022 - 2023 Volleyball season. The sample group consisted of a total of 277 volleyball coaches, 71 female and 206 male, who were within the research population and could be reached by the researcher. Subjects were selected by random sampling method.

**Table 1.** Findings on Demographic Variables of the Research Group

| Variables | Groups | n | % |
|---|---|---|---|
| **Educational Status** | High school | 35 | 12.6 |
| | University | 210 | 75.8 |
| | Postgraduate | 32 | 11.6 |
| | Total | 277 | 100 |
| **Gender** | Woman | 71 | 25.6 |
| | Male | 206 | 74.4 |
| | Total | 277 | 100 |
| **Coaching Year** | 1-5 Years | 66 | 23.9 |
| | 6-10 Years | 89 | 32.1 |
| | 11 years and above | 122 | 44.0 |
| | Total | 277 | 100 |
| **Coaching Category** | little ones | 51 | 18.4 |
| | Star Team | 76 | 27.4 |
| | Junior Team | 56 | 20.2 |
| | 2nd League | 51 | 18.4 |
| | 1st League | 27 | 9.7 |
| | League of Efes and Sultans | 16 | 5.8 |
| | Total | 277 | 100 |

When Table 1 is examined, the frequency and percentage distributions according to the descriptive statistics data of volleyball coaches are seen. According to the educational status variable, 12.6% (n=35) of the volleyball coaches participating in our research are high school graduates, 75.8% (n=210) are university graduates, and 11.6% (n=32) are postgraduates. According to gender, 25.6% (n=71) of the volleyball coaches included in our research are female and 74.4% (n=206) are male. According to the coaching year variable, 23.9% (n=66) of volleyball coaches have been working for 1-5 years, 32.1% (n=89) have been working for 6-10 years, and 44.0% (n=122) have been working for 11 years. He has been coaching for years and more. According to

the coaching category variable, 18.4% (n=51) of the volleyball coaches participating in the research are juniors, 27.4% (n=76) are stars, 20.2% (n=56) are youth team, 18% are junior volleyball coaches. 4 of them (n=51) stated that they were coaching in the 2nd League, 9.7% (n=27) in the 1st League and 5.8% (n=16) in the Efeler and Sultanlar League.

**Data Collection Tools**

Personal Information Form: In this form, the volleyball coaches participating in the research; It will include items regarding gender, coaching age, educational status and classification.

It was redeveloped as 16 questions by Ames, Rose and Anderson at Colombia University (1). Saim Atay (2) made the Turkish adaptation of the inventory in 2009 and found the Cronbach Alpha value of the inventory to be .627. The internal consistency coefficient of NKE-16, which was later adapted by Güngör and Selçuk (19) by making changes and corrections in some items, was recalculated as .74. In this study, the Cronbach's alpha value of the scale was calculated as .64.

The Coaching Self – Efficacy Scale-2: The scale developed by Feltz et al., in 1999 to measure the competence levels of coaches (14), was renewed and adapted by Myers et al., (32). The Coaching Self – Efficacy Scale-II, which was adapted to Turkish by Unutmaz and Gençer (39) by verifying its validity and reliability, includes physical condition (3 items), game strategies (4 items), motivation (4 items), character formation (3 items) and technique teaching (4 items), consists of a total of 18 items and 5 sub-dimensions. Participants answered all items of the scale with a 4-point Likert -type rating. There are no negative (reverse) items in the scale. Cronbach's alpha coefficient of the original form of the scale was calculated as .89. In our study, the Cronbach's alpha internal consistency coefficient of the scale is .88.

**Data Collection and Analysis**

Ethics committee approval was given for the research by Dicle University on 21.09.2021 with approval number 141169. The scales were prepared electronically and delivered to volleyball coaches via virtual network channels (e-mail, social media) during TVF's coach seminars held at TVF Facilities in Ankara in 2022 - 2023.

SPSS 22.00 package program was used in the analysis of research data. T-Test was used for the difference in means between two variables, ANOVA test was used for the comparison of three or more independent variables. Tukey and Scheffe Post Hoc tests were used to determine which groups the difference originated from. Pearson Correlation test was used to reveal the relationship between narcissistic personality traits of coaches and self-efficacy levels.

**RESULT**

**Table 2.** T-Test Results for the Narcissistic Personality Inventory (NCI) and its Sub-Dimensions According to the Gender Variable of the Research Group

**Table 2.** T-Test Results for the Narcissistic Personality Inventory (NCI) and its Sub-Dimensions According to the Gender Variable of the Research Group

| Scale and Sub-Dimensions | Gender | n | $\bar{X}$ | ss | T | df | p |
|---|---|---|---|---|---|---|---|
| **Superiority** | Female | 71 | 0.31 | 0.35 | 0.09 | 275 | 0.37 |
| | Male | 206 | 0.30 | 0.32 | | | |
| **Exhibitionism** | Female | 71 | 0.33 | 0.36 | 1.75 | 275 | 0.05 |
| | Male | 206 | 0.26 | 0.30 | | | |
| **Authority** | Female | 71 | 0.46 | 0.40 | 1.34 | 275 | 0.41 |
| | Male | 206 | 0.39 | 0.37 | | | |
| **Claiming Rights** | Female | 71 | 0.11 | 0.25 | 0.34 | 275 | 0.44 |
| | Male | 206 | 0.09 | 0.23 | | | |
| **Exploitativeness** | Female | 71 | 0.39 | 0.33 | 1.25 | 275 | **0.01**** |
| | Male | 206 | 0.34 | 0.28 | | | |
| **Self Sufficiency** | Female | 71 | 0.29 | 0.20 | -1.58 | 275 | 0.61 |
| | Male | 206 | 0.34 | 0.24 | | | |
| **Narcissistic Personality Inventory (Total)** | Female | 71 | 0.32 | 0.19 | 1.10 | 275 | 0.11 |
| | Male | 206 | 0.29 | 0.16 | | | |

*** p<0,01  * p<0.05*

Table 2 shows the T-Test results conducted to determine whether the narcissistic personality inventory and its sub-dimensions differ according to gender. According to the applied t-test, it was determined that the average scores of the volleyball coaches on the "Narcissistic Personality Inventory" did not differ statistically according to the gender variable. As a result of the applied T test, while no significant difference was observed in the "Superiority, Exhibitionism, Authority, Assertiveness and Self-Sufficiency" sub-dimensions of the narcissistic personality inventory, the average scores of female coaches were statistically significantly higher than male coaches in the "Exploitativeness" sub-dimension. It has been determined that.

**Table 3.** T-Test Results for the Coaching Self – Efficacy Scale -II and its Sub-Dimensions According to the Gender Variable of the Research Group

| Scale and Sub-Dimensions | Gender | n | $\bar{X}$ | ss | T | df | p |
|---|---|---|---|---|---|---|---|
| **Physical Condition** | Female | 71 | 3.36 | 0.54 | -0.48 | 275 | 0.75 |
| | Male | 206 | 3.39 | 0.53 | | | |
| **Game Strategies** | Female | 71 | 3.27 | 0.51 | -2.31 | 275 | 0.42 |
| | Male | 206 | 3.42 | 0.45 | | | |
| **Motivation** | Female | 71 | 3.48 | 0.42 | -0.79 | 275 | 0.24 |
| | Male | 206 | 3.52 | 0.41 | | | |
| **Character Creation** | Female | 71 | 3.73 | 0.38 | 0.02 | 275 | 0.69 |
| | Male | 206 | 3.73 | 0.37 | | | |
| **Technical Education** | Female | 71 | 3.59 | 0.39 | -0.10 | 275 | 0.69 |
| | Male | 206 | 3.60 | 0.39 | | | |
| **Competency Scale (Total)** | Female | 71 | 3.48 | 0.36 | -1.05 | 275 | 0.47 |
| | Male | 206 | 3.53 | 0.34 | | | |

** p<0.05*

Table 3 includes the T test results performed to determine whether the Coaching Competence Scale - II and its sub-dimensions differ according to gender. According to the applied t-test, it was determined that the average scores of the volleyball coaches on the "Coaching Competency Scale - II" did not differ statistically according to the gender variable. As a result of the applied T test, it was determined that there was no significant difference in the average scores of volleyball coaches according to gender type in the "Physical Condition, Game Strategies, Motivation, Character Formation and Technical Teaching" sub-dimensions of the Coaching Competency Scale - II.

**Table 4.** ANOVA Results for the Narcissistic Personality Inventory (NCI) and its Sub-Dimensions According to the Educational Attainment Variable of the Research Group

| Scale and Sub-Dimensions | Educational Status | n | $\bar{X}$ | ss | f | p |
|---|---|---|---|---|---|---|
| **Superiority** | High school | 35 | 0.35 | 0.30 | | |
| | University | 210 | 0.30 | 0.33 | 0.82 | 0.44 |
| | Postgraduate | 32 | 0.25 | 0.33 | | |
| **Exhibitionism** | High school | 35 | 0.31 | 0.31 | | |
| | University | 210 | 0.29 | 0.32 | 1.91 | 0.15 |
| | Postgraduate | 32 | 0.18 | 0.27 | | |
| **Authority** | High school | 35 | 0.41 | 0.39 | | |
| | University | 210 | 0.41 | 0.37 | 0.04 | 0.97 |
| | Postgraduate | 32 | 0.39 | 0.40 | | |
| **Claiming Rights** | High school | 35 | 0.11 | 0.27 | | |
| | University | 210 | 0.10 | 0.23 | 0.20 | 0.82 |
| | Postgraduate | 32 | 0.08 | 0.18 | | |
| **Exploitativeness** | High school | 35 | 0.41 | 0.29 | | |
| | University | 210 | 0.34 | 0.30 | 0.78 | 0.46 |
| | Postgraduate | 32 | 0.38 | 0.31 | | |
| **Self Sufficiency** | High school | 35 | 0.35 | 0.21 | | |
| | University | 210 | 0.31 | 0.24 | 0.71 | 0.49 |
| | Postgraduate | 32 | 0.35 | 0.19 | | |
| **Narcissistic Personality Inventory (Total)** | High school | 35 | 0.33 | 0.16 | | |
| | University | 210 | 0.30 | 0.17 | 1.10 | 0.34 |
| | Postgraduate | 32 | 0.28 | 0.16 | | |

** p<0.05*

One-Way ANOVA results showing significant differences in the Narcissistic Personality Inventory and sub-dimensions of the scale regarding the educational level of the participating volleyball coaches; It was determined that there was no significant difference in the narcissistic personality inventory averages and sub-dimensions of the scale according to the educational level of the participating volleyball coaches (p>0.05).

**Table 5.** ANOVA Results for the Coaching Self – Efficacy Scale -II and its Sub-Dimensions According to the Educational Attainment Variable of the Research Group

| Scale and Sub-Dimensions | Educational Status | n | $\bar{X}$ | ss | f | p |
|---|---|---|---|---|---|---|
| **Physical Condition** | High school | 35 | 3.34 | 0.49 | 0.21 | 0.81 |
| | University | 210 | 3.38 | 0.52 | | |
| | Postgraduate | 32 | 3.43 | 0.61 | | |
| **Game Strategies** | High school | 35 | 3.46 | 0.52 | 0.78 | 0.46 |
| | University | 210 | 3.37 | 0.46 | | |
| | Postgraduate | 32 | 3.33 | 0.48 | | |
| **Motivation** | High school | 35 | 3.56 | 0.38 | 0.80 | 0.45 |
| | University | 210 | 3.52 | 0.42 | | |
| | Postgraduate | 32 | 3.44 | 0.43 | | |
| **Character Creation** | High school | 35 | 3.74 | 0.36 | 0.07 | 0.94 |
| | University | 210 | 3.72 | 0.38 | | |
| | Postgraduate | 32 | 3.74 | 0.33 | | |
| **Technical Education** | High school | 35 | 3.59 | 0.38 | 0.10 | 0.90 |
| | University | 210 | 3.59 | 0.39 | | |
| | Postgraduate | 32 | 3.63 | 0.40 | | |
| **Competency Scale (Total)** | High school | 35 | 3.54 | 0.35 | 0.12 | 0.89 |
| | University | 210 | 3.51 | 0.34 | | |
| | Postgraduate | 32 | 3.50 | 0.36 | | |

** p<0.05*

One-Way ANOVA results showing significant differences in the Coach Competency Scale - II and the sub-dimensions of the scale regarding the educational level of the participating volleyball coaches in Table 5; It was determined that there was no significant difference in the averages of the Coach Proficiency Scale-II and the sub-dimensions of the scale depending on the educational level of the participating volleyball coaches ($p>0.05$).

**Table 6.** ANOVA Results for the Narcissistic Personality Inventory (NCI) and its Sub-Dimensions According to the Coaching Year Variable of the Research Group

| Scale and Sub-Dimensions | Coaching Year | n | $\bar{X}$ | ss | f | p | Scheffe |
|---|---|---|---|---|---|---|---|
| **Superiority** | 1-5 Years (1) | 66 | 0.29 | 0.33 | 0.76 | 0.52 | |
| | 6-10 Years (2) | 89 | 0.34 | 0.35 | | | |
| | 11 years and above (3) | 122 | 0.28 | 0.31 | | | |
| **Exhibitionism** | 1-5 Years (1) | 66 | 0.34 | 0.33 | 2.50 | 0.06 | |
| | 6-10 Years (2) | 89 | 0.31 | 0.35 | | | |
| | 11 years and above (3) | 122 | 0.22 | 0.28 | | | |
| **Authority** | 1-5 Years (1) | 66 | 0.42 | 0.40 | 0.67 | 0.57 | |
| | 6-10 Years (2) | 89 | 0.43 | 0.36 | | | |
| | 11 years and above (3) | 122 | 0.39 | 0.37 | | | |
| **Claiming Rights** | 1-5 Years (1) | 66 | 0.13 | 0.28 | 2.31 | 0.08 | |
| | 6-10 Years (2) | 89 | 0.13 | 0.26 | | | |
| | 11 years and above (3) | 122 | 0.06 | 0.17 | | | |
| **Exploitativeness** | 1-5 Years (1) | 66 | 0.37 | 0.31 | 3.10 | 0.03* | **2-3** |
| | 6-10 Years (2) | 89 | 0.42 | 0.29 | | | |
| | 11 years and above (3) | 122 | 0.30 | 0.29 | | | |
| **Self Sufficiency** | 1-5 Years (1) | 66 | 0.28 | 0.24 | 1.11 | 0.35 | |
| | 6-10 Years (2) | 89 | 0.32 | 0.22 | | | |
| | 11 years and above (3) | 122 | 0.35 | 0.24 | | | |
| **Narcissistic Personality Inventory (Total)** | 1-5 Years (1) | 66 | 0.31 | 0.17 | 2.29 | 0.08 | |
| | 6-10 Years (2) | 89 | 0.33 | 0.18 | | | |
| | 11 years and above (3) | 122 | 0.27 | 0.15 | | | |

** p<0.05*

One-Way ANOVA showing significant differences in the Narcissistic Personality Inventory and sub-dimensions of the scale regarding the years of coaching of the participating volleyball coaches; It is observed that the average scores of the narcissistic personality inventory of the participating volleyball coaches do not differ at a statistically significant level according to the variable of years of coaching. No significant differentiation was determined in the sub- dimensions of the narcissistic personality questionnaire, "Superiority, Exhibitionism, Authority, Assertiveness and Self-Sufficiency". In the "Exploitativeness" sub-dimension of the narcissistic personality inventory, the average scores of those who have been coaching volleyball for 6-10 years are statistically significantly higher than those of volleyball coaches who have been coaching for 11 years or more ($p<0.05$).

**Table 7.** ANOVA Results for the Coaching Self – Efficacy Scale -II and its Sub-Dimensions According to the Coaching Year Variable of the Research Group

| Scale and Sub-Dimensions | Coaching Year | n | $\bar{X}$ | Ss | f | p |
|---|---|---|---|---|---|---|
| **Physical Condition** | 1-5 Years | 66 | 3.41 | 0.55 | 0.30 | 0.74 |
| | 6-10 Years | 89 | 3.40 | 0.50 | | |
| | 11 years and above | 122 | 3.36 | 0.54 | | |
| **Game Strategies** | 1-5 Years | 66 | 3.30 | 0.53 | 1.38 | 0.26 |
| | 6-10 Years | 89 | 3.38 | 0.47 | | |
| | 11 years and above | 122 | 3.42 | 0.44 | | |
| **Motivation** | 1-5 Years | 66 | 3.51 | 0.42 | 0.14 | 0.87 |
| | 6-10 Years | 89 | 3.53 | 0.46 | | |
| | 11 years and above | 122 | 3.50 | 0.39 | | |
| **Character Creation** | 1-5 Years | 66 | 3.73 | 0.37 | 0.25 | 0.78 |
| | 6-10 Years | 89 | 3.70 | 0.38 | | |
| | 11 years and above | 122 | 3.74 | 0.37 | | |
| **Technical Education** | 1-5 Years | 66 | 3.55 | 0.44 | 0.61 | 0.55 |
| | 6-10 Years | 89 | 3.61 | 0.38 | | |
| | 11 years and above | 122 | 3.61 | 0.38 | | |
| **Competency Scale (Total)** | 1-5 Years | 66 | 3.49 | 0.37 | 0.19 | 0.83 |
| | 6-10 Years | 89 | 3.52 | 0.35 | | |
| | 11 years and above | 122 | 3.52 | 0.33 | | |

** p<0.05*

Scale - II of the participant volleyball coaches' years of coaching and the One-Way test showing the significant difference in the sub-dimensions of the scale. According to ANOVA results; It was determined that there was no significant difference in the coach competency scale-II averages and sub-dimensions of the scale according to the years of coaching of the participating volleyball coaches (p>0.05).

**Table 8.** ANOVA Results for the Narcissistic Personality Inventory (NCI) and its Sub-Dimensions According to the Coaching Category Variable of the Research Group

| Scale and Sub-Dimensions | Coaching Category | n | $\bar{X}$ | Ss | f | p |
|---|---|---|---|---|---|---|
| Superiority | **Little ones** | 51 | 0.25 | 0.34 | 0.47 | 0.80 |
| | **Star Team** | 76 | 0.32 | 0.34 | | |
| | **Junior Team** | 56 | 0.33 | 0.32 | | |
| | **2nd League** | 51 | 0.28 | 0.32 | | |
| | **1st League** | 27 | 0.32 | 0.31 | | |
| | **League of Efes and Sultans** | 16 | 0.27 | 0.33 | | |
| Exhibitionism | **Little ones** | 51 | 0.35 | 0.36 | 1.60 | 0.16 |
| | **Star Team** | 76 | 0.25 | 0.29 | | |
| | **Junior Team** | 56 | 0.27 | 0.32 | | |
| | **2nd League** | 51 | 0.33 | 0.34 | | |
| | **1st League** | 27 | 0.20 | 0.27 | | |
| | **League of Efes and Sultans** | 16 | 0.19 | 0.27 | | |
| Authority | **Little ones** | 51 | 0.33 | 0.40 | 0.98 | 0.43 |
| | **Star Team** | 76 | 0.39 | 0.38 | | |
| | **Junior Team** | 56 | 0.38 | 0.37 | | |
| | **2nd League** | 51 | 0.48 | 0.37 | | |
| | **1st League** | 27 | 0.44 | 0.40 | | |
| | **League of Efes and Sultans** | 16 | 0.47 | 0.29 | | |
| Claiming Rights | **Little ones** | 51 | 0.12 | 0.28 | 0.98 | 0.43 |
| | **Star Team** | 76 | 0.08 | 0.20 | | |
| | **Junior Team** | 56 | 0.14 | 0.28 | | |
| | **2nd League** | 51 | 0.06 | 0.19 | | |
| | **1st League** | 27 | 0.11 | 0.21 | | |
| | **League of Efes and Sultans** | 16 | 0.06 | 0.17 | | |
| Exploitativeness | **Little ones** | 51 | 0.37 | 0.30 | 1.05 | 0.39 |
| | **Star Team** | 76 | 0.35 | 0.30 | | |
| | **Junior Team** | 56 | 0.38 | 0.31 | | |
| | **2nd League** | 51 | 0.41 | 0.32 | | |
| | **1st League** | 27 | 0.26 | 0.25 | | |
| | **League of Efes and Sultans** | 16 | 0.29 | 0.27 | | |
| Self Sufficiency | **Little ones** | 51 | 0.31 | 0.25 | 1.16 | 0.33 |
| | **Star Team** | 76 | 0.32 | 0.23 | | |
| | **Junior Team** | 56 | 0.35 | 0.24 | | |
| | **2nd League** | 51 | 0.27 | 0.24 | | |
| | **1st League** | 27 | 0.33 | 0.16 | | |
| | **League of Efes and Sultans** | 16 | 0.42 | 0.23 | | |
| Narcissistic Personality Inventory (Total) | **Little ones** | 51 | 0.30 | 0.17 | 0.27 | 0.93 |
| | **Star Team** | 76 | 0.29 | 0.16 | | |
| | **Junior Team** | 56 | 0.31 | 0.18 | | |
| | **2nd League** | 51 | 0.31 | 0.18 | | |
| | **1st League** | 27 | 0.28 | 0.14 | | |
| | **League of Efes and Sultans** | 16 | 0.29 | 0.16 | | |

** p<0.05*

In Table 8, according to the results of One-Way ANOVA showing significant differences in the sub-dimensions of the Narcissistic Personality Inventory and the scale regarding the category levels in which the participating volleyball coaches work; It was determined that there was no significant difference in the narcissistic personality inventory averages and sub-dimensions of the scale according to the educational level of the participating volleyball coaches (p>0.05).

**Table 9.** ANOVA Results for the Self – Efficacy Scale-II and its Sub-Dimensions According to the Coaching Category Variable of the Research Group

| Scale and Sub-Dimensions | Coaching Category | n | $\bar{X}$ | ss | F | p | tukey |
|---|---|---|---|---|---|---|---|
| **Physical Condition** | Little ones (1) | 51 | 3.33 | 0.56 | 1.64 | 0.15 | |
| | Star Team (2) | 76 | 3.33 | 0.52 | | | |
| | Junior Team (3) | 56 | 3.41 | 0.52 | | | |
| | 2nd League (4) | 51 | 3.33 | 0.54 | | | |
| | 1st League (5) | 27 | 3.48 | 0.51 | | | |
| | League of Efes and Sultans (6) | 16 | 3.69 | 0.45 | | | |
| **Game Strategies** | Little ones (1) | 51 | 3.21 | 0.51 | 2.80 | 0.02* | **5-1** |
| | Star Team (2) | 76 | 3.39 | 0.44 | | | |
| | Junior Team (3) | 56 | 3.42 | 0.49 | | | |
| | 2nd League (4) | 51 | 3.34 | 0.42 | | | |
| | 1st League (5) | 27 | 3.57 | 0.43 | | | |
| | League of Efes and Sultans (6) | 16 | 3.52 | 0.51 | | | |
| **Motivation** | Little ones (1) | 51 | 3.48 | 0.41 | 0.29 | 0.92 | |
| | Star Team (2) | 76 | 3.51 | 0.43 | | | |
| | Junior Team (3) | 56 | 3.55 | 0.43 | | | |
| | 2nd League (4) | 51 | 3.50 | 0.41 | | | |
| | 1st League (5) | 27 | 3.56 | 0.39 | | | |
| | League of Efes and Sultans (6) | 16 | 3.45 | 0.42 | | | |
| **Character Creation** | Little ones (1) | 51 | 3.76 | 0.37 | 0.69 | 0.63 | |
| | Star Team (2) | 76 | 3.75 | 0.41 | | | |
| | Junior Team (3) | 56 | 3.73 | 0.35 | | | |
| | 2nd League (4) | 51 | 3.65 | 0.38 | | | |
| | 1st League (5) | 27 | 3.78 | 0.32 | | | |
| | League of Efes and Sultans (6) | 16 | 3.67 | 0.34 | | | |
| **Technical Education** | Little ones (1) | 51 | 3.56 | 0.40 | 0.84 | 0.53 | |
| | Star Team (2) | 76 | 3.58 | 0.40 | | | |
| | Junior Team (3) | 56 | 3.59 | 0.38 | | | |
| | 2nd League (4) | 51 | 3.57 | 0.38 | | | |
| | 1st League (5) | 27 | 3.65 | 0.41 | | | |
| | League of Efes and Sultans (6) | 16 | 3.77 | 0.37 | | | |
| **Competency Scale (Total)** | Little ones (1) | 51 | 3.46 | 0.36 | 1.05 | 0.39 | |
| | Star Team (2) | 76 | 3.51 | 0.36 | | | |
| | Junior Team (3) | 56 | 3.54 | 0.35 | | | |
| | 2nd League (4) | 51 | 3.48 | 0.33 | | | |
| | 1st League (5) | 27 | 3.60 | 0.32 | | | |
| | League of Efes and Sultans (6) | 16 | 3.61 | 0.34 | | | |

** p<0.05*

One-Way ANOVA results showing significant differences in the Coach Competency Scale-II and sub-dimensions of the scale belonging to the category levels in which the participating volleyball coaches work; It is observed that the average scores of the coach competency scale-II of the participating volleyball coaches do not differ at a statistically significant level according to the category variable in which they work. No significant differentiation was determined in the "Physical Condition, Motivation, Character Formation, Technical Education" sub-dimensions of the narcissistic personality inventory. In the "Game Strategies" sub-dimension of the Coach Competency Scale -II, the average scores of volleyball coaches in the 1st League category are statistically significantly higher than those of volleyball coaches in the Junior category ($p<0.05$).

**Table 10.** Results of Simple Correlation Analysis Between Narcissistic Personality Traits and Self-Efficacy Levels of Volleyball Coaches

| | | **Narcissistic Personality Inventory** |
|---|---|---|
| **Competency Scale (Total)** | r | 0.20** |
| | p | 0.01 |

*** p<0.01*

Table 10 shows that there is a weak relationship between the Narcissistic Personality Inventory and the Coach Efficacy Scale-II, according to the responses of the volleyball coaches participating in the study to the scales.

**Discussion**

This study aimed to examine the relationship between the level of narcissistic personality traits and self-efficacy levels of coaches who are thought to have a high impact in volleyball. The study group consists of a total of 277 volleyball coaches, 71 of whom are female and 206 of whom are male, working in different categories (Minis, Stars, Youth, 1st League, 2nd League, Efeler and Sultans League). In this section, interpretations of the findings obtained from the research will be discussed and suggestions will be made regarding the results of the study.

In the study, it was determined that the narcissistic personality traits of volleyball coaches did not differ according to gender ($p>0.05$). However, it was observed that the average scores of female coaches in the exploitativeness sub-dimension of the narcissistic personality inventory were higher than those of male coaches ($p<0.05$). At this point, it is possible to say that female coaches develop their social skills in order to achieve their goals and gain appreciation.In their study where Cankurtaran and Berisha (8) examined the relationship between narcissistic personality traits and education levels of coaches, they found that female coaches obtained higher scores than male coaches in the exploitativeness sub-dimension. Rosenthal and Pittinsky (37) stated in their study that the average scores of male coaches in the assertion subscale were higher than those of female coaches. In the study, although the average narcissistic personality inventory scores of female volleyball coaches were high, studies conducted by Atay (2), Kiraz (23), Öngün and Demirağ (34) found that there was no significant difference between the gender variable and narcissistic personality tendency.

In the study, as a result of the statistical test performed in terms of the gender variable of volleyball coaches, it was determined that the coach competence levels did not differ ($p>0.05$). Coaching inherently involves leadership, and all coaches, male or female, have a normal level of narcissistic personality traits. Contrary to our study, the study conducted by Marback et al. (30) found that the competence levels of male coaches were lower than female coaches. In the study conducted by Cankurtaran and Berisha (8) on the narcissistic personality traits and competence levels of coaches, they observed that the competence averages of the coaches did not differ according to the gender variable, and this also supports our study.

Another finding obtained in the research was that narcissistic personality traits did not differ according to the education levels of volleyball coaches ($p>0.05$). This situation can be explained by the fact that the data were mostly obtained from individuals with a high level of education. In their study on narcissism in managers, Çoban and İrmiş (10) stated that managers with associate degree education have higher exhibitionism characteristics than managers with graduate and undergraduate education. Again, contrary to our study, Uzun (40) observed in his study that the assertion and superiority sub-dimensions of individuals with a university education level were higher than individuals with other education levels. In support of our

study, Atay (3) and Çakır (9) reported in their research that there was no significant difference between narcissistic personality traits and education level.

According to the findings obtained from the study, no statistically significant difference could be detected between the volleyball coaches' trainer self efficacy levels according to their education levels ($p>0.05$). This is thought to be due to the high level of education of the participating coaches and the fact that all of the coaches received the same training and became experts by the volleyball federation. Contrary to our study, Malete et al., (29) found in their study on the competence levels of coaches that there was a significant relationship between education and training and coaching competence. In their research with athletes, teams and coaches, Feltz et al. (15) determined that there was no statistically significant difference between the competency levels and education levels of the coaches. This study also supports our work.

In the study, a statistically significant difference is observed between the narcissistic personality traits of volleyball coaches and the years of coaching in the exploitative dimension of the narcissistic personality traits of volleyball coaches who have been working for 6-10 years and volleyball coaches who have been working for 11 or more years ($p<0.05$). It is thought that this is because individuals' ability to control their emotions becomes stronger with age. In Gülmez's study on narcissism in 2009, he found that there was a relationship between duration of experience and narcissistic personality (18). In their study on the narcissistic personality traits of coaches, Cankurtaran and Berisha (8) did not observe a statistical difference in the narcissism levels of the coaches according to the variable of years of experience, supporting our study.

In this study, no difference was observed between the coaching years and self efficacy levels of volleyball coaches ($p>0.05$). It is thought that this is because self-efficacy is a personal characteristic and coaching experience is not a determining factor on self-efficacy. In the study by Ermiş et al. (13), in which they investigated the self efficacy levels of tennis coaches, they stated that as the tenure of coaches increases, their self efficacy levels also increase. In support of our study, Dumangöz and Sanlav's (11) study on the professional self-efficacy of volleyball coaches found that the self-efficacy levels of the coaches did not differ in terms of the year of the experiment.

Another finding obtained in the research was that the narcissistic personality traits of volleyball coaches did not differ according to the category in which they worked ($p>0.05$). Contrary to our study, Cankurtaran and Berisha (8), in their study examining the narcissistic personality traits of coaches, found a statistically significant difference between the coaching levels of the coaches and their narcissistic personality traits. In Atay's study on the narcissistic personality traits and positions of managers, he found that middle-level managers had more narcissistic personality traits than upper-level managers in the exhibitionism sub-dimension, but in general, he did not observe a significant relationship between managers' positions and narcissistic personality traits (3). This result also supports our study.

In the study, no difference was observed between the category in which volleyball coaches worked and their self efficacy levels ($p>0.05$). Contrary to our study, Göral's (17) study titled "Examination of the Relationship Between the Efficacy of Football Coaches, Decision-Making Strategies and Team Performances" observed that as the ranks of the coaches increase, their competence levels also increase. In their study on volleyball coaches, Ateş and Ateş (4) determined that the self-efficacy levels of volleyball coaches did not differ statistically according to the coaching category, which supports our study. This study supports the result of the research.

As a result, it was determined that there was a weak, positive relationship between the narcissistic personality traits of volleyball coaches and their self-efficacy ranking. Although the relationship between the narcissistic personality traits of volleyball coaches and their self-efficacy level seems weak, self-efficacy, which is an important psychological feature in terms of narcissistic personality traits and self-efficacy management, should be increased and supported by sports psychologists and mental performance coaches. This research, which can be supported in the future, can provide more effective results by expanding the size of its order and observing different branch coaches. A more detailed examination in terms of many demographic characteristics will provide valuable information to the relevant field in terms of the relationship between narcissistic personality and self-efficacy. In addition, examining the narcissistic personality traits and self-

efficacy levels of coaches in terms of leadership styles will make important contributions to the literature and will make important contributions to the understanding of the personality traits of coaches.

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# The Effects of Different Strength Training Programs on Field Tests in Individuals Aged 18-20

Ali SAÇIKARA[1A], Mehmet KILIÇ [2B]

[1] *Sport Sciences, Independent Researcher, Turkey*
[2] *Selcuk University, Faculty of Sport Sciences, Konya, TÜRKİYE*
*Address Correspondence to Ali SAÇIKARA: e-mail: byali.sacikara@gmail.com*

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*Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*

**This study is based on the PhD thesis titled "The Effect of Different Strength Training on the Performance and Detraining Levels of Individuals in the 18-20 Age Group," published in 2024.*
*This study was presented as an abstract at the 6th International "Artemis" Congress on Health and Sports Sciences, held in Izmir from January 17-19, 2024.*

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A: Orcid ID: 0009-0004-3504-422X B: Orcid ID: 0000-0002-8917-9048

**Abstract**

This study examined the effects of different strength training programs applied over a 12-week period on various performance values in young individuals aged 18-20, as well as the performance values following a 1-month detraining period. The research involved 30 male volunteers studying at Selçuk University in Konya. After initial measurements, participants were randomly assigned to one of three groups: a control group (CG), a plyometric strength training group (PSTG), and a resistance band strength training group (RBSTG).

The training groups performed the prescribed 8 training modalities 3 days per week for 12 weeks, with 10 repetitions and 4 sets each session. Following the training period, post-tests were conducted and the detraining period began. After a 1-month detraining period, detraining tests were conducted, and statistical analyses were performed. Results were analyzed using SPSS (IBM SPSS Statistics 26). Mean and standard deviations for all variables were calculated. Differences within groups for pre-test, post-test, and detraining test measurements were assessed using 'Repeated Measures ANOVA'. Differences between groups for each period (pre-test, post-test, and detraining test) were determined using 'One-Way ANOVA'. To identify which group contributed to the differences, the "Duncan" post-hoc test was applied. A significance level of $P<0.05$ was considered statistically significant.

Significant differences were observed within the plyometric training group for aerobic power testing ($P<0.05$). In speed tests, the control group showed negative changes, while the training groups showed supportive improvements ($P<0.05$). Reaction tests revealed significant changes within the training groups ($P<0.05$). Between-group comparisons showed that the plyometric training group had statistically significant results in post-tests ($P<0.05$). In agility testing, significant changes were observed within the training groups, with the resistance band training group showing statistically significant results post-tests ($P<0.05$).

In conclusion, plyometric training is effective in improving aerobic capacity, while resistance band training shows limited impact. Furthermore, it highlights that the effects of these training methods may vary depending on individual factors such as age, gender, and training history.

**Keywords:** Detraining, Strength, Performance.

**Farklı Kuvvet Antrenmanlarının 18-20 Yaş Grubu Bireylerin Saha Testleri Üzerine Etkileri**

**Özet**

Bu çalışmada, 18-20 yaş arasındaki genç bireylerde farklı kuvvet antrenmanlarının 12 haftalık bir süre boyunca uygulanmasının antrenman sonrası bazı performans değerleri üzerindeki etkisi ve ardından 1 aylık detraining dönemi sonrası performans değerleri incelenmiştir. Araştırmaya, Konya Selçuk Üniversitesi'nde

öğrenim gören 30 erkek birey gönüllü olarak katılmıştır. Katılımcılar, ilk ölçümleri alındıktan sonra rastgele bir şekilde kontrol grubu (KG), pliometrik kuvvet antrenman grubu (PKAG) ve direnç lastiği kuvvet antrenman grubu (DLKAG) olmak üzere 3 gruba ayrıldı.

Antrenman grupları, belirlenen 8 antrenman şeklini ilk testlerin ardından haftada 3 gün boyunca 12 hafta boyunca 10 tekrar 4 set şeklinde uygulamıştır. Antrenman dönemi sona erdikten sonra son testler yapılmış ve detraining dönemine geçilmiştir. 1 aylık detraining dönemi sonrasında detraining testleri yapılarak istatistiksel analizler gerçekleştirilmiştir. Çalışmanın sonuçları, SPSS (IBM SPSS Statistics 26) paket programında değerlendirilmiştir. Tüm değişkenlere ait verilerin ortalama ve standart sapmaları hesaplanmıştır. Ön test, son test ve detraining test dönemlerinde alınan ölçümler için grup içindeki farklılığın belirlenmesinde, 'Tekrarlı Ölçümlerde Varyans Analizi' (Repeated Measures ANOVA) testi uygulanmıştır. Her bir dönem için (ön test, son test ve detraining test), gruplar arasındaki farklılığın belirlenmesinde ise 'Tek Yönlü Varyans Analizi (One Way ANOVA)' kullanılmıştır. Farklılığın hangi gruptan kaynaklandığının belirlenmesinde ise Post-hoc testlerden "Duncan" testi uygulanmıştır. İstatistiksel analizlerin değerlendirilmesinde, P<0,05 olduğu durumlar anlamlı değer olarak kabul edilmiştir.

Aerobik güç testinde pliometrik antrenman grubunda grup içi ölçümler arasında anlamlılık gözlemlenmiştir (P<0,05). Sürat testinde kontrol grubunda negatif yönde, antrenman gruplarında ise destekleyici yönde anlamlılık tespit edilmiştir (P<0,05). Reaksiyon testinde antrenman gruplarında grup içi ölçümlerde anlamlılık gözlemlenmiştir (P<0,05). Gruplar arası ölçümlerde ise son testler sonrasında PKAG istatistiksel olarak önemli ölçüde anlamlı bulunmuştur (P<0,05). Çeviklik testinde antrenman gruplarında grup içi ölçümlerde anlamlılık bulunmuştur. Gruplar arası ölçümlerde ise son testler sonrasında DLKAG istatistiksel olarak önemli ölçüde anlamlı bulunmuştur (P<0,05).

Sonuç olarak, pliometrik antrenmanın aerobik kapasiteyi artırmada etkili olduğunu, direnç bandı antrenmanının ise sınırlı bir etkisi bulunduğunu göstermektedir. Ayrıca, bu antrenman yöntemlerinin etkilerinin yaş, cinsiyet ve antrenman geçmişi gibi bireysel faktörlere bağlı olarak değişebileceğini vurgulamaktadır.

**Anahtar Kelimeler:** Detraining, kuvvet, performans.

## INTRODUCTION

The effects of strength training on sports performance have become an important research topic for both individual and team sports. These types of training are commonly used to enhance essential performance components such as speed, power, and endurance in athletes (1). It has been proven that resistance training is safe and effective for children and adolescents, and various resistance training modalities have been observed to positively affect sprinting and jumping performance (2).

The ability to perform repeated sprints and change direction is considered an important factor in the performance of individual athletes. These skills are regarded by coaches and researchers as indicators of superior performance in many sports and serve as significant markers of players' fitness levels (3). It has been found that athletes with a higher skill level demonstrate better reactive sprint performance (RSA) compared to those with a lower skill level (4)

Physical fitness stands out as one of the fundamental characteristics of athletes, as they can face high physical work demands (5). Tests for maximal oxygen consumption ($VO_2max$), considered the gold standard in assessing aerobic capacity, are often not practically applied. Therefore, alternative assessment methods, such as field tests, are utilized (5). Field tests used to determine the effectiveness of strength training are of great importance in assessing the performance capacity of athletes (6). The relationships between isokinetic muscle strength and field-based jump tests are considered important when evaluating athletes' muscle strength and jumping abilities (7).

The balance system involves the coordinated functioning of elements such as vision (eyes), positioning (inner ear), support surface (deep sensation), motor system, central nervous system, and brain. The starting point of the balance system is the perception of our position in space. This perception occurs by activating muscle groups through nerve impulses sent to the brain by sensory receptors located in the eyes, muscles, joints, and inner ear, thus maintaining balance (8).

Reaction times also play a significant role in the performance of individual athletes. Simple reaction time (SRT) describes a straightforward response to a single stimulus, while recognition reaction time (RRT) and cognitive reaction time (CRT) involve more complex cognitive processes (9). Moreover, the relationship

between individual athletes' hand dominance is a significant factor in the optimization of their motor skills (9).

Endurance parameters such as maximal oxygen consumption ($VO_2max$) are considered one of the determining factors of performance, especially in sports like soccer that require high aerobic capacity. Evaluating $VO_2max$ in both laboratory settings and field tests necessitates the comparison of different methods to ensure the most accurate assessment of this capacity (10). Studies on the requirements of individual sports and the impact of these requirements on training programs assist coaches in developing specialized training programs tailored to the needs of athletes (3).

Plyometric training is a training method used to enhance explosive strength and plays a significant role in improving performance in both individual and team sports. Explosive strength is defined as the capacity of muscles to produce maximum force in the shortest possible time, and plyometric training facilitates rapid and powerful muscle contractions (11). In team sports such as football, volleyball, handball, and basketball, as well as in individual sports like athletics, wrestling, tennis, judo, and taekwondo, plyometric training includes exercises aimed at enhancing speed, agility, and strength (12, 13).

In general, plyometric training is used across various sports as a method to enhance explosive strength, reactive strength, and movement speed. This training method is particularly applied to elevate athletic performance to a high level and significantly contributes to the development of motor skills. The benefits of plyometric exercises include the rapid conversion of elastic energy into mechanical energy during muscle tension, thereby increasing the movement efficiency of athletes and improving their performance (14). It has been demonstrated through numerous scientific studies that plyometric training is a significant determinant of athletic success in both team and individual sports (15).

Resistance band training is a form of exercise that has gained popularity in recent years and is particularly effective for strength development. These workouts are performed using elastic bands that provide resistance, allowing for greater muscle contractions and targeting strength increases. Research has shown that resistance band training enhances both the isometric and dynamic strength capacities of athletes (14).

Training with resistance bands is noted for allowing muscles to work in a more controlled and efficient manner by placing a low load on the musculoskeletal system. For this reason, they are widely used in both rehabilitation processes and strength training (16). Additionally, resistance band training is said to carry a lower risk of injury compared to bodyweight training, as it promotes flexibility and ensures balanced strength development among muscle groups (15).

Especially when used in conjunction with strength training, resistance band exercises are effective in enhancing performance determinants such as maximal strength, explosive strength, and muscular endurance in athletes. The literature indicates that resistance band training directly contributes to strength development by targeting various muscle groups in the body, thereby improving sports performance (14, 16). In this context, scientific studies have proven that resistance band training is an effective tool for increasing athletes' strength capacities.

This study aimed to investigate the effects of different strength training methods on the field test results of individuals aged 18-20 and evaluated the effectiveness of the relevant testing methods based on the findings of the aforementioned studies.

## METHOD

### Participants

Thirty male individuals aged 18-20, who had been involved in sports for at least five years and had entered a sedentary period for various reasons, participated in this study at the Faculty of Sports Sciences of Selçuk University in Konya. Measurements of the participants were conducted at the Performance and Kinanthropometry Laboratory of the Faculty of Sports Sciences as well as in the university's sports facilities. General information about the study was provided to the volunteers, and they were asked to sign a consent

form confirming their voluntary participation. The study was approved by the Ethics Committee of Selçuk University, Faculty of Sports Sciences, Konya, Turkey (Protocol number 07, 25 January 2016).

**Procedure**

**Training Protocol:** The measurements taken from the participants and the determined loading levels formed the basis of the study. The research was conducted according to a training protocol applied three days a week for a total duration of 12 weeks. Preliminary trials offered opportunities for familiarization with the tests and review of the training protocols. The frequency of the training program was three days a week, with a total of four sets and repetitions ranging from 8 to 10. The groups were randomly assigned following the pre-tests.

**20-Meter Shuttle Run Test:** Participants will run between two lines placed 20 meters apart while keeping pace with pre-recorded audio signals. The initial speed is set at 9.0 km/h, increasing by 0.5 km/h every minute. If a participant fails to keep up with the audio signals twice in succession or stops due to fatigue, the test will be terminated. Results will be recorded at the nearest stage (17). Participants were provided with the necessary explanations before the test and were given a 5-10 minute period to warm up.

**60 Meter Speed Test**: To assess the speed performance of the participants, a 60-meter sprint test was conducted. The test took place on a tartan track, utilizing electronic photo cells placed at the 0-60 meter distances. Each participant was given two attempts in the 60-meter sprint test, and the best time achieved was recorded as the test result. All participants performed a warm-up exercise before the sprint test (18).

**Reaction Test**: Five Fitlight lights have been fixed to the ground for the test. Two lights are placed 50 cm to the right and left of the spot where the participant will stand, followed by two lights 50 cm further ahead and one light 50 cm ahead of those two. The participant will stand in the middle of the lights and will be required to extinguish the red lights that will turn on 10 times using their dominant foot after the test begins. Each light is set to stay on for 5 seconds, and immediately after one light is turned off, another light will be activated. (19). The lights are set to detect the foot from a distance of 10 cm. Each participant is given one trial, followed by two tests conducted at 2-minute intervals, and the best result from these tests is recorded for analysis.

**AgilityT-Test**: The athlete will start in a proper stance at cone 1. Each athlete used the same starting position, running towards cone 2 while touching the top of the cone with their right hand. They then ran sideways to cone 3 and touched the top of cone 3 with their left hand. The athlete moved laterally towards cone 4, touching it with their right hand, and then touched cone 2 with their left hand while returning. Finally, the athlete ran backward from the starting line to cone 1. The timing began at the start and was stopped when the athlete crossed the starting line. Each participant was given one trial, followed by two tests, with the best result from these tests recorded for analysis (20).

**Statistical Analysis:** The results of the study were analyzed using SPSS (IBM SPSS Statistics 26) software. The mean and standard deviation values for all variables were calculated, and the 'Repeated Measures ANOVA' test was used to determine differences within the group for measurements obtained during the pre-test, post-test, and detraining test periods. For determining the differences between groups for each period (pre-test, post-test, and detraining test), the 'One-Way ANOVA' method was applied. To identify the source of the differences, the "Duncan" test was preferred among the post-hoc tests. In the statistical analysis results, values of $P<0.05$ were considered significant.

**Ethical approval and institutional permission**

The study was approved by the local ethics committee (Protocol number 07, 25 January 2016, Ethics Committee of Selcuk University, Faculty of Sports Science, Konya, Turkey) in accordance with the Declaration of Helsinki. Before the assessment, every participant received the same detailed information about the testing procedure. Every participant signed the informed consent.

## FINDINGS

The performance outcomes of the measurements taken from our participants were compared in the tables created below after the analysis.

**Table 1.** Demographic characteristics of the participants.

| | | Control Group (n:10) | | Plyometric Group (n:10) | Resistance Band Group (n:10) | P |
|---|---|---|---|---|---|---|
| **Age (years)** | **Pre-Test** | 18.70 ± 0.67 | | 18.70 ± 0.67 | 19.10 ± 0.87 | 0.39 |
| | **Post-Test** | 18.70 ± 0.67 | | 18.70 ± 0.67 | 19.10 ± 0.87 | 0.39 |
| | **Detraining** | 18.70 ± 0.67 | | 18.70 ± 0.67 | 19.10 ± 0.87 | 0.39 |
| | **P** | | | | | |
| **Height (cm)** | **Pre-Test** | 178.76 ± 7.38 | | 176.90 ± 5.64 | 174.70 ± 6.12 | 0.42 |
| | **Post-Test** | 178.76 ± 7.38 | | 176.90 ± 5.64 | 174.70 ± 6.12 | 0.42 |
| | **Detraining** | 178.76 ± 7.38 | | 176.90 ± 5.64 | 174.70 ± 6.12 | 0.42 |
| | **P** | | | | | |
| **Body Weight (kg)** | **Pre-Test** | 71.40 ± 8.82 | **C** | 69.00 ± 6.58 | 68.70 ± 12.65 | 0.79 |
| | **Post-Test** | 73.00 ± 9.34 | **B** | 70.00 ± 6.56 | 69.30 ± 11.55 | 0.64 |
| | **Detraining** | 74.00 ± 9.15 | **A** | 70.60 ± 6.56 | 69.50 ± 11.28 | 0.53 |
| | **P** | **0.00** | | 0.08 | 0.41 | |

A, B, C:Differences within group means in the same column that contain different letters are significant (P<0.05).
x, y, z:Differences between group means in the same row that contain different letters are significant (P<0.05).
**P<0.05**

According to Table 1, when examining the age and height values of the participants, no significant differences were found among the groups during the pre-test, post-test, and detraining periods (P > 0.05). A stable profile was observed in age values across all groups (P = 0.39). Similarly, no significant difference was found among the groups in terms of height measurements (P = 0.42). Looking at body weight values, a significant increase was observed over time in the Control Group (P = 0.00). However, no significant differences were detected in the Plyometric and Resistance Band Groups (P > 0.05). It is noteworthy that there was a significant increase in weight during the post-test and detraining periods in the Control Group, while this increase was less pronounced in the Plyometric and Resistance Band Groups.

**Table 2.** Descriptive statistical analysis table showing the speed test values of the participants.

| Speed Test | | Control Group (n:10) | | Plyometric Group (n:10) | | Resistance Band Group (n:10) | | P |
|---|---|---|---|---|---|---|---|---|
| **60-Meter Speed Test (s)** | **Pre-Test** | 8.19 ± 0.28 | **A** | 8.45 ± 0.39 | **B** | 8.21 ± 0.75 | **B** | 0.47 |
| | **Post-Test** | 8.19 ± 0.29 | **A** | 7.91 ± 0.37 | **A** | 7.70 ± 0.67 | **A** | 0.08 |
| | **Detraining** | 8.32 ± 0.32 | **B** | 8.40 ± 0.42 | **B** | 8.48 ± 0.94 | **C** | 0.85 |
| | **P** | **0.01** | | **0.00** | | **0.00** | | |

A, B, C:Differences within group means in the same column that contain different letters are significant (P<0.05).
x, y, z:Differences between group means in the same row that contain different letters are significant (P<0.05).
**P<0.05**

According to Table 2, when examining the speed test results of the participants, no statistically significant difference was found among the groups in the pre-test values (P = 0.47). According to the post-test results, significant improvements were recorded in the Plyometric and Resistance Band Groups (P < 0.05), while no significant change was observed in the Control Group. The difference between the Plyometric and Resistance Band Groups was not significant (P = 0.08). During the detraining period, performance declines were observed in all three groups, with the Resistance Band Group showing the largest decrease (P = 0.85). In within-group comparisons, significant improvements were particularly noted in the Plyometric and Resistance Band Groups (P = 0.00).

**Table 3.** Descriptive statistical analysis table showing the reaction test values of the participants.

| Reaction Test | | Control Group (n:10) | | Plyometric Group (n:10) | | Resistance Band Group (n:10) | | P |
|---|---|---|---|---|---|---|---|---|
| Fitlight (s) | **Pre-Test** | 0.48 ± 0.02 | | 0.46 ± 0.02 | **A** | 0.49 ± 0.02 | **A** | 0.11 |
| | **Post-Test** | 0.47 ± 0.02 | **/x** | 0.43 ± 0.02 | **B/y** | 0.46 ± 0.02 | **C/xy** | 0.00 |
| | **Detraining** | 0.48 ± 0.02 | | 0.46 ± 0.01 | **A** | 0.48 ± 0.03 | **B** | 0.10 |
| | **P** | 0.06 | | **0.00** | | **0.00** | | |

A, B, C:Differences within group means in the same column that contain different letters are significant (P<0.05).
x, y, z:Differences between group means in the same row that contain different letters are significant (P<0.05).
**P<0.05**

According to Table 3, when evaluating the reaction test results of the participants, it was observed that there was no significant difference among the groups in the pre-test values (P = 0.11). In the post-test results, the Plyometric Group showed a statistically significant improvement compared to the Control and Resistance Band Groups (P < 0.05). However, there was no significant difference between the Control Group and the Resistance Band Group in the post-test results (P = 0.00). When evaluating the detraining period, a decline was observed in the Plyometric Group compared to the post-test results, but this decline was not found to be statistically significant (P = 0.10). In within-group comparisons, statistically significant improvements were recorded in the post-test values, particularly in the Plyometric and Resistance Band Groups (P = 0.00).

**Table 4.** Descriptive statistical analysis table showing the agility test values of the participants.

| Agility T Test | | Control Group (n:10) | | Plyometric Group (n:10) | | Resistance Band Group (n:10) | | P |
|---|---|---|---|---|---|---|---|---|
| T- Testi (s) | **Pre-Test** | 10.98 ± 0.69 | | 10.97 ± 0.72 | **C** | 10.58 ± 0.56 | **C** | 0.33 |
| | **Post-Test** | 10.82 ± 0.71 | **y** | 10.29 ± 0.76 | **A/xy** | 9.96 ± 0.54 | **A/x** | **0.02** |
| | **Detraining** | 10.90 ± 0.64 | | 10.68 ± 0.79 | **B** | 10.42 ± 0.61 | B | 0.31 |
| | **P** | 0.32 | | **0.00** | | **0.00** | | |

A, B, C: Differences within group means in the same column that contain different letters are significant (P<0.05).
x, y, z:Differences between group means in the same row that contain different letters are significant (P<0.05).
**P<0.05**

According to Table 4, when examining the pre-test values of the participants' agility test results, it was observed that there was no significant difference among the groups (P = 0.33). In the evaluation of the post-test results, the Plyometric and Resistance Band Groups showed significant improvements compared to the Control Group (P = 0.02). Although the post-test results of the Plyometric Group were lower than those of the Resistance Band Group, both groups performed better than the Control Group. During the detraining period, a certain decline was observed in the Plyometric and Resistance Band Groups; however, these declines were not found to be significant (P = 0.31). In within-group comparisons, statistically significant differences were recorded, particularly between the pre-test and post-test values of the Plyometric and Resistance Band Groups (P = 0.00).

**Table 4.** Descriptive statistical analysis table showing the agility test values of the participants.

| Aerobic Power Test | | Control Group (n:10) | Plyometric Group (n:10) | | Resistance Band Group (n:10) | P |
|---|---|---|---|---|---|---|
| 20-Meter Shuttle Run Test (MaxVo2) ml/kg/min | **Pre-Test** | 48.63 ± 3.33 | 47.47 ± 4.36 | **B** | 48.83 ± 5.95 | 0.78 |
| | **Post-Test** | 48.76 ± 3.66 | 50.40 ± 4.33 | **A** | 52.32 ± 4.07 | 0.16 |
| | **Detraining** | 47.10 ± 3.56 | 49.22 ± 3.99 | **AB** | 49.47 ± 4.70 | 0.38 |
| | **P** | 0.23 | **0.01** | | 0.12 | |

A, B, C:Differences within group means in the same column that contain different letters are significant (P<0.05).
x, y, z:Differences between group means in the same row that contain different letters are significant (P<0.05).
**P<0.05**

According to Table 5, when examining the results of the 20-meter shuttle run test (MaxVO2), no significant differences were observed among the groups during the pre-test period (P = 0.78). In the evaluation of the post-test results, significant improvements were recorded in the Plyometric and Resistance Band Groups. The Plyometric Group showed a significant increase in the post-test (P = 0.01), while the Resistance Band Group also showed improvement (P = 0.12), although this improvement was not found to be statistically significant. In the Control Group, no significant changes were detected in the post-test results (P = 0.23). During the detraining period, both the Plyometric and Resistance Band Groups maintained their performance compared to the pre-test results, but no significant differences emerged among the groups (P = 0.38).

**DISCUSSION AND CONCLUSION**

Considering that strength development and sensory-motor system responses can vary according to the type and intensity of exercise (21), it is clear that resistance band training can enhance skills such as dynamic balance and reaction. This research emphasizes the importance of cognitive functions and reaction speed on athletic performance and offers insights into the integration of plyometric and resistance training (22).

Similar inferences hold true for the speed factor as well. In our study, performance improvements were observed in both the plyometric and resistance band training groups in the 60m sprints, as expected. The enhancing effects of plyometric training on short-distance running speeds have been demonstrated in numerous previous studies (23-25). In this context, it appears that resistance band training can also enhance running speed (26).

The direct relationship between running speed and explosive power, along with the similar effects of these two training types, suggests that both methods can equally enhance speed. However, definitive conclusions cannot be drawn, as there is no study comparing the effects of plyometric and resistance band training on physical performance following the cessation of sports activity. Some studies that address differences in short-distance sprints consider distances as short as 10m as sprint distances, while others evaluate 100 meters (27). Our study is similar to those evaluating longer sprints, such as 50m (28), and has shown that elastic strength training and other training methods can improve 50m speed performance to similar extents.

Additionally, there are studies suggesting that resistance band training may produce similar effects to all forms of strength training except plyometric training (29, 30). It has been noted that plyometric and resistance band training may have similar effects in terms of muscle contraction principles (31).

Significant differences between groups were observed in agility performances involving high-intensity sprints. The resistance band training group showed a significant improvement in agility performance after the intervention. This finding indicates that resistance band training can enhance agility performance (30, 32). However, there is no study demonstrating greater improvements in agility when compared to plyometric training. The amortization phase between eccentric and concentric contractions in resistance band training, which can be performed with a higher resistance than in plyometric training, may have contributed to the enhancement of agility performance.

In summary, the lack of significant differences in speed performance without direction changes between plyometric and resistance band training can be interpreted to suggest that resistance band training may be more effective in agility performances involving direction changes. However, this perspective needs to be supported by scientific data. Additionally, it should be noted that periods of inactivity may lead to dramatic performance losses for both groups, resulting in final values dropping to similar levels.

In our study, the aim was to examine all components of physical fitness, including aerobic capacity. Significant improvements were observed only in the plyometric training group for the 20-meter shuttle run performance. It has been previously reported that plyometric training can positively affect not only anaerobic performance but also aerobic performance (33). However, the effects of plyometric training on aerobic capacity may vary depending on the intensity and duration of the training (34). There is insufficient data regarding the effects of resistance band training on aerobic performance.

In conclusion, it was observed that both plyometric training and theraband training may have similar effects on muscular and overall anaerobic performance. Although no exceptionally strong outcomes were

reported, plyometric training appeared to be more effective than theraband training for aerobic performance, while theraband training seemed to have a greater impact on agility development compared to plyometric training. However, due to the limited studies in the relevant literature, these findings cannot be strongly supported. Additionally, it was clearly evident that neither of these training methods had an advantage in preserving performance loss resulting from inactivity. Further research is needed to clearly establish the effects of theraband training on aerobic or anaerobic performance and the changes in these effects following a period of inactivity.

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# Adaptation of the Exercise Maintenance Motivation Scale to Turkish Culture

Mehmet ÖZTAŞ [1A], Abdullah KILCI [2B], Ali ERDOĞAN [3C],Erkan Faruk ŞİRİN [4D]

[1] *Çukurova University, Faculty of Sport Sciences, Department of Coaching Education, Adana, TÜRKİYE*
[2] *Tokat Gaziosmanpaşa University, Faculty of Sport Sciences, Department of Sport Management, Tokat, TÜRKİYE*
[3] *Karamanoğlu Mehmetbey, University, Faculty of Sport Sciences, Department of Sport Management, Karaman, TÜRKİYE*
[4] *Selcuk University, Faculty of Sport Sciences, Department of Sport Management, Konya, TÜRKİYE*
*Address Correspondence to Abdullah KİLCİ: e-mail: abdullahkilci89@gmail.com*

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A: Orcid ID: 0000-0003-4689-6490 B: Orcid ID: 0000-0002-5242-1582
C: Orcid ID: 0000-0001-8306-5683 D: Orcid ID: 0000-0002-6837-7758

**Abstract**

This study includes findings regarding reliability and validity values within the scope of adaptation of the exercise continuation motivation measure by Nam et al. (2023) into Turkish. Descriptive survey model was used as the research design. The scale was translated into Turkish with a team of six experts using the back-translation method. The study data were collected from 326 members of the Healthy Living Application and Research Center between the ages of 18 and 60 who voluntarily agreed to participate in the study. Confirmatory factor analysis (CFA) was used to prove the validity of the scale structure previously developed by Nam et al. (2023) for Turkish culture, and test-retest and internal consistency analyses were used for reliability. SPSS Amos package software was used for CFA. CFA validated the 30-item and 5-factor structure of the scale. Reliability analysis findings revealed that internal consistency and test-retest values were within the expected range. As a result, it was determined that the scale, adapted into Turkish with this study, is a valid and reliable measurement tool that can be used to measure the motivation to maintain exercise among the members of healthy living application and research centers in Turkey.

**Keywords:** Motivation, exercise maintenance, exercise maintenance motivation

**Egzersizi Sürdürme Motivasyonu Ölçeğinin Türk Kültürüne Uyarlanması**

**Özet**

Bu çalışmada, Nam ve ark., (2023) tarafından egzersizi sürdürme motivasyonu ölçmeğinin Türkçeye uyarlanması kapsamında, güvenirlik ve geçerlik değerleri ile ilgili bulguları içermektedir. Araştırma deseni olarak betimsel tarama modeli kullanılmıştır. Ölçek altı kişilik uzman ekip eşliğinde ve çevir-geri çevir yöntemi kullanılarak Türkçe'ye çevrilmiştir. Çalışma verisi, araştırmaya gönüllü katılmayı kabul eden 18 ile 60 yaş aralığında olan 326 sağlıklı yaşam uygulama ve araştırma merkezi üyesinden toplanmıştır. Ölçeğin daha önce Nam ve ark., (2023) tarafından ortaya çıkarılan yapısının Türk kültürü için geçerliliğinin ispatı için doğrulayıcı faktör analizi ; güvenirlik için test tekrar test ve iç tutarlılık analizleri kullanılmıştır. DFA için SPSS Amos paket programı kullanılmıştır. Gerçekleştirilen Doğrulayıcı Faktör Analizi sonucunda, ölçeğin 30 madde ve 5 alt boyutlu yapısı doğrulamıştır. Güvenirlik analizi bulguları, iç tutarlılık ve test tekrar test değerlerinin beklenen değer aralığında olduğunu göstermiştir. Sonuç olarak, Türkçe uyarlaması bu çalışma ile

gerçekleştirilen ölçeğin Türkiyedeki sağlıklı yaşam uygulama ve araştırma merkezleri üyelerinin egzersizi sürdürme motivasyonunu ölçmede kullanılabilecek geçerli ve güvenilir bir ölçme aracı olduğu tespit edilmiştir.

**Anahtar Sözcükler:** Motivasyon, Egzersiz sürdürme, Egzersiz sürdürme motivasyonu.

## INTRODUCTION

Today, the understanding of healthy life is gaining great importance to increase the physical and psychological well-being of individuals. Exercise plays an essential role in this regard and helps individuals maintain their physical and mental health (7). However, maintaining individuals' motivation to exercise is a critical factor not only in the initial phase but also in the long term (12). Studies have found that between 40% and 65% of people who start exercise stop within the first year, regardless of whether they are guided or self-directed, and this trend holds across age and gender (2,11). Maintaining a consistent exercise routine in fitness facilities can be challenging and largely depends on individual factors (18). The motivation of individuals who exercise is a critical factor linked to both their success and setbacks in adopting healthier behaviors (18). As a result, identifying the underlying causes of exercise is imperative for fitness center members to maintain a consistent fitness regimen. Understanding the motivations of individuals exercising in fitness centers will contribute to the spread of a healthy living culture. Exercise motivation includes psychological and social factors that affect individuals' participation in physical activity (17). An accurate assessment of this motivation is essential to strengthen individuals' exercise habits and help them adopt a sustainable lifestyle. However, existing motivation scales are generally based on Western cultures and therefore their validity in Turkish culture is questionable (8). The values, beliefs, and social norms of Turkish society are among the significant factors affecting exercise motivation.

This study aimed to adapt the exercise maintenance motivation scale to Turkish culture in healthy living and fitness centers and to ensure that cultural characteristics are taken into consideration in this process. This adaptation will be a critical step to better understand the exercise motivation of Turkish individuals, increase the effectiveness of exercise programs, and develop awareness of healthy living. The study aims to contribute to the maintenance of individuals' exercise habits by presenting a motivation scale suitable for the needs and expectations of Turkish society.

## METHOD

Before the study implementation, the necessary permissions were obtained from the Selcuk University Sports Sciences Scientific Research and Publication Ethics Committee (Decision no: E-40990478-050.99-852097). In addition, individual volunteer participation forms were collected from each participant.

### Study group

In the study, 326 active healthy life application and research center members determined by convenience sampling method participated. The participants were members of the Çukurova University Healthy Living Application and Research Center and were between 18 and 60 years of age. Among the participants, 148 (45.4 %) were female and 178 (54.6 %) were male. For Confirmatory Factor Analysis (CFA) to be conducted with the data obtained from the members of the healthy living application and research center participating in the study, a sample size over 300 is considered sufficient (5,15,20). In our study, it was determined that the number of samples used for CFA to be performed was sufficient.

### Data Collection Tools

In this study, the personal information form developed by the researchers and the Exercise Maintenance Motivation Scale, which is planned to be adapted to Turkish culture, were used as data collection tools.

### Personal Information Form

It was developed by the researchers to collect age and gender data of the active healthy life application and research center members who participated in the study.

### Exercise Maintenance Motivation Scale

In the study, the exercise maintenance motivation scale was used for the adaptation of which permission was obtained from the responsible author via e-mail. The scale was originally introduced to the literature by Nam et al., (19). The scale consists of 30 items. A 5-point Likert-type (1=Strongly Disagree, 5=Strongly Agree)

measurement approach was used for the responses of the scale. The scale consists of five sub-dimensions and 30 items. According to the reliability analysis results, Cronbach's alpha value was determined as .80 (19).

**Scale Translation Process**

In the process of translation of the Exercise Maintenance Motivation Scale into Turkish, the translation-back-translation method, which is frequently used in the literature, was used (4). In the translation phase of the scale, a commission consisting of three academicians with a PhD degree in sports sciences and a good command of English, and three English Language Science experts was utilized. The original English form of the scale was translated into Turkish by two English linguists and an academic in the field of sports sciences. When the translations obtained were analyzed, common points were identified and no significant differences were found in the translation of any item. The resulting Turkish translation was sent to two other academics in the field of sports sciences and an English language expert. The translations from the experts were checked and no differences were found. The items in the original form of the scale and the translations made by the experts were determined by the commission members to be similar to each other and no additions or deletions were made. The translated scale was presented to 20 healthy living application and research center members and they were asked to examine the scale items in terms of comprehensibility. Sports center members stated that the items were clear and that there were no items that needed to be corrected. The items were finalized and the data collection process started.

**Data Collection Process**

The data required for the validity and reliability analyses of the scale were collected between 01 October and 07 October 2024 at Adana Çukurova University Healthy Living Application and Research Center. Face-to-face interviews were conducted with the participants and data were collected from the members of the Healthy Living Application and Research Center who voluntarily agreed to participate. The data were collected by sharing the Google form link with the participants and they were given 20 minutes to answer the questionnaire.

**Data Analysis**

SPSS 27.0 package software and AMOS 16 software were employed for the data analysis. For descriptive analyses, standard deviation and arithmetic mean values were examined, while kurtosis and skewness values were examined to check the distribution normality of the data. Since the scale used in the study had previously undergone EFA, CFA was applied in this study. Distribution normality was checked before the analysis of the data. Distribution normality was checked with kurtosis and skewness values and expected to be between +2.0 and -2.0 (14). The findings show that the values are within the specified range and the data was distributed normally.

After the validity analysis, internal consistency coefficient and test-retest methods were used to check whether the scale was reliable. The criteria expressed by Alpar (1) were used for the internal consistency coefficient. In the reliability method examined with Cronbach's alpha value, values between 0.80 and 1.00 indicate very high reliability, values between 0.80 and 0.60 indicate that the scale is highly reliable, values between 0.60 and 0.40 indicate low reliability, and values between 0.40 and 0.00 indicate that the scale is not reliable (1). The second method used to test the reliability of the scale is the test-retest. The researchers collected data twice at three-week (21-day) intervals from 60 healthy living and fitness center members who did not take part in the CFA phase. The test-retest values calculated by Pearson moment correlation analysis are .70 and above, indicating that the scale is reliable (16).

## FINDINGS

**Findings Regarding Construct Validity**

After the data obtained from the members of the Healthy Living Application and Research Center were computerized, CFA was performed using the AMOS software. CFA is a method that enables the verification of the previously determined or existing structure in scale development and validity studies (3), and is applied to determine whether the data obtained by the researchers are compatible with the pre-constructed factor status (9). Although different CFA fit indices are used in the literature, in this study, the commonly preferred Chi-Square Goodness, RMSEA (Root Mean Square Error of Approximation), CFI (Comparative Fit Index), GFI (Goodness of Fit Index), IFI (Incremental Fit Index) and SRMR fit index values were examined (13).

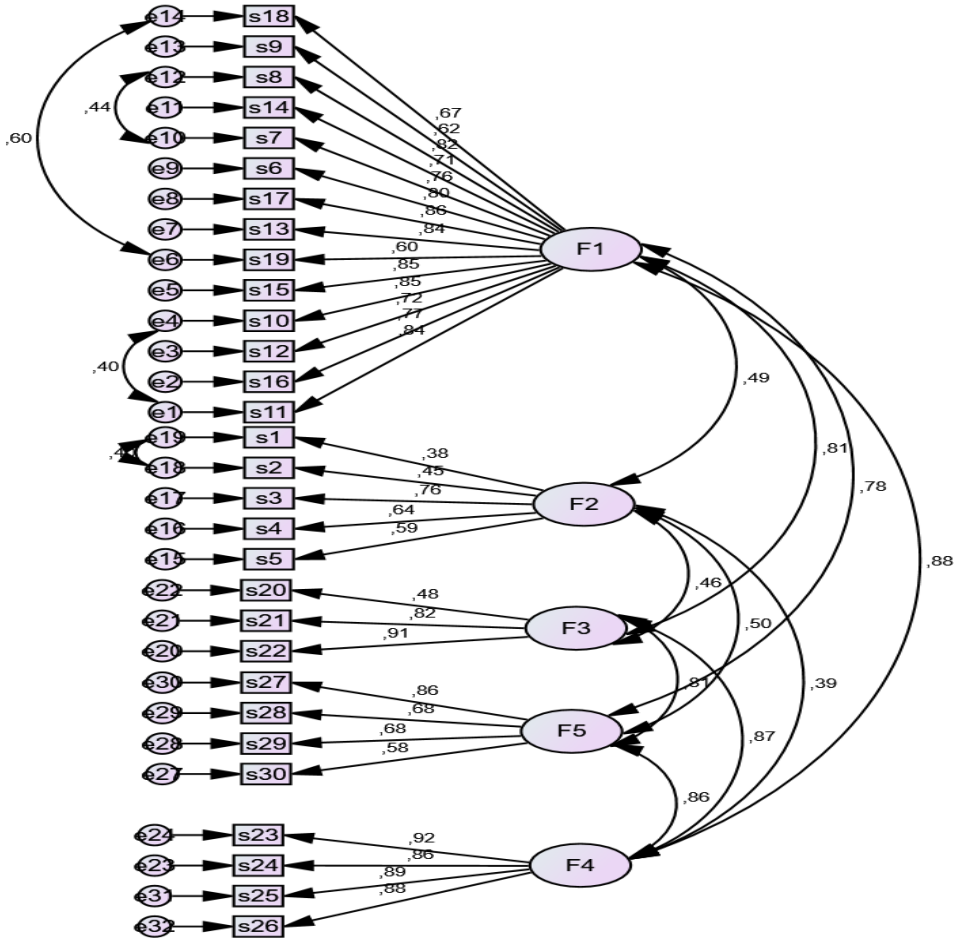


**Figure 1:** Path Diagram of the Exercise Maintenance Motivation Scale

In order to make the analysis more compatible, a covariance connection was established between the error terms e10-e12, e6-e14, e18-e19 and more compatible results were obtained in the relevant values. Covariance assignment can be associated with the error terms of the items that predict the same factor aiming to measure the same feature (21).

As can be seen in Figure 1, item factor loads ranged from 0.38 to 0.92. It is stated that items with a factor loading of 0.30 and above are good items (6). In light of the findings obtained, it was determined that the item factor loadings of the Exercise Maintenance Motivation Scale are sufficient. It is found that the scale can be adapted into Turkish with 30 items.

**Table 1.** Confirmatory factor analysis fit values of the Exercise Maintenance Motivation Scale

| Model Fit Index | Accepted Perfect Range | Range of Acceptable Fit values | Obtained Values of the Scale |
|---|---|---|---|
| X2/df | $0<\chi^2/sd<3$ | $3<\chi^2/sd<5$ | 3.28 |
| RMSEA | 0.00<RMSEA<0.05 | 0.00<RMSEA<0.05 | 0,080 |
| SMRM | 0.00 ≤ SRMR <, 0.05 | 0.05 ≤ SRMR <, 0.10 | 0.074 |
| CFI | 0.95<GFI<1.00 | 0.90<GFI<0.95 | 0.90 |
| IFI | 0.95<GFI<1.00 | 0.90<GFI<0.95 | 0.90 |

As can be seen in Table 1, the structure of the scale was confirmed with the data obtained according to the cut-off values in the literature. Accordingly, $\chi 2$ /sd, SRMR, CFI, IFI, and RMSEA values were acceptable. No multicollinearity problem was detected among the dimensions.

**Reliability Analyses**

Cronbach's alpha ($\alpha$) and test-retest coefficients were calculated to test the internal reliability of the 30-item and 5-subdimensional structure of the Exercise Maintenance Motivation Scale.

**Table 2.** Confirmation of the reliability of the gamer ıdentity scale with CR, AVE, ınternal consistency coefficient and test-retest methods

| CompositeReliability (CR) | | AverageVarianceExtracted (AVE) | Test-Retest Method | Internal Consistency Coefficient |
|---|---|---|---|---|
| Gamer Identity Scale | 0.96 | 0.57 | 0.86 | 0.95 |

The reliability study of the Exercise Maintenance Motivation Scale was examined using Cronbach's alpha coefficient and test-retest method. Cronbach's Alpha coefficient of the scale was found to be .95. The test-retest reliability of the scale was obtained by administering it to 60 healthy living application and research center members at three-week intervals. As a result of the test-retest reliability study, it was determined that there was a high, positive, and significant correlation between the first and second administration of the scale.

When Table 5 is examined, it is seen that the AVE values are 0.64 for the personality traits scale of E-sports players. CR values are 0.94 for the personality traits scale of E-sports players. Considering that scales with a reliability coefficient of 0.70 and above are considered reliable in scale development and adaptation studies (22,23,24,25), it can be said that the internal consistency, AVE, and CR values of the E-sports players' personality traits scale are sufficient.

## DISCUSSION AND CONCLUSION

This study aimed to adapt the Exercise Maintenance Motivation Scale developed by Nam et al., (19) to Turkish culture. Within the scope of the validity study of the scale, CFA was applied to test the appropriateness of the 30-item and 5-subdimensional structure of the scale to Turkish culture. After the conformity of the scale was determined by CFA, internal consistency and test-retest analyses were used to test the reliability of the scale.

CFA findings showed that the CFI value of the model was .90, the RMSEA value was .080, the SRMR value was 0.074, and the X2/df value was 3.28. The findings revealed that the CFA values were considered adequate and in line with the original form (19). In our study, internal consistency coefficient and test-retest methods were used for the reliability analysis of the Exercise Maintenance Motivation Scale. The internal consistency coefficient was found to be high at .95. The internal consistency values in the original form of the scale were in parallel with the findings of our study. The reliability of the scale was confirmed with the values (0.86) obtained in the test-retest method, which was used in the Turkish adaptation, although it was not used in the original form of the scale (16).

Although the values obtained in our study are within acceptable ranges, there are some limitations in our study. The first limitation is that the data obtained for the measurement tool are collected only from the members of the Healthy Living Application and Sports Center operating in Adana. In future studies, it is recommended to select a sample covering Turkey in general. The second limitation is that the data were collected from a single sample group. In future studies, it is recommended to test the validity and reliability of the measurement tool by collecting data from healthy living and sports centers operating on different exercises and sports.

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# Evaluation of Security Measures Taken in Stadiums from the Perspective of Spectators (Security in Sport Study)

Erhan BUYRUKOĞLU [1A], Kemal KIZILKAYA [2B],
Abdulkadir EKİN [3C], İsmail VAROL[4D]

[1] *Aydın Adnan Menderes University, Faculty of Sport Sciences, Department of Sport Management Sciences, Aydın, TURKEY*
[2] *Siirt Governorate, Siirt Governor, Siirt, TURKEY*
[3] *Siirt University, BESYO, Department of Sports Management, Siirt, TURKEY*
[4] *Akdeniz Univeristesi, Faculty of Sport Sciences, Department of Sport Management, Antalya, TURKEY*
*Correspondence Address: Erhan BUYRUKOĞLU e-mail: erhanbuyrukoglu@gmail.com*

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A: Orcid ID:0000-00002-8459-9270 B: Orcid ID: 0009-0007-4103-7992
C: Orcid ID: 0000-0001-9421-711X D: Orcid ID: 0009-0006-3690-6949

**Abstract**

The safety of the spectators watching the competitions in the stadiums is of great importance in terms of the security measures taken in the competition area. In this context, the aim of our research is to examine how the security measures taken in stadiums are evaluated by the spectators. The population of our research consists of fans in professional football league competitions in the 2022-2023 season. The sample group consists of a total of 1540 fans, 406 women and 1134 men, who were randomly selected from the universe and who voluntarily agreed to participate in our research. As a data collection tool, the personal information form created by the researchers and the "Security in Sport Scale" were used to measure the evaluation of the security measures taken in the stadiums by the spectators. As a result of the normality analysis of the scale and its sub-dimensions, it was determined that the significance values were $p > 0.05$ and accordingly, nonparametric tests (Mann-Whitney U Test, Kruskal-Wallis H Test) were applied. As a result, it was determined that gender, marital status, educational status, participation in away competitions, self-identification as a football spectator, responsibility for violence in stadiums and frequency of going to the stadium had statistically significant effects on the sub-dimensions of the scale and general security perception.

**Keywords:** Stadium, Security Measures, Spectators.

Erhan BUYRUKOGLU Orcid ID: 0000-00002-8459-9270 / Kemal KIZILKAYA Orcid ID: 0009-0007-4103-7992
Abdulkadir EKIN Orcid ID: 0000-0001-9421-711X / Ismail VAROL Orcid ID: 0009-0006-3690-6949

**Stadyumlarda Alınan Güvenlik Önlemlerinin Seyirciler Acısından Değerlendirilmesi (Sporda Güvenlik Çalışması)**

**Özet**

Stadyumlarda müsabakaları izleyen seyircilerin güvenliği, müsabaka alanında alınan güvenlik önlemleri açısından büyük önem taşımaktadır. Bu bağlamda, araştırmamızın amacı, stadyumlarda alınan güvenlik önlemlerinin seyirciler tarafından nasıl değerlendirildiğini incelemektir. Araştırmamızın evrenini 2022-2023 sezonunda profesyonel futbol ligi müsabakalarındaki taraftarlar oluşturmaktadır. Örneklem grubu ise, evren içerisinden rastgele seçilen ve araştırmamıza gönüllü olarak katılmayı kabul eden 406 kadın ve 1134 erkek olmak üzere toplam 1540 taraftardan oluşmaktadır. Veri toplama aracı olarak, araştırmacılar tarafından oluşturulan kişisel bilgi formu ile stadyumlarda alınan güvenlik önlemlerinin seyirciler tarafından değerlendirilmesini ölçmek amacıyla "Sporda Güvenlik Ölçeği" kullanılmıştır. Ölçek ve alt boyutlarına ilişkin normallik analizi sonucunda anlamlılık değerlerinin $p > 0.05$ olduğu saptanmış ve bu doğrultuda parametrik olmayan testler (Mann-Whitney U Testi, Kruskal-Wallis H Testi) uygulanmıştır. Sonuç olarak, cinsiyet, medeni durum, eğitim durumu, deplasman müsabakalarına katılım, futbol seyircisi olarak kendini tanımlama, stadyumlarda yaşanan şiddetin sorumluluğu ve stadyuma gitme sıklığı değişkenlerinin ölçeğin alt boyutları ve genel güvenlik algısı üzerinde istatistiksel olarak anlamlı etkileri olduğu belirlenmiştir.

**Anahtar Kelimeler:** Stadyum, Alınan Güvenlik Önlemleri, Seyirci.

## INTRODUCTION

The participation of spectators in sportive competitions is shown as an effective role of the competitions. It is stated that the areas where sportive competitions have the highest number of spectators are stadiums (16). It is included in the literature studies that the competitions held in stadiums are generally hooliganised in fan groups around the world, safe areas in stadiums are restricted as a result of hooliganism and individuals do not want to come to watch competitions in stadiums (1; 17; 24; 12).

Hooliganisation and the quarrels between fan groups have led to the restriction of security areas in sports. It is explained in the literature studies that there are many aspects of violent incidents in the competitions played in stadiums. In the stadium, the provocative actions and insults of the fans in the opposite groups against each other, the media's reflection of bad events, the harsh interventions of the athletes during the competition, the critical decisions of the referees, the cheerleaders' provocation of the fans, the opposing discourses of the sports administrators against each other, the wrong and faulty design and public order deficiencies of the security officers in their duty places (11).

As a result of the incidents of violence in the stadiums, the TFF announced the security instruction in the stadiums. In the circular, in order to minimise the incidents of violence in stadiums and to prevent violent incidents, the authority to take security measures in stadiums has been given to the general directorate of security, the general directorate of gendarmerie and private security units in accordance with the regulation on the prevention of violence and irregularity in sports numbered 2012/4018, the law on the prevention of violence and irregularity in sports numbered 6222 and the instruction published by the TFF. A security committee has been established by TFF in stadiums. This committee evaluates the incidents of violence in the stadiums and imposes financial penalties on individuals and sports clubs, and it is stated that if the stadiums comply with the articles in the security instructions published by the TFF that there will be no weakness in terms of security in the stadiums, a certificate of conformity is given, and if this certificate of conformity is obtained, competitions can be played in the stadiums (28).

When the studies in the literature were analysed, it was seen that there are almost no security studies in sports and no project related to security areas in sports has been put into operation (30). When the researches conducted in general are examined, it is stated in the research results that the incidents of violence in the stadium have increased over the years and that the violent incidents in the stadiums cause material damages as well as moral damages (27). Considering the researches in the literature and the TFF security instruction, it was aimed to evaluate the security measures taken in the stadiums from the perspective of the spectators.

## METHOD

### Materials and Methods

In this part of the study, explanations about the research model, population and sample size, data collection process and data analysis are given. During the current research, the Directive on Scientific Research and Publication Ethics of Higher Education Institutions was followed.

### Research Model

In our research, the descriptive survey model, which is within the scope of the survey model, was used. In general, researches aiming to determine any situation in a subject are defined as descriptive research model (21).

### Research Group

The study group of our research consists of a total of 1540 (n=406 women, n=1134 man) volunteer fans who came to the professional football league competitions in 2022-2023.

### Data Collection Tools

The data collection tools in our study consist of two parts. In the first part, the personal information forum created by the researchers), and in the second part, the "Safety in Sport" scale developed by Taştan and Ataman Yancı (2016) was used.

*Personal Information Forum*

A personal information forum consisting of 11 questions such as gender, marital status, age, education level, which team are you a fan of, do you have a season-pass, do you go to away matches, how do you define your spectatorship as a football spectator, with whom do you go to the stadium to watch a match, how often do you go to the stadium to watch a match, who do you think is responsible for the violence in stadiums was used.

*Safety in Sport Scale*

The "Safety in Sport" scale developed by Taştan and Ataman Yancı (2016) was graded in 5 stages as (1) strongly agree, (2) agree, (3) undecided, (4) disagree and (5) strongly disagree. The scale of safety in sport consists of 20 questions and 4 sub-dimensions. The sub-dimensions are as follows: Perception of the adequacy of the security measures taken: 12, 10, 13, 11, 20 (Dimension 1), Perception of prevention of violent incidents by security forces: 16, 15, 18, 14, 17, 19 (Dimension 2), Perception of the use of security systems in stadiums: 5, 4, 8, 9, 6 (Dimension 3), Perception of controls at the entrance to the stadiums: 1, 2, 3, 7 (Dimension 4). According to the Cronbach's Alpha reliability coefficient analysis to determine the reliability of the scale, Cronbach's Alpha value was calculated as .880 in the whole scale (27). The Cronbach's Alpha value of the scale in this study was found to be .815.

### Data Analysis

The data of our research were collected face-to-face. Within the scope of the research, a total of 1564 participants were reached and the outliers in the data set and whether the multivariate normality assumption was met were examined with the help of Mahalanobis distance values and 24 data showing outlier outliers were removed from the data set and statistical analysis of 1540 participants was performed.

In this study, SPSS 25.0 package programme was used to analyse the data. Outliers in the data set and whether the assumption of multivariate normality was met were analysed with the help of Mahalanobis distance values and 24 data showing outlier outliers were removed from the data set. The kurtosis-skewness

coefficients were found to be between +2-2 and non-parametric tests were used in the analysis (21). Statistically, frequency, percentage and reliability coefficient calculations, Kruskal Wallis H Test and Man Witney U Test were performed. The analyses were performed according to 95% confidence interval.

**FINDING**

**Tablo 1.** Demographic Variables

| **Variables** | | **f** | **%** |
|---|---|---|---|
| Gender | Woman | 406 | 26,4 |
| | Man | 1134 | 73,6 |
| | Total | 1540 | 100 |
| Marital Status | Married | 658 | 42,7 |
| | Single | 882 | 57,3 |
| | Total | 1540 | 100 |
| Age | 18-25 age range | 364 | 23,6 |
| | 26 to 33 years old | 602 | 39,1 |
| | 34-41 age range | 294 | 19,1 |
| | 42- 49 age range | 280 | 18,2 |
| | Total | 1540 | 100 |
| Education Status | High School Graduate | 1316 | 85,5 |
| | University Graduate | 224 | 14,5 |
| | Total | 1540 | 100 |
| Which team are you a fan of | Sivas spor | 396 | 25,7 |
| | Kayseri spor | 369 | 24,0 |
| | Konya spor | 387 | 25,1 |
| | Antalya spor | 388 | 25,2 |
| | Total | 1540 | 100 |
| Do you have a season ticket? | Yes | 210 | 13,6 |
| | No | 1330 | 86,4 |
| | Total | 1540 | 100 |
| Do you go to away competitions? | Yes | 252 | 16,4 |
| | No | 1288 | 83,6 |
| | Total | 1540 | 100 |
| How would you define your spectatorship as a football spectator? | Very Bad | 154 | 10,0 |
| | Bad | 154 | 10,0 |
| | Centre | 504 | 32,7 |
| | Good | 434 | 28,2 |
| | Very Good | 294 | 19,1 |
| | Total | 1540 | 100 |
| With whom do you go to the stadium to watch a match? | Alone | 252 | 16,4 |
| | With My Friends | 1064 | 69,1 |
| | With My Family | 224 | 14,5 |
| | Total | 1540 | 100 |
| Who do you think is responsible for the violence in stadiums? | Hooligans | 896 | 58,2 |
| | Athletes | 644 | 41,8 |
| | Total | 1540 | 100 |
| How often do you go to the stadium to watch a match? | Every Two Months | 434 | 28,2 |
| | Once a Month | 154 | 10,0 |
| | Two Weeks One | 112 | 7,3 |
| | Every Week | 840 | 54,5 |
| | Total | 1540 | 100 |

Table 1 shows that most of the participants were in favour of male participants (73.6%). When we examine the highest variables in the categories, single participants (57.3%) in the marital status variable, 26-33 age range

participants (39.1%) in the age variable, high school graduate participants (85.5%) in the education status variable, Sivas sport participants (25.7%) in the variable of which team are you a fan, participants who said no in the variable of do you have a season-pass (86.4%), do you go to away competitions? (83,6%), how do you define your spectatorship as a football spectator? (32,6%), who do you go to the stadium to watch a competition with? (69,1%), who do you think is responsible for the violence in stadiums? (58,2%) and how often do you go to the stadium to watch a competition? (54,5%).

**Tablo 2.** Descriptive Values Related to Scales

| Variables | Minimum | Maksimum | $\bar{x}$ | Ss | Cronbach alpha |
|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | 5,00 | 25,00 | 14,3455 | 4,48260 | ,776 |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | 6,00 | 30,00 | 14,0818 | 4,79764 | ,753 |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | 5,00 | 23,00 | 12,3818 | 4,10007 | ,781 |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | 4,00 | 20,00 | 8,1273 | 3,32074 | ,795 |
| Safety Scale in Sport | 23,00 | 98,00 | 48,9364 | 13,50407 | ,815 |

According to the descriptive statistics results of the scales in Table 2, it is seen that the Cronbach Alpha values of the scale total score and scale sub-dimensions are high.

**Table 3.** Safety Scale in Sport Normality Analysis

| | Kolmogorov-Smirnova | | |
|---|---|---|---|
| | Statistic | df | Sig. |
| Perception of Adequacy of Security Measures Taken (Dimension 1) | ,082 | 1540 | ,000 |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | ,089 | 1540 | ,000 |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | ,084 | 1540 | ,000 |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | ,194 | 1540 | ,000 |
| Safety Scale in Sport | ,070 | 1540 | ,000 |

In Table 3, as a result of the normality analysis of the scale and its sub-dimensions, it was seen that the significance values were greater than 0.05 and it was decided to use nonparametric analyses in the analysis.

**Tablo 4.** Participants' Views on "Gender" Man Witney U Test Results According to Variable

| Scale and Subscale Dimensions | Gender | n | Sequence Centre. | Ranking Total | U Value | z | p |
|---|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | Woman | 406 | 26,4 | 755,64 | 213346,000 | -2,199 | **,028*** |
| | Man | 1134 | 73,6 | 812,02 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | Woman | 406 | 26,4 | 805,02 | 190414,000 | -5,190 | **,000*** |
| | Man | 1134 | 73,6 | 672,50 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | Woman | 406 | 26,4 | 776,72 | 305767,000 | -,921 | ,357 |
| | Man | 1134 | 73,6 | 753,12 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | Woman | 406 | 26,4 | 761,25 | 863261,000 | -1,380 | ,168 |
| | Man | 1134 | 73,6 | 769,33 | | | |
| Safety Scale in Sport | Woman | 406 | 26,4 | 773,18 | 309785,000 | -,395 | ,693 |
| | Man | 1134 | 73,6 | 763,02 | | | |
| p<0.05* | | | | | | | |

When the results of the Man Witney U Test results of the participants' opinions according to the "gender" variable in Table 4 are examined, it is seen that there is a statistically significant difference (p<0.05) in the perception of the adequacy of the security measures taken (dimension 1) and the perception of the prevention of violent incidents by the security forces (dimension 2), while the perception of the use of security systems in stadiums (dimension 3), the perception of the controls at the entrance to the stadiums (dimension 4) and the SSI were found to be statistically insignificant (p>0.05).

**Tablo 5.** Participants' Views on "Marital Status Man Witney U Test Results According to Variable

| Scale and Subscale Dimensions | Marital Status | n | Sequence, Centre. | Ranking Total | U Value | z | p |
|---|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | Married | 658 | 42,7 | 800,50 | 263718,000 | -3,034 | **,002*** |
| | Single | 882 | 57,3 | 730,29 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | Married | 658 | 42,7 | 770,39 | 290080,000 | -,011 | ,991 |
| | Single | 882 | 57,3 | 770,65 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | Married | 658 | 42,7 | 765,17 | 285474,000 | -,547 | ,585 |
| | Single | 882 | 57,3 | 777,65 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | Married | 658 | 42,7 | 770,83 | 289884,000 | -,034 | ,973 |
| | Single | 882 | 57,3 | 770,05 | | | |
| Safety Scale in Sport | Married | 658 | 42,7 | 779,83 | 281946,000 | -,954 | ,340 |
| | Single | 882 | 57,3 | 757,99 | | | |
| p<0.05* | | | | | | | |

When the results of the Man Witney U Test results of the opinions of the participants according to the "marital status" variable in Table 5 are examined, it is seen that there is a statistically significant difference ($p<0.05$) in the perception of the adequacy of the security measures taken (dimension 1), while there is no statistically significant difference ($p>0.05$) in the perception of the prevention of violent incidents by the security forces (dimension 2), the perception of the use of security systems in stadiums (dimension 3), the perception of the controls at the entrance to the stadiums (dimension 4) and the SSI ($p>0.05$).

**Tablo 6.** Participants' Views on "Age" Kruskal Wallis H Test Results According to Variable

| Scale and Subscale Dimensions | Age | n | Sequence Average | Chi-square Value | df | p |
|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | 18-25 age range | 364 | 23,6 | 12,292 | 3 | ,006 |
| | 26 to 33 years old | 602 | 39,1 | | | |
| | 34-41 age range | 294 | 19,1 | | | |
| | 42- 49 age range | 280 | 18,2 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | 18-25 age range | 364 | 23,6 | 26,895 | 3 | **,001*** |
| | 26 to 33 years old | 602 | 39,1 | | | |
| | 34-41 age range | 294 | 19,1 | | | |
| | 42- 49 age range | 280 | 18,2 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | 18-25 age range | 364 | 23,6 | 30,736 | 3 | **,001*** |
| | 26 to 33 years old | 602 | 39,1 | | | |
| | 34-41 age range | 294 | 19,1 | | | |
| | 42- 49 age range | 280 | 18,2 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | 18-25 age range | 364 | 23,6 | 62,591 | 3 | **,001*** |
| | 26 to 33 years old | 602 | 39,1 | | | |
| | 34-41 age range | 294 | 19,1 | | | |
| | 42- 49 age range | 280 | 18,2 | | | |
| Safety Scale in Sport | 18-25 age range | 364 | 23,6 | 27,148 | 3 | **,001*** |
| | 26 to 33 years old | 602 | 39,1 | | | |
| | 34-41 age range | 294 | 19,1 | | | |
| | 42- 49 age range | 280 | 18,2 | | | |

$p<0.05$*

When the Kruskal Wallis H Test results of the opinions of the participants according to the "age" variable in Table 6 are examined, it is seen that there is no statistically significant difference ($p>0.05$) in the perception of the adequacy of the security measures taken (dimension 1), while there is a statistically significant difference ($p<0.05$) in the perception of the prevention of violent incidents by security forces (dimension 2), the perception of the use of security systems in stadiums (dimension 3), the perception of controls at the entrance to the stadiums (dimension 4) and SSI.

**Tablo 7.** "Education Status" of Participants' Opinions Man Witney U Test Results According to Variable

| Scale and Subscale Dimensions | Education Status | n | Sequence, Centre. | Ranking Total | U Value | z | p |
|---|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | High Scholl Graduate | 1316 | 85,5 | 742,20 | 110152,000 | --6,070 | **,001*** |
| | University Graduate | 224 | 14,5 | 936,75 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | High Scholl Graduate | 1316 | 85,5 | 760,74 | 134554,000 | -2,093 | **,003*** |
| | University Graduate | 224 | 14,5 | 827,81 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | High Scholl Graduate | 1316 | 85,5 | 751,36 | 122206,000 | -4,106 | **,001*** |
| | University Graduate | 224 | 14,5 | 882,94 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | High Scholl Graduate | 1316 | 85,5 | 790,46 | 121128,000 | -4,320 | **,001*** |
| | University Graduate | 224 | 14,5 | 653,25 | | | |
| Safety Scale in Sport | High Scholl Graduate | 1316 | 85,5 | 753,52 | 125048,000 | -3,634 | **,001*** |
| | University Graduate | 224 | 14,5 | 870,25 | | | |

p<0.05*

When the results of the Man Witney U Test results of the participants' opinions according to the "education status" variable in Table 7 are analysed, a statistically significant difference (p<0.05) was found in the perception of the adequacy of the security measures taken (dimension 1), the perception of the prevention of violent incidents by the security forces (dimension 2), the perception of the use of security systems in stadiums (dimension 3), the perception of the controls at the entrance to the stadiums (dimension 4) and SSI.

**Tablo 8.** Participants' Opinions on the Question "Which Team Are You a Fan of? Kruskal Wallis H Test Results According to Variable

| Scale and Subscale Dimensions | Which Team Are You a Fan Of? | n | Sequence Average | Chi-square Value | df | p |
|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | Sivas spor | 396 | 25,7 | 4,021 | 3 | ,259 |
| | Kayseri spor | 369 | 24,0 | | | |
| | Konya spor | 387 | 25,1 | | | |
| | Antalya spor | 388 | 25,2 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | Sivas spor | 396 | 25,7 | 5,801 | 3 | ,122 |
| | Kayseri spor | 369 | 24,0 | | | |
| | Konya spor | 387 | 25,1 | | | |
| | Antalya spor | 388 | 25,2 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | Sivas spor | 396 | 25,7 | 11,336 | 3 | **,001*** |
| | Kayseri spor | 369 | 24,0 | | | |
| | Konya spor | 387 | 25,1 | | | |
| | Antalya spor | 388 | 25,2 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | Sivas spor | 396 | 25,7 | 6,151 | 3 | ,105 |
| | Kayseri spor | 369 | 24,0 | | | |
| | Konya spor | 387 | 25,1 | | | |
| | Antalya spor | 388 | 25,2 | | | |
| Safety Scale in Sport | Sivas spor | 396 | 25,7 | 1,287 | 3 | ,732 |
| | Kayseri spor | 369 | 24,0 | | | |
| | Konya spor | 387 | 25,1 | | | |
| | Antalya spor | 388 | 25,2 | | | |

P<0.05*

When the Kruskal Wallis H Test results of the opinions of the participants according to the variable "which team you are a fan of" are examined in Table 8, it is seen that there is no statistically significant difference in the perception of the adequacy of the security measures taken (dimension 1), the perception of the prevention of violent incidents by the security forces (dimension 2), the perception of controls at the entrance to the stadiums (dimension 4) and SSI ($p>0.05$), while a statistically significant difference was found in the perception of the use of security systems in stadiums (dimension 3) ($p<0.05$).

**Tablo 9.** The Opinions of the Participants According to the Variable "Do You Have a Combined Card? Man Witney U Test Results According to Variable

| Scale and Subscale Dimensions | Do You have a Combined Card? | n | Sequence, Centre. | Ranking Total | U Value | z | p |
|---|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | Yes | 210 | 13,6 | 822,77 | 128674,000 | -1,838 | ,066 |
| | No | 1330 | 86,4 | 762,25 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | Yes | 210 | 13,6 | 867,57 | 119266,000 | -3,414 | **,001*** |
| | No | 1330 | 86,4 | 755,17 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | Yes | 210 | 13,6 | 772,83 | 139160,000 | -,082 | ,935 |
| | No | 1330 | 86,4 | 770,13 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | Yes | 210 | 13,6 | 664,10 | 117306,000 | -3,775 | **,001*** |
| | No | 1330 | 86,4 | 787,30 | | | |
| Safety Scale in Sport | Yes | 210 | 13,6 | 803,63 | 132692,000 | -1,162 | ,245 |
| | No | 1330 | 86,4 | 765,27 | | | |

p<0.05*

In Table 9, when the results of Man Witney U Test are analysed according to the variable "Do you have a season-pass?", it is seen that there is no statistically significant difference in the Perception of Adequacy of Security Measures Taken (Dimension 1), Perception of Use of Security Systems in Stadiums (Dimension 3) and SSI (p>0.05), while there is a statistically significant difference in the Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) and Perception of Controls at the Entrance to the Stadiums (Table 4) (p<0.05).

**Tablo 10.** Participants' Opinions on "Do you go to away competitions? Man Witney U Test Results According to Variable

| Scale and Subscale Dimensions | Do you to Away Competitions | n | Sequence Centre. | Ranking Total | U Value | z | p |
|---|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | Yes | 47 | 46,5 | 942,78 | 118874,000 | -6,744 | **,001*** |
| | No | 24 | 23,8 | 736,79 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | Yes | 47 | 46,5 | 922,56 | 123970,000 | -5,953 | **,001*** |
| | No | 24 | 23,8 | 740,75 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | Yes | 47 | 46,5 | 692,33 | 142590,000 | -3,061 | **,002*** |
| | No | 24 | 23,8 | 785,79 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | Yes | 47 | 46,5 | 777,50 | 160524,000 | -,276 | ,728 |
| | No | 24 | 23,8 | 769,13 | | | |
| Safety Scale in Sport | Yes | 47 | 46,5 | 855,67 | 140826,000 | -3,326 | **,001*** |
| | No | 24 | 23,8 | 753,84 | | | |

P<0.05*

In Table 10, the views of the participants according to the variable "Do you go to away competitions? " variable, a statistically significant difference ($p<0.05$) is observed in the perception of the adequacy of the security measures taken (dimension 1), the perception of the prevention of violent incidents by the security forces (dimension 2), the perception of the controls at the entrance to the stadiums (dimension 4) and the SSI, while no statistically significant difference is detected in the perception of the use of security systems in stadiums (dimension 3) ($p>0.05$).

**Tablo 11.** Participants' Opinions on "How Would You Define Your Spectatorship as a Football Spectator? Variable According to Kruskal Wallis H Test Results

| Scale and Subscale Dimensions | How Would You Define Your Spectatorship as a Football Spectator? | n | Sequence Average | Chi-square Value | df | p |
|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | Very Bad | 154 | 10,0 | 109,005 | 4 | **,001*** |
| | Bad | 154 | 10,0 | | | |
| | Centre | 504 | 32,7 | | | |
| | Good | 434 | 28,2 | | | |
| | Very Good | 294 | 19,1 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | Very Bad | 154 | 10,0 | 41,751 | 4 | **,001*** |
| | Bad | 154 | 10,0 | | | |
| | Centre | 504 | 32,7 | | | |
| | Good | 434 | 28,2 | | | |
| | Very Good | 294 | 19,1 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | Very Bad | 154 | 10,0 | 46,864 | 4 | **,001*** |
| | Bad | 154 | 10,0 | | | |
| | Centre | 504 | 32,7 | | | |
| | Good | 434 | 28,2 | | | |
| | Very Good | 294 | 19,1 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | Very Bad | 154 | 10,0 | 113,902 | 4 | **,001*** |
| | Bad | 154 | 10,0 | | | |
| | Centre | 504 | 32,7 | | | |
| | Good | 434 | 28,2 | | | |
| | Very Good | 294 | 19,1 | | | |
| Safety Scale in Sport | Very Bad | 154 | 10,0 | 110,270 | 4 | **,001*** |
| | Bad | 154 | 10,0 | | | |
| | Centre | 504 | 32,7 | | | |
| | Good | 434 | 28,2 | | | |
| | Very Good | 294 | 19,1 | | | |

P<0.05*

When the Kruskal Wallis H Test results of the participants' opinions according to the variable "How would you define your spectatorship as a football spectator?" are analysed in Table 11, a statistically significant difference was found in the perception of the adequacy of the security measures taken (dimension 1), the perception of the prevention of violent incidents by the security forces (dimension 2), the perception of the use of security systems in stadiums (dimension 3), the perception of the controls at the entrance to the stadiums (dimension 4) and SSI ($p<0.05$).

**Tablo 12.** Participants' Opinions on the Question "With whom do you come to the competitions in the stadium? According to Variable Kruskal Wallis H Test Results

| Scale and Subscale Dimensions | With Whom do You the Competitions in the Stadium | n | Sequence Average | Chi-square Value | df | p |
|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | Alone | 252 | 16,4 | 6,708 | 3 | ,035 |
| | With My Friends | 1064 | 69,1 | | | |
| | With My Family | 224 | 14,5 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | Alone | 252 | 16,4 | 29,336 | 3 | **,001*** |
| | With My Friends | 1064 | 69,1 | | | |
| | With My Family | 224 | 14,5 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | Alone | 252 | 16,4 | 5,536 | 3 | ,006 |
| | With My Friends | 1064 | 69,1 | | | |
| | With My Family | 224 | 14,5 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | Alone | 252 | 16,4 | 22,887 | 3 | **,001*** |
| | With My Friends | 1064 | 69,1 | | | |
| | With My Family | 224 | 14,5 | | | |
| Safety Scale in Sport | Alone | 252 | 16,4 | 24,075 | 3 | **,001*** |
| | With My Friends | 1064 | 69,1 | | | |
| | With My Family | 224 | 14,5 | | | |
| P<0.05* | | | | | | |

When the Kruskal Wallis H Test results are analysed in Table 12 according to the variable "with whom do you come to the competitions in the stadium" of the participants' opinions, no statistically significant difference was found in the perception of the adequacy of the security measures taken (dimension 1), the perception of the use of security systems in stadiums (dimension 3) (p>0. 05), while a statistically significant difference was detected in the perception of preventing violent incidents by security forces (dimension 2), perception of controls at the entrance to the stadiums (dimension 4) and SSI (p<0,05).

**Tablo 13.** Participants' Opinions "Who do you think is responsible for the violence in the stadiums?" Man Witney U Test Results According to Variable

| Scale and Subscale Dimensions | Who dou Think is Responsible for the Violence in the Stadium? | n | Sequence Centre. | Ranking Total | U Value | z | p |
|---|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | Hooligans | 896 | 58,2 | 829,24 | 250684,000 | -4,4007 | **,001*** |
| | Athletes | 644 | 41,8 | 728,28 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | Hooligans | 896 | 58,2 | 828,48 | 251174,000 | -4,351 | **,001*** |
| | Athletes | 644 | 41,8 | 728,83 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | Hooligans | 896 | 58,2 | 747,37 | 273616,000 | -1,736 | ,083 |
| | Athletes | 644 | 41,8 | 787,13 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | Hooligans | 896 | 58,2 | 844,61 | 240786,000 | -5,610 | **,001*** |
| | Athletes | 644 | 41,8 | 717,23 | | | |
| Safety Scale in Sport | Hooligans | 896 | 58,2 | 820,41 | 256368,000 | -3,736 | **,001*** |
| | Athletes | 644 | 41,8 | 734,63 | | | |

P<0.05*

In Table 13, when the results of the Man Witney U Test are analysed according to the variable "Who do you think is responsible for the violence in the stadiums? " variable, a statistically significant difference (p<0.05) is observed in the perception of the adequacy of the security measures taken (dimension 1), the perception of the prevention of violent incidents by security forces (dimension 2), the perception of controls at the entrance to the stadiums (dimension 4) and the SSI, while no statistically significant difference (p>0.05) is detected in the perception of the use of security systems in stadiums (dimension 3).

**Tablo 14.** Participants' Opinions on the Variable "How Often Do You Go to the Stadium to Watch a Competition? Variable According to Kruskal Wallis H Test Results

| Scale and Subscale Dimensions | How Often do You go to the Stadium to Wach a Competition? | n | Sequence Average | Chi-squar Value | df | p |
|---|---|---|---|---|---|---|
| Perception of Adequacy of Security Measures Taken (Dimension 1) | Every Two Months | 434 | 28,2 | 94,189 | 3 | **,001*** |
| | Once a Month | 154 | 10,0 | | | |
| | Two Weeks One | 112 | 7,3 | | | |
| | Every Week | 840 | 54,5 | | | |
| Perception of Prevention of Violent Incidents by Security Forces (Dimension 2) | Every Two Months | 434 | 28,2 | 27,607 | 3 | **,001*** |
| | Once a Month | 154 | 10,0 | | | |
| | Two Weeks One | 112 | 7,3 | | | |
| | Every Week | 840 | 54,5 | | | |
| Perception of the Use of Security Systems in Stadiums (Dimension 3) | Every Two Months | 434 | 28,2 | 14,831 | 3 | **,002*** |
| | Once a Month | 154 | 10,0 | | | |
| | Two Weeks One | 112 | 7,3 | | | |
| | Every Week | 840 | 54,5 | | | |
| Perception Of Controls at Entrances to Stadiums (Dimension 4) | Every Two Months | 434 | 28,2 | 114,342 | 3 | **,001*** |
| | Once a Month | 154 | 10,0 | | | |
| | Two Weeks One | 112 | 7,3 | | | |
| | Every Week | 840 | 54,5 | | | |
| Safety Scale in Sport | Every Two Months | 434 | 28,2 | 75,335 | 3 | **,001*** |
| | Once a Month | 154 | 10,0 | | | |
| | Two Weeks One | 112 | 7,3 | | | |
| | Every Week | 840 | 54,5 | | | |

p<0.05*

When the Kruskal Wallis H Test results of the participants' opinions according to the variable "how often do you go to the stadium to watch the competition?" are examined in Table 14, a statistically significant difference was found in the perception of the adequacy of the security measures taken (dimension 1), the perception of the prevention of violent incidents by the security forces (dimension 2), the perception of the use of security systems in stadiums (dimension 3), the perception of the controls at the entrance to the stadiums (dimension 4) and SSI ($p<0.05$).

**DISCUSSION AND CONCLUSION**

In this research, the results of the evaluation of the security measures taken in the stadiums in terms of the spectators in terms of gender, marital status, age, educational status, which team are you a fan of, do you have a season-pass, do you go to away matches, how do you define your spectatorship as a football spectator, with whom do you go to the stadium to watch a match, how often do you go to the stadium to watch a match, who do you think is responsible for the violence in the stadiums are explained below.

When demographic variables were analysed, it was seen that male participants were in the majority. When the highest variables are examined in our research; in the marital status variable of singles, in the age variable of 26 -33 age range, in the educational status variable of high school graduates, in the variable of which team are you a supporter of Sivasspor, in the variable of do you have a season-pass for those who do not have a season-pass, in the variable of do you go to away competitions for those who do not go to away competitions, When the level of football spectatorship was evaluated by the individual himself/herself, it was seen that the level of football spectatorship was at a moderate level, in the variable of with whom do you go to the competitions in the stadiums, it was seen that the participants who said with friends, hooligans were evaluated as responsible for the violence experienced in the stadium, and the frequency of going to the competitions in the stadiums every week (Table 1).

When the gender variable is examined in Table 4, it is seen that there is a statistically significant difference in the sub-dimensions of the perception of the adequacy of the security measures taken and the perception of the prevention of violent incidents by the security forces, while there is no statistically significant difference in the sub-dimensions of the perception of the use of security systems in stadiums, the perception of the controls at the entrance to the stadiums and the SSI. When the studies conducted in the literature are examined, as seen in the demographic variables in our research, there is a statistical difference in the perception of security adequacy in the sub-dimensions of the scale in which male participants are at a higher level than females in the researches, and in the perception of the adequacy of preventing the violent incidents by the security forces, and this difference is the result that the security guards working in the stadiums are sufficient in number and that the security forces are insufficient in preventing the violent incidents (7; 5; 10; 3; 6; 2; 23).

When the marital status variable is analysed, a statistical difference is observed in the perception of the adequacy of the security measures taken, while no statistical difference is observed in the total score of the scale and other sub-dimensions (Table 5).

When the results of the age variable of the participants are analysed in Table 6, a statistically significant difference was found in the sub-dimensions of the perception of the prevention of violent incidents by security forces, the perception of the use of security systems in stadiums, the perception of the controls at the entrance to the stadiums and the SSI. However, no statistically significant difference was found in the sub-dimension of the perception of the adequacy of the security measures taken in the same variable. In the research conducted by Taştan (2019), Yücel et al. (2018), statistical difference was not observed in the age variable. When the studies in the literature are examined, there are results that there is a statistical difference in the sub-dimensions of the perception of being prevented by security forces, the perception of the use of security systems in stadiums, and the perception of controls at the entrance to stadiums (9; 29; 20; 19; 18; 14; 13; 30).

In Table 7, it was seen that there was a statistical difference in all sub-dimensions of the scale and in the total score of the scale. When the studies in the literature are examined, it is seen that there are statistical differences in individuals with higher education level in the education level variable (25; 22; 15).

In Table 8, while there is a statistical difference in the sub-dimension of the perception of the use of security systems in stadiums, there is no statistical difference in the total score of the scale and other sub-dimensions. When the results of the studies in the literature are examined, it is stated that there is a statistical difference in the sub-dimension of the perception of the use of security systems in stadiums and this difference is related to technological sports devices (4; 5; 8; 10).

When the results of the variable "Do you have a season ticket?" are analysed in Table 9, it is seen that there is no statistically significant difference in the perception of the adequacy of the security measures taken, the perception of the use of security systems in the stadiums and the perception of the use of security systems in the stadiums, while there is a statistically significant difference in the perception of the prevention of violent incidents by the security forces and the perception of the controls at the entrance to the stadiums.

When the results of the variable "Do you go to away matches?" are analysed in Table 10, it is seen that there is a statistically significant difference in the perception of the adequacy of the security measures taken, the perception of the prevention of violent incidents by the security forces, the perception of the controls at the entrance to the stadiums and the SSI, while there is no statistically significant difference in the perception of the use of security systems in the stadiums.

When the variable "How would you define your spectatorship as a football spectator?" is analysed in Table 11, a statistical difference was found in the sub-dimensions and total score of the scale.

In Table 12, a statistically significant difference was found in the sub-dimensions of the perception of prevention of violent incidents by security forces, perception of controls at the entrance to the stadiums and SSI according to the variable of who you come to the competitions in the stadium.

When the results of the variable "Who do you think is responsible for the violence in stadiums?" are analysed in Table 13, it is seen that there is no statistically significant difference in the sub-dimension of the perception of the use of security systems in stadiums, while there is a statistically significant difference in the total score of the scale and other sub-dimensions.

When the results of the variable "How often do you go to the stadium to watch a competition?" are analysed in Table 14, a statistically significant difference was found in the scale sub-dimensions and the total score of the scale ($p<0.05$).

As a result; in dimension 1 of the scale sub-dimensions, gender, marital status, educational status, do you go to away matches, how do you define your spectatorship as a football spectator, who do you think is responsible for the violence in stadiums, how often do you go to the stadium to watch competitions, in dimension 2 of the scale sub-dimensions, gender, educational status, do you have a combine card? do you go to away matches, how do you define your spectatorship as a football spectator, with whom do you go to matches, who do you think is responsible for the violence in stadiums, how often do you go to the stadium to watch a match, in dimension 3, age, education level, which team do you support, how do you define your spectatorship as a football spectator? in dimension 4, age, educational level, do you have a combine card, do you go to away matches, how do you define your spectatorship as a football spectator, who do you come to the matches in the stadium with, who do you think is responsible for the violence in stadiums, how often do you go to the stadium to watch a match? Statistical differences were found in the variables of age, education status, do you go to away matches, how do you define your spectatorship as a football spectator, how do you define your spectatorship as a football spectator, who do you go to the matches in the stadium with, who do you think is responsible for the violence in the stadiums, how often do you go to the stadium to watch a match?

Based on the findings of this research, several recommendations can be proposed:

The study identified significant differences in perceptions of security measures based on gender and age groups, suggesting that different demographic groups have distinct security needs. Security measures should therefore be tailored to address the specific concerns of these groups. For instance, specific arrangements could be made to ensure that female spectators have easier access to security personnel and are more informed about security protocols.

Given the observed differences in security perceptions based on educational background, it would be beneficial to implement educational campaigns and programs aimed at informing spectators about the effectiveness of security measures and stadium regulations. These programs could help increase trust in security measures by ensuring that spectators better understand how these systems function.

The research highlights that some groups perceive the technological security systems in stadiums as inadequate. This perception may indicate that current systems are not meeting expectations. Therefore, it is crucial to upgrade these technologies and enhance their effectiveness. Additionally, educating spectators on how these systems work and their role in ensuring safety could improve their perception and trust in these systems.

Findings related to the frequency of attendance and how spectators define their level of engagement suggest the need for strategies to strengthen fans' connection to the stadium experience. Such strategies could include supporting fan groups, organizing special events, and developing loyalty programs to encourage more frequent attendance and deeper engagement with the sport.

The study indicates that security forces are perceived as insufficient in preventing violence in stadiums. In response, it is recommended to increase the number of security personnel, develop more effective intervention techniques for handling violent incidents, and address the root causes of violence through comprehensive preventative measures.

These recommendations aim to enhance the effectiveness of security measures in stadiums and improve spectators' perceptions of safety, ultimately contributing to a more secure and enjoyable spectator experience.

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# Communication and Its Importance in Sports

Şinasi ÖZSAYDI [1A], Özlem Sinem USLU [2B]

Kıvılcım KAPLAN [3C], Alpaslan GÖRÜCÜ[2D]

[1] *Osmaniye Youth and Sports Provincial Directorate, Osmaniye / TURKEY*
[2] *Selcuk University, Sports Science Faculty, Department of Physical Education Teaching, Konya, Turkey.*
[3] *İstanbul Sabahattin Zaim University, Sports Science Faculty, Department of Physical Education and Sports Teaching, İstanbul, Turkey.*
*Correspondence Address: Şinasi ÖZSAYDI e-mail: sinasiozsaydi@hotmail.com*


*Ethical Statement: It is declared that scientific and ethical principles were followed while conducting and writing this study and that all sources used were properly cited.*

*(Date Of Received): 13.07.2024 (Date of Acceptance): 18.12.2024 (Date of Publication): 31.12.2024*
A: Orcid ID: 0000-0003-0291-8248 B: Orcid ID: 0000-0002-7605-8511
C: Orcid ID: 0000-0003-1862-9109 D: Orcid ID: 0000-0003-0396-7658

**Abstract**

This review was carried out to systematically examine the existing literature on the subject. The importance and impact of communication in the world of sport has been systematically evaluated through literature review, scientific articles, books, reports and other reliable sources. Communication is a fundamental process that facilitates the transfer of information, feelings and thoughts between individuals in the field of sport. Sport communication encompasses the interaction of athletes with coaches, teammates, media and fans and plays a critical role at all levels of sport. A favourable communication environment can influence athletes' performance, enhance team cohesion and emerge as a critical factor on the path to success.

As a result, sport communication is a critical factor in enhancing performance, strengthening team cohesion and building healthy relationships with other stakeholders in the world of sport. Developing and implementing effective communication strategies is important to support the long-term success of both individual athletes and teams. Therefore, sport managers, coaches and athletes should prioritise communication and strive to achieve success in this area.

**Keywords:** Communication, Sports, Transfer of information, Relationships

**İletişim ve Sporda Önemi**

**Özet**

Bu derleme, konuyla ilgili mevcut literatürü sistematik bir şekilde incelemek amacıyla gerçekleştirilmiştir. Spor dünyasında iletişimin önemi ve etkisi, literatür taraması, bilimsel makaleler, kitaplar, raporlar ve diğer güvenilir kaynaklar üzerinden sistematik olarak değerlendirilmiştir. İletişim, bilgi, duygu ve düşüncelerin spor alanında bireyler arasında aktarılmasını kolaylaştıran temel bir süreçtir. Spor iletişimi, sporcuların antrenörlerle, takım arkadaşlarıyla, medya ve taraftarlarla etkileşimini kapsar ve sporun her seviyesinde kritik bir rol oynar. Uygun bir iletişim ortamı, sporcuların performansını etkileyebilir, takım uyumunu artırabilir ve başarı yolunda kritik bir faktör olarak ortaya çıkabilir.

Sonuç olarak, spor iletişimi, performansı artırma, takım uyumunu güçlendirme ve spor dünyasındaki diğer paydaşlarla sağlıklı ilişkiler kurma konusunda kritik bir faktördür. Etkili iletişim stratejileri geliştirmek ve uygulamak, hem bireysel sporcuların hem de takımların uzun vadeli başarısını desteklemek için önemlidir.

Dolayısıyla, spor yöneticileri, antrenörler ve sporcular iletişime öncelik vermelidir ve bu alanda başarı elde etmeye çalışmalıdır.

**Anahtar Kelimeler:** İletişim, Spor, Bilgi Transferi, İlişkiler

## INTRODUCTION

Human communication ability influences and shapes interactions in every aspect and environment of daily life. It is through communication that individuals both influence others and are influenced by them, thus realizing themselves as social beings. People communicate to be able to be together with others, understand and express themselves, and impact others, in other words, to socialize (34).

Communication among living beings, involving the sharing of meanings and conducted through various symbols, fundamentally enables us to express ourselves, understand others, be liked by others, love others, learn and teach, express our emotions, achieve success, solve problems and conflicts, manage and be managed, and live either individually or collectively in everyday and professional life (34).

### Communication

Communication is a multidirectional social process that enables the transfer of information, thoughts, feelings and meaning between individuals or groups. This process is based on the transmission of the message between the sender (source) and the receiver (target) and the creation of mutual meaning. Communication can take place through linguistic and non-linguistic elements (e.g. body language, gestures, signs) and can be supported by audio, written or visual means. Communication is a dynamic interaction, often shaped by social, cultural and psychological factors (6), (31).

Communication is a complex and multidimensional process that enables the transfer of information, thoughts, feelings and meanings between individuals or groups. This process is defined as the exchange of information, notification and communication using tools such as telephone, telegraph, television and radio. Communication means the verbal exchange of thoughts, the understanding of two people and the expression of people themselves. It is also used in the sense of stimulating the memory of the person receiving the message to respond in accordance with the expectation of the sender of the message and the social interaction established through messages (21).

### Characteristics of Communication

Communication is an inevitable process; even our silence can convey rich nonverbal messages. Behaviors such as facial expressions, posture, gestures, and attire signal important information about our attitudes. It is crucial to consider unintentional messages in communication. Communication generally occurs on two levels: content messages (pertaining to the discussed topic) and relational messages (signals indicating the emotional states between individuals). Communication is irreversible; words and actions remain in others' memories and cannot be retracted. Therefore, careful selection of words in communication is necessary, as a momentary reaction or criticism can have a lasting impact (10).

### Types of Communication

Communication can take place in various ways and can be classified into different types. These are;

Intrapersonal communication: A similar communication between two beings can sometimes take place within the individual himself/herself. Observing one's own inner world, realising one's needs, feeling sadness or happiness can be given as examples of this type of communication. In this context, internal communication can be defined as the interpretation of certain messages that individuals create within themselves (18).

Interpersonal communication: This is the communication that individuals carry out directly with each other through verbal and non-verbal means. Interacting with each other, individuals send and receive mutual messages. Here, a meaningful and interactive communication process takes place between individuals.

Organisational communication: Organisational communication can be defined as a structure in which the activities of individuals are coordinated within the framework of division of labour to achieve a specific

organisational goal while interacting with their environment. Organisations that interact with their environment typically have a hierarchical organisation. Therefore, individuals within the organisation strive to fulfil predefined roles and the nature of the relationships between superiors and subordinates is specified in organisational charts.

Mass communication: It can be defined as the transmission of various types of messages to a large and dispersed audience using means developed for this purpose (18).

**The Importance of Communication**

Every individual should possess at least a basic understanding of communication because it is one of the central elements in our lives (34). Effective communication helps people solve problems in their professional lives and enhances and sustains relationships in their personal lives. Communication experts believe that poor communication lies at the root of many problems, and effective communication is seen as the key solution (14). Understanding communication theories, research, and applications can lead to meaningful changes in one's life. Communication principles and practices can resolve conflicts among friends, family, and even on an international scale, provided they are perceived accurately. While learning and applying effective communication won't magically make the world a problem-free place—thinking of communication as a magic wand would be misguided-good communication can prevent many problems and contribute to solving many others. Communication is ubiquitous and omnipresent, playing a significant role in all stages of our lives. Regardless of your interests and goals, the ability to communicate effectively improves and enriches your life (19), (26).

**Communication Process and its Elements**

Communication, in its simplest form, involves a sender or source who expresses their feelings, thoughts, or information using specific symbols, requiring a receiver who decodes and understands these symbols. Other elements involved in the communication process include the message, encoding, decoding, channel, feedback, and noise (12).

Source: In the communication process, it is the person or persons who initiate communication. Coding comes into play when the source prepares a message to the target. The source encodes the message or message and sends it to the receiver. In simple terms, coding is the transformation of the information that the source wants to convey into a series of symbols and signals. In communication, the source uses symbols that contain the same meanings as the receiver itself (43).

Channel: In the communication process, it is the path that enables the message to be transmitted between the sender (source) and the receiver. This path involves the transport of the message through physical, technical or symbolic means. Channels vary depending on the type of means of communication and the nature of the message transmitted (13).

Receiver: In the communication process, it refers to individuals or groups who perceive, interpret and respond verbally or non-verbally to messages from the source through biological, psychological and social processes. The receiver processes and makes sense of the message by using his/her cognitive abilities to understand the content of the message. The receiver's response is shaped by the expectations, experiences and knowledge of the receiver of the message. This process is influenced by various factors such as individual differences, cultural context and current psychosocial situations.

Noise: Noise is any element that can occur at any stage of the communication process and can confuse or even disrupt communication. Noise can interfere with the correct transmission of the message and reduce the efficiency of communication. These elements can be examined in four main groups: physical, physiological, psychological and semantic: Physical noise is external noise such as environmental sounds and background noise; physiological noise is caused by the physical state of individuals such as fatigue, hunger or illness; psychological noise is caused by the mental state of individuals such as prejudices, stress and distraction; semantic noise is confusion caused by the content of the message such as the complexity of the language used or cultural differences. Noise can seriously affect the effectiveness of communication and should therefore be minimised as much as possible in the communication process (13).

Feedback: In the communication process, the message that the receiver sends to the source to indicate his/her reaction or comment in response to the message from the source to the receiver is called feedback. The fact that the source is a knowledgeable, reliable person, that the message is clear, understandable, accurate, that the channel is selected in accordance with the message created, that the receiver's perception ability is wide, that he/she is willing to communicate, and that there are no noise sources in the communication process will emerge as the main factors that ensure successful and effective communication (43).

Understanding these elements helps in comprehending how communication functions and how effective communication can be achieved by ensuring clarity, feedback, and minimizing noise (12).

**Communication Hindering Processes**

Communication hindrances can occur at the individual, dyadic (between two people), or group levels. The successful delivery of content depends on the process. Therefore, the clearer and more effective the process, the clearer the communication. Factors that diminish or completely eliminate the effectiveness of the process include:

Cultural Level of the Individual: If a person does not have sufficient knowledge about the message they want to convey, their cultural level may hinder effective communication. For example, a group member speaking on topics they are unfamiliar with.

Process (Delivery of Message): The manner in which a message is delivered can become a habit or a defensive behavior in an individual's life. For instance, if a group member laughs when faced with a difficult situation to alleviate tension, this behavior may detract from the message's intent. Process as a Defense Mechanism: If the process, or the behavioral pattern that constitutes the message, is still being used as a defense mechanism against real or perceived threats, its effectiveness in communication diminishes (5).

Effective communication forms the foundation of public relations, necessitating a focus on factors that hinder communication. According to the message, the target audience can be divided into four categories:

Target Audience: These are recipients for whom messages are directly tailored and prepared.

Unintended Audience: These are individuals, groups, or organizations who were not intended to be affected by the transmitted messages.

Interested Third Parties: Communication with this group primarily involves journalists, opinion leaders, and influential figures.

Unrelated Audience: This group includes individuals whose reactions are insignificant to those preparing and transmitting the messages (8). Understanding these hindrances and categorizing the audience appropriately ensures that communication efforts are targeted and effective, enhancing overall message reception and impact.

**Communication Models and Their Use in Sports**

The diversity in communication structures that can be referred to as communication models is fundamentally rooted in concerns regarding the "direction of communication." Within groups, the directionality of messages (opinions, suggestions, requests, commands, directives, etc.) can vary as one-way, two-way, or multi-way. This, in a way, determines the communication models. In other words, whether a message is conveyed without expecting a response or with the anticipation of receiving a response necessitates different structuring (38).

Multi-way communication signifies a different communication model in this regard. As the number of members within a group increases, so does the emergence of the same number of messages. Therefore, each group, in order to achieve its goals and succeed, must determine its communication structure based on its own dynamics and the number of members in the group. Particularly in sports teams, where the number of athletes in each sport may vary, and due to differences in athletes' structural characteristics and coaches' leadership models, communication models may not be uniform (38).

Group communication is accepted to evolve based on the following four main models:

1. Circle: In the 'circle model' applied within a basketball team comprising athletes and coaches, it is observed that each athlete has equal chances in terms of communication, being able to interact with two athletes adjacent to them. The highest effort in terms of group members' satisfaction, endeavor, and success is observed within the 'circle model'. Therefore, it is necessary for each athlete within the team to have equal voice, ensuring that their thoughts, views, suggestions, criticisms, and experiences are taken into account. This model promotes not only equitable participation but also enhances overall team cohesion and morale. By fostering an environment where every team member feels heard and valued, the circle model reduces misunderstandings and conflicts, thereby creating a more collaborative and supportive atmosphere. Moreover, it facilitates the development of stronger interpersonal relationships among team members, which is crucial for maintaining motivation and resilience during challenging periods. Implementing the circle model can lead to improved decision-making processes, as diverse perspectives and insights are considered, ultimately contributing to more innovative and effective strategies in both training and competitive scenarios. (39).

2. Network: If there is a communication system based on the 'Network' model within the team, it is observed that it relies on mutual relationships among all athletes while maintaining equity, allowing each athlete to communicate with their teammates and coach. With this model, each athlete has the opportunity to interact with their peers, and the coach engages in dialogue with all athletes. This approach promotes transparency and inclusivity, ensuring that every team member has access to essential information and can contribute to discussions. It also fosters a sense of unity and collective responsibility, as athletes are encouraged to support each other and share insights freely. The network model can enhance problem-solving abilities and decision-making processes by incorporating diverse viewpoints and experiences. Furthermore, it helps in identifying and addressing any issues promptly, as open lines of communication allow for immediate feedback and adjustments. (39).

3. Intermediate Models (Chain, "Y"): In this model, athlete A has communication chances only with B, athlete J solely with I, and athlete F-Coach-G has the opportunity to communicate with two athletes adjacent to them (two individuals). Particularly in team sports, ensuring team cohesion and dynamics is highly problematic with this model. This is because success in team sports depends not on individual performance but on the aggregate performance of the team members. In such a communication model, teams have no chance of achieving success. Teams employing this communication model will gradually lose friendship, trust, and belief in the coach over time (39).

In the 'Y' model, unfairness in terms of communication opportunities among athletes themselves and between athletes and the coach increases similarly to the chain model. While athletes A and B can establish close communication with the coach, athlete I has communication only with I, and athlete C has the chance to communicate with both the coach and athlete D. From the coach's perspective, there is a significant imbalance in communication with team athletes. This is because the coach communicates with A, B, and athlete C, neglecting the issues of other athletes and struggling to convey messages to them (39).

4. Wheel Model: The 'T' model exhibits a complete mismatch and unfairness that is entirely unsuitable for sports teams, leading to detrimental effects on team performance. Here, each athlete can only communicate with their coach, with no provision for athlete-to-athlete communication. While this communication model may be suitable solely for coach-athlete interactions, it tends to diminish trust, respect, love, and tolerance among athletes. Therefore, the 'T' model cannot serve as an effective communication model in sports teams.

In this context, research on group concepts and dynamics has shown that variations in communication structures within group formations yield diverse outcomes among group members (33). These include:

- Activity: Effort exerted by group members.

- Achievement: Quantitative and qualitative outputs and goal attainment speed.

- Satisfaction of Group Members: Each of these attributes represents fundamental concepts in sports.

The communication model adopted by a coach towards their athletes can sometimes yield positive or negative outcomes on team structure. If applied within a team with weak internal dynamics, the 'T' model can completely eradicate an already fragile communication structure. Conversely, effective communication

among athletes and the implementation of a 'network' model by the coach can elevate communication among team members to a higher level, leading to collective achievements and enhanced motivation and satisfaction for each athlete. In the realm of sports, although the 'Wheel' model may appear optimal for internal team communication, it risks placing undue emphasis on the coach as the sole authority, pushing athletes into the background and potentially reducing their commitment both in training and competition. This decline in athlete performance naturally results in failure. By attributing blame solely to coaches for the team's and athletes' failures, internal satisfaction among athletes becomes improbable (39).

While models like 'Z' and 'Y' serve as transitional forms between the 'Circle' and 'Wheel' models, moving from the Circle model towards the 'T' model shows a subjective decrease in athletes' efforts, albeit an increase in organizational efforts among athletes. Correspondingly, a qualitative decrease can also be observed in group members' satisfaction. Therefore, in sports clubs, coaches must undertake the crucial task of managing both internal and external communication of their athletes, setting clear communication structures and boundaries between athletes and coaches (38).

**Communication and Sports**

It can be said that communication as a system is of great importance both individually and socially in the context of organizing relationships that are disconnected and scattered, and achieving balance between individual and societal goals (24).

Sport plays a crucial role in the formation and perpetuation of many valued social norms. It is known that through communication, interaction between individuals and societies occurs within the concept of sport. Having an area within the concept of sports where individuals can express themselves supports their development within a process of socialization, at least by providing support for such activities (40).

Both in team sports and individual sports, the primary goal is to achieve top-level performance and success. Strengthening the communication network in sports environments makes it possible to increase harmony among individuals and within teams, thus achieving success (15).

Sport is a powerful cultural institution for the formation, direction, and revitalization of personality interactions across local, national, and global boundaries. It is also a tool that brings people together regardless of race, gender, religion, or language (16).

A sports community is not only composed of coaches, athletes, and referees but also dynamically includes spectators in sports events, making it a widespread, effective, complex, and sometimes limited community. In addition, sports media, amateur and professional sports organizations, sports management bodies, and fan clubs are also part of the sports world. Completing and sustaining membership and participation in sports communities communicationally is crucial for constructing and interpreting the sports experience, necessitating the realization of interpersonal communication, organizational communication, and mass communication concepts (22).

Communication is crucial in supporting successful participation in sports and physical activity environments. For example, in terms of athlete-coach relationships, effective communication facilitates the development of shared knowledge and understanding about the goals and beliefs of both the coach and the athlete (29).

Deci and Ryan (2000) emphasize that coaches should use supportive communication methods, which include allowing athletes to make meaningful choices, acknowledging their negative emotions, providing constructive feedback, and showing interest in their needs. Communication in sports environments is vital for both individual interactions and the socio-cultural dynamics among team sports participants in educational and club settings. The education athletes receive throughout their sports careers helps them perform well and effectively interpret, understand, and communicate information, fostering harmony within their surroundings (32), (42).

The empirical studies conducted by Kassing et al. (2024), Chung and Jeong (2023), Isaikina and Navalna (2022), Akdagcık and Mamak (2016), Jeffers (2015) and Green (2005) on the concept of communication and sport also show that effective communication strategies significantly increase athletes psychological resilience,

team cohesion and performance, and that coach-player interaction plays a critical role in athletes' motivation levels and strategic decision-making processe (23), (7), (17), (2), (20), (11).

**Coach-Athlete Communication**

In coaching, the concept of communication is utilized to motivate, persuade, assist in problem-solving, evaluate activities and movements, provide feedback, and inform (27), (25). When evaluated from the perspective of athletes, those with high communication skills are known to express themselves better, and psychological skills affect performance as much as motor skills (33).

In the communication process, it is crucial for coaches to use communication skills such as respect, valuing, positive approach, consistency, effective listening, non-verbal communication, reinforcement principles, providing informational messages, and teaching sport skills based on knowledge and experience for coach-athlete interactions (28). Ansel and Orlick (2000) also emphasize the necessity for coaches to exhibit positive behaviors such as honesty, positivity, constructiveness, empathy, and making decisions compatible with the team's thought structure (4), (41).

The physical and psychosocial development of athletes is highlighted as an important factor in the coach-athlete relationship during the communication process. Coaches and athletes sometimes engage in a professional partnership or relationship, spending time together and collaborating to achieve success. In this regard, a positive coach-athlete relationship not only enhances athlete motivation and satisfaction but also provides opportunities for athletes to develop their skills in sportive environments where positive relationships and communication processes occur (3).

It has been noted that the closeness between coach and athlete is directly related to the duration of collaboration and the time spent together (35). Consequently, increased frequency of shared time and longer periods of working with the same coach enhance athletes' communication skills. Spending time together facilitates better understanding of mutual feelings and thoughts within the framework of personality compatibility, thereby easing communication. In other words, long-term collaboration with the same coach significantly influences the establishment of positive communication. It has been suggested that the positive attitudes and behaviors gained through sports, such as socialization and personality traits, may increase over time due to the more positive relationships athletes develop with their experienced coaches through extended participation in sports (1).

## CONCLUSION

Communication is a crucial factor for success in the field of sports. Effective communication within sports teams helps establish trust, respect, collaboration, and motivation among athletes. This fosters team cohesion and maximizes performance (37), (7). A conducive communication environment enables athletes to perform more efficiently both in training sessions and competitions. Different communication models have varying effects within sports teams. For instance, the 'Circle' model provides each athlete with equal participation and the ability to communicate with everyone within the team, fostering increased engagement and a sense of value for everyone's ideas. Conversely, hierarchical models like the 'T' model feature one-way communication, which can adversely affect team dynamics (9), (30).

Research deepening the relationship between sports and communication demonstrates that successful teams generally rely on robust communication foundations. It is critically important for coaches to maintain balanced and open communication among athletes and between athletes and themselves to enhance team unity and performance.

In conclusion, communication in sports impacts not only the flow of information but also team spirit, motivation, and success (11), (36). Establishing a strong communication environment supports the individual and team development of athletes and forms a crucial foundation for long-term success. Therefore, sports teams should prioritize communication and develop appropriate communication strategies.

**Recommendations**

Regular communication trainings can be organised for coaches and athletes.

Open and transparent communication channels can be established within the team.

It is thought that effective use of different communication models will be more beneficial.

Utilising modern communication technologies will be important for effective communication.

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# An Examination of The Relationship Between Aggression and Anger Levels and Psychological Performance of Students at A Faculty of Sports Sciences

Tarkan HAVADAR [1A], Arslan KALKAVAN [2B], Metin ÖZLÜ [3C]

[1] *Kafkas University Sarıkamış Faculty of Sports Sciences, Department of Physical Education and Sports Teaching, Kars / TURKEY*
[2] *Recep Tayyip Erdogan University, School of Physical Education and Sports, Department of Sports, Rize, Turkey.*
[3] *Kafkas University Sarıkamış Faculty of Sports Sciences Department of Sports Management Teaching, Kars, Turkey.*
*Correspondence Address: Metin ÖZLÜ e-mail: metinozlu42@gmail.com*


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A: Orcid ID: 0000-0003-3122-0324 B: Orcid ID: 0000-0001-9439-4976 C: Orcid ID: 0000-0002-1657-4717

**Abstract**

The aim of this study is to examine the relationship between aggression and anger levels and psychological performance among students of the Faculty of Sports Sciences. The study was conducted with students enrolled at the Kafkas University Sarıkamış Faculty of Sports Sciences during the 2023-2024 academic year. The sample of the study consisted of a total of 473 students, including both female and male students from the Faculty of Sports Sciences at Kafkas University Sarıkamış. The data collection tools used in the research consisted of two sections. The first section was the "Personal Information Form" to determine the demographic characteristics of the participants, and the second section included the "Aggression and Anger Scale in Sports (SSÖÖ)" and the "Psychological Performance Evaluation Scale in Sports (SPPDÖ)". Non-parametric techniques were used in the data analysis.

According to the findings of the study, the aim was to understand the potential relationship between aggression and anger levels and psychological performance by using the variables of gender, age, class, department, and sports branch. The analysis revealed that the anger levels of female students were significantly higher than those of male students in the anger sub-dimension. A significant difference was found in the aggression sub-dimension between the 21-23 age group and the 27 and older age group. Additionally, the 21-23 age group had a lower motivation level compared to the other age groups. No significant difference was found in other sub-dimensions. The findings highlight that demographic factors such as gender, age, and sports branch contribute to significant differences in psychological factors such as anger and aggression among university students.

**Keywords:** University, Aggression, Anger, Students, Psychological Performance

**Spor Bilimleri Fakültesi Öğrencilerinin Saldırganlık ve Öfke Düzeyleri ile Psikolojik Performansları Arasındaki İlişkinin İncelenmesi**

**Özet**

Bu araştırmanın amacı, Spor Bilimleri Fakültesi öğrencilerinin saldırganlık ve öfke düzeyleri ile psikolojik performansları arasındaki ilişkinin incelenmesi amaçlanmıştır. Araştırma 2023-2024 eğitim öğretim yılında Kafkas Üniversitesi Sarıkamış spor bilimleri fakültesindeki öğrenim gören öğrenciler oluşturmaktadır. Araştırmanın örneklemini Kafkas Üniversitesi Sarıkamış spor bilimleri fakültelerinde okuyan kadın ve erkek olmak üzere toplam öğrenci 473 oluşmaktadır. Araştırmada kullanılan veri toplama araçları iki bölümden oluşmaktadır. Birinci bölümde katılımcıların demografik özellikleri belirlemek için "Kişisel Bilgi Formu" ikinci bölümde 'Sporda Saldırganlık ve Öfke Ölçeği-SSÖÖ" ile Sporda Psikolojik Performans Değerlendirme Ölçeği (SPPDÖ)" kullanılmıştır. Veri analizin de Non-parametrik tekniklerden yararlanılmıştır.

Araştırmanın bulgularına göre; Spor Bilimleri Fakültesi öğrencilerinin cinsiyet, yaş, sınıf, bölüm ve spor branşı değişkenleri kullanılarak saldırganlık ve öfke düzeyleri ile psikolojik performansları arasındaki potansiyel ilişkinin anlaşılmasını amaçlamıştır. Yapılan analizlerde, Spor Bilimleri Fakültesi öğrencilerinin cinsiyet ve öfke alt boyutunda Kadın öğrencilerin öfke düzeylerinin, erkeklere göre; yaş grubu ve saldırganlık alt boyutunda 21-23 yaş grubu ile 27 yaş ve üzeri grubu arasında; saldırganlık düzeyinde, anlamlı bir fark bulunmuştur. Ayrıca 21-23 yaş grubu, diğer yaş gruplarına göre daha düşük bir güdülenme düzeyine sahip olduğu diğer alt boyutlarda anlamlı bir farka rastlanmamıştır. üniversite öğrencilerinin cinsiyet, yaş ve spor dalı gibi demografik faktörlerin, öfke ve saldırganlık gibi psikolojik faktörlerde anlamlı farklılıklar oluşturduğunu ortaya koymaktadır.

**Anahtar Kelimeler:** Üniversite, Saldırganlık, Öfke, Öğrenciler, Psikolojik Performans

## INTRODUCTION

Time spent on university campuses offers students several important experiences, such as meeting a new environment, following lectures in lecture halls, and participating in sports and cultural events. This process includes vital events, including students developing skills such as managing their expenses for the first time, starting new relationships, understanding others' feelings, and expressing their thoughts. However, one of the problems that may arise if needs are not met and expectations are not realized in this process may be anger and aggression (11). The beginning years of university education also include the psychological difficulties experienced by young people in the process of adapting to a new city and academic life, coping with individual difficulties, and assuming their own responsibilities (4;28). Participation in sports, especially hindering motivations such as success, superiority, and prestige, is often considered an important factor that leads to a decrease in the sports performance of university students. It is known that this situation also contributes to the emergence of feelings of anger and aggression in students (15). Given the diverse cultural and social backgrounds of college students who come together, their future roles and psychological health are affected not only by their athletic performance but also by their habits of aggression and anger. The success of these students in sports will not only contribute to physical health but will also provide advantages in future leadership roles by encouraging the development of important skills such as discipline, teamwork, and leadership (19).

The university years are very important periods for students to set goals for their future investments and create a career plan. However, a large portion of university students have problems with career decisions, and it is observed that a significant portion of them have higher levels of psychological negativity (such as anxiety, uneasiness, and depression) and lower levels of psychological well-being (24). This situation, which occurs due to low psychological well-being, rapidly increases the tendency towards anger, aggression, and violence among university students, which constitute a global public health problem affecting families and communities (16). Spielberger defined anger as "an emotion ranging from mild discomfort to severe

resentment and anger" (49). Considering experiences in the university environment, situations such as domestic incidents, mistreatment leading to violence, limited access to food and sleep, workplace obstacles, the effects of failures, and emotional and sexual dissatisfaction reflect real challenges faced by both individuals and society (41). Aggressive behavior is defined as "any behavior intended to harm others" (25). Psychological resilience, defined as an individual's ability to overcome difficulties, refers to individuals controlling the difficulties that may arise due to acting with a sense of commitment (33). Numerous studies show that college athletes experience positive effects on their physical, mental, and personality development by participating in sports activities. These positive effects include strengthening the will, creating mutual solidarity, increasing self-confidence, self-control, anger control, gaining the ability to avoid aggressive behavior, and learning respect for others (50; 10). Social competence, which is an important dimension of self-efficacy that is associated with many psychological structures and affects various behaviors, is thought to be related to anger and anger expression styles as well as aggression (5; 6; 7). Cicchetti expressed psychological development as a process in which an individual can develop into someone who can adapt positively to the environment. This process occurs in situations of great difficulty, serious threat, or trauma (13). Leary et al. argue that anger acts as a bodily signal and can be affected by numerous biological, psychological, interpersonal, and cultural factors. Therefore, aggression and anger can also be considered emotional behaviors (36).

In sports activities, situations such as competitive drive, excessive effort, and the high stress of winning can lead the individual to exhibit aggressive and uncontrolled behavior (20). Encouraging university athletes to identify and evaluate the qualities necessary for success in their field (32), Loehr's (37) development of a psychological performance scale to measure athletes' psychological abilities during competitions provided coaches and athletes with the opportunity to recognize their own abilities. Understanding one's own mental strengths and weaknesses, oneself, and one's limits enables the individual to define these limits and set effective goals. In this context, seven basic psychological skills have been defined: Negative energy, self-confidence, attention control, motivation level, visualization and imagination, positive energy, and attitude control (9). This process not only provides an effective platform for athlete-focused goal setting and the development of future training programs, but also brings about positive changes in athletes' increased awareness of the strengths and weaknesses of their performance (9).

**Research Purpose**

The purpose of this study is to examine the relationship between aggression and anger levels and the psychological performances in the students of the Faculty of Sports Sciences and reveal the differences in terms of the demographic variables in light of scientific data.

**Problem Statement**

It has been suggested in different studies that the aggression and anger levels and the psychological performance of Faculty of Sports Sciences students affect their success. In this study, it is considered important to investigate the anger and aggression levels and psychological performance of the students of the Faculty of Sports Sciences.

Moreover, investigating the impact level of these factors and the relationship levels between them is important in terms of their impact on the success and performance of the students in the Faculty of Sports Sciences. Within this context, answers were sought to answer the following research questions:

1. What are the students' aggression and anger levels?
2. Is there a significant relationship between students' aggression levels and anger levels?
3. Do students' aggression and anger levels show any statistically significant differences by

a. Gender,

b. Age,

c. Year in the school,

d. Program of study, and

e. Sports branches?

## METHOD

### Data Collection Instrument

Study data were collected using the "Competitive Aggressiveness and Anger Scale-CAAS" and the "Psychological Performance Evaluation Scale in Sports (PPESS)". CAAS was adapted into Turkish by Gürbüz, Kural, and Özbek in 2019. PPESS has a two-dimensional structure (1-6: Anger Dimension and 7-12: Aggression Dimension). The "Psychological Performance Evaluation Scale in Sports (PPESS)" developed by Aydoğan ve Honaş (3) consists of 32-item and has 3-factor structure. The three sub-dimensions of the Psychological Performance Evaluation Scale in Sports were adapted as the physical and formal anxiety, motivation, and self-confidence sub-dimensions.

### Population and Sample of the Research

In our study, the survey research model, which is preferred among quantitative survey methods, was used. It is the process that enables the development of the learning model and the emergence of desired behavioral patterns in people by describing past and present research with the relational screening model (29). In this research, the general survey model, which aims to objectively describe a past or present situation, was used. On the other hand, the relational screening model aims to determine the relationship between two or more variables. In this model, the focus is on the existence of co-change between variables and the nature of this change (30).

The data were collected from students studying at Kafkas University Sarıkamış Faculty of Sports Sciences. The data collection process was conducted face-to-face and remotely (online scale forms). In other words, the researcher reached the sample determined by the random sampling method both face-to-face and remotely through online scale forms. The main purpose here was to increase the generalizability (external validity) of the research results by reaching as many participants as possible.

The population of the study consists of students studying in the departments of Physical Education and Sports Teaching, Coaching Education, Sports Management (Regular Education), and Sports Management (Evening Education) at Kafkas University Sarıkamış Faculty of Sports Sciences in the 2023-2024 academic year. An ethics committee approval was obtained from the Kafkas University Social and Human Sciences Scientific Research and Publication Ethics Board of Ethics with the date 24.01.2024 and number 53. The sample of the study consists of a sufficient number of students at Kafkas University Sarıkamış Faculty of Sports Sciences during the 2023-2024 academic year selected using the random method and calculated according to statistical techniques. The reason for using the random sampling method is to give everyone in the population an equal chance of being selected. The sample group of the study consists of a total of 473 students, female (n = 194) and male (n = 279), studying at Kafkas University Sarıkamış Faculty of Sports Sciences.

### Statistical Analysis of Data

The data obtained with the data collection instruments used in the study were analyzed in a computer environment using the IBM SPSS Statistic 25 statistical analysis program. Descriptive analysis results were presented in graphs and tables, including arithmetic mean (X), standard deviation (SD), frequency (n), percentage (%), minimum (min.), and maximum (max) values. Cronbach's alpha value was calculated to determine the sub-dimensions and total internal consistency coefficients of the Competitive Aggressiveness

and Anger Scale (CAAS) and the Psychological Performance Evaluation Scale in Sports (PPESS), which were used as data collection tools. To examine the normality assumptions of the distribution of scale data, the Kolmogorov-Smirnov (K-S) test, skewness, and kurtosis values, as well as the Q-Q plot, box plot, histogram graphs, and mode-median-arithmetic mean-standard deviation data were analyzed. The normality analysis revealed that the Kolmogorov-Smirnov test results were lower than 0.5 in all variables. When the skewness-kurtosis values, graphs, and mode-median-arithmetic mean-standard deviation values were evaluated as a whole, it was found that the distribution did not meet the normality assumptions, and therefore, nonparametric statistical techniques were used. In data analysis, the Mann-Whitney-U test was used to determine the difference between the means of two independent variables, and Kruskal-Wallis-H was used to determine the mean difference between three or more independent variables. At this stage, Mann-Whitney-U tests were performed between the pairs to determine which groups showed a difference found using the Kruskall-Wallis-H test.

**RESULTS**

**Table 1.** Demographic Characteristics of Participants

| **Variables** | **Group** | **n** | **%** |
|---|---|---|---|
| **Gender** | Female | 194 | 41.0 |
| | Male | 279 | 59.0 |
| **Age** | 18-20 | 109 | 23.0 |
| | 21-23 | 268 | 56.7 |
| | 24-26 | 83 | 17.5 |
| | 27 and older | 13 | 2.7 |
| **Year in the Program** | 1st Year | 79 | 16.7 |
| | 2nd Year | 92 | 19.5 |
| | 3rd Year | 110 | 23.3 |
| | 4th Year | 192 | 40.6 |
| **Program of Study** | Physical Education and Sports Teaching | 72 | 15.2 |
| | Coaching Training | 126 | 26.6 |
| | Sports Management (Regular Education) | 219 | 46.3 |
| | Sports Management (Evening Education) | 56 | 11.8 |
| **Sports Branch** | Team Sports | 236 | 49.9 |
| | Individual Sports | 237 | 50.1 |
| Total | | 473 | 100 |

Table 1 shows the student distributions according to the variables of gender, age, year in the program, and sports branch. When examined according to the gender variable, it was found that the rate of female participants was 41.0% and the rate of male participants was 59.0%. When examining the age variable, the largest age group consists of participants between the ages of 21-23 (56.7%), while the smallest group consists of participants aged 27 and over (2.7%). Regarding the year in the program variable, most participants are in their 4th year in the program (40.6%). According to the department variable, the number of students in sports management (evening education) is higher (11.8%). The highest participation was in sports management (regular education) (46.3%). Regarding the sport branch variable, participants are involved in a wide range of sports, including individual sports (50.1%) and team sports (49.9%).

**Table 2.** Cronbach's Alpha Internal Consistency Coefficients of the Competitive Aggressiveness and Anger Scale (CAAS) and the Psychological Performance Evaluation Scale in Sports (PPESS) sub-dimensions

| Factors | Cronbach's Alpha Coefficient |
|---|---|
| **CAAS Anger sub-dimension** | 0.94 |
| **CAAS Aggression sub-dimension** | 0.96 |
| **PPESS Physical and formal anxiety sub-dimension** | 0.85 |
| **PPESS Motivation sub-dimension** | 0.85 |
| **PPESS Self-confidence sub-dimension** | 0.87 |

Table 2 shows the Cronbach's alpha internal consistency coefficients obtained from the Competitive Aggressiveness and Anger Scale (CAAS) and its sub-dimensions. For the overall scale, the Cronbach's alpha internal consistency coefficients were 0.94 for the CAAS anger sub-dimension and 0.96 for the CAAS aggression sub-dimension. In the study conducted by Gürbüz (27), the Cronbach's alpha internal consistency coefficient was reported as 0.79 for the overall scale. In general, the correlation values in this study are similar to the values obtained for the original Turkish form. Table 2 also includes the Cronbach's alpha internal consistency coefficients obtained from the Psychological Performance Evaluation Scale in Sports and its sub-dimensions. The Cronbach's alpha internal consistency coefficients for the overall scale were 0.85 for the physical and formal anxiety sub-dimension, 0.85 for the motivation sub-dimension, and 0.87 for the self-confidence sub-dimension. In the study conducted by Aydoğan ve Honaş (3), the Cronbach's alpha internal consistency coefficients were determined as 0.91 for the overall scale, 0.91 for the physical and formal anxiety sub-dimension, 0.82 for the motivation sub-dimension, and 0.78 for the self-confidence sub-dimension. In general, the correlation values in this study are similar to the values obtained for the original Turkish form.

**Table 3.** Total Means of Scales/Sub-Dimensions

| Variables | n | $\bar{X}$ | SD | Value |
|---|---|---|---|---|
| **CAAS** | 473 | 2.65 | 1.01 | Moderate level |
| **CAAS Anger sub-dimension** | 473 | 2.43 | 1.07 | Moderate level |
| **CAAS Aggression sub-dimension** | 473 | 2.97 | 1.08 | Moderate level |
| **PPESS** | 473 | 3.09 | 0.77 | Moderate level |
| **PPESS Physical and formal anxiety** | 473 | 2.95 | 0.88 | Moderate level |
| **PPESS Motivation sub-dimension** | 473 | 3.19 | 0.97 | High |
| **PPESS Self-Confidence sub-dimension** | 473 | 3.31 | 1.03 | High |

According to Table 3, the results of the analysis of the Competitive Aggressiveness and Anger Scale (CAAS) are generally at a moderate level. The overall mean of CAAS was 2.65, and its standard deviation was 1.01. These values show that the participants have a moderate attitude towards aggression and anger. The anger sub-dimension ($\bar{X}$ = 2.43) and aggression sub-dimension ($\bar{X}$ = 2.97) have slightly lower and higher values, respectively, than the general scale mean, indicating that there are significant differences in the anger and aggression sub-dimensions. Again, when we examine Table 3, the analysis results of the Psychological Performance Evaluation Scale in Sports (PPESS) are generally at a moderate level. The overall PPESS mean was 3.09, and the standard deviation was 0.77. These values show that the psychological performance evaluation skills of the participants are generally at a medium level. While the physical and formal anxiety sub-dimension ($\bar{X}$ = 2.95) has a moderate score, the motivation ($\bar{X}$ = 3.19) and self-confidence ($\bar{X}$ = 3.31) sub-dimensions have higher values than the general scale averages, indicating that the participants have a more positive attitude in terms of motivation and self-confidence.

Overall, the table reveals the athletes' level of coping with aggression and anger and their psychological performance evaluation skills. These evaluations show that the athletes have a more positive attitude in terms of motivation and self-confidence, while there are differences in the sub-dimensions of aggression and anger.

**Table 4.** Mann-Whitney U Test Results for Comparing Students' Scores on Survey Sub-Dimensions by Gender

| | | | | | | Significance | |
|---|---|---|---|---|---|---|---|
| **Sub-Dimensions** | **Gender** | **n** | **Mean Rank** | **Sum of Ranks** | u | **z** | **p** |
| **CAAS Anger sub-dimension** | Female | 194 | 224.97 | 43644.5 | 24729.5 | -1.59 | .011* |
| | Male | 279 | 245.36 | 68456.5 | | | |
| **CAAS Aggression sub-dimension** | Female | 194 | 238.1 | 46191.5 | 26849.5 | -0.14 | .884 |
| | Male | 279 | 236.23 | 65909.5 | | | |
| **PPESS Physical and formal anxiety sub-dim.** | Female | 194 | 244.23 | 47380 | 25661 | -0.95 | .337 |
| | Male | 279 | 231.97 | 64721 | | | |
| **PPESS Motivation sub-dimension** | Female | 194 | 236.33 | 45847.5 | 26932.5 | -0.08 | .929 |
| | Male | 279 | 237.47 | 66253.5 | | | |
| **PPESS Self-confidence sub-dimension** | Female | 194 | 227.68 | 44169 | 25254 | -1.23 | .216 |
| | Male | 279 | 243.48 | 67932 | | | |

***p<0.05**

This study used the Mann-Whitney U test to examine the emotional differences in the sub-dimensions of anger, aggression, physical and formal anxiety, motivation, and self-confidence between gender groups. According to the results presented in Table 4, there was a significant difference between gender groups only in the anger subscale ($p = 0.011$). No significant difference was found between gender groups in the sub-dimensions of aggression ($p = 0.884$), physical and mental anxiety ($p = 0.337$), motivation ($p = 0.929$), and self-confidence ($p = 0.216$). These findings point to gender-related emotional differences, especially in the anger sub-dimension. The study is expected to contribute to the literature on gender-based differences in these sub-dimensions.

**Table 5.** Kruskal-Wallis Test Results for Comparing the Students' Scores on Survey Sub-Dimensions by Age Groups

| Sub-Dimensions | Age Groups | n | Mean Rank | s.d | X2 | p | Difference |
|---|---|---|---|---|---|---|---|
| **CAAS Anger Sub-Dimension** | 1.18-20 | 109 | 245.22 | 3 | 5.005 | 0.171 | |
| | 2.21-23 | 268 | 225.56 | | | | |
| | 3.24-26 | 83 | 257.9 | | | | |
| | 4.27 & older | 13 | 270.42 | | | | |
| **CAAS Aggression Sub-Dimension** | 1.18-20 | 109 | 256.5 | 3 | 7.544 | 0.056* | 2>4 |
| | 2.21-23 | 268 | 225.42 | | | | |
| | 3.24-26 | 83 | 237.88 | | | | |
| | 4.27 & older | 13 | 306.65 | | | | |
| **PPESS Physical and Formal Anxiety Sub-Dimension** | 1.18-20 | 109 | 243.28 | 3 | 1.686 | 0.64 | |
| | 2.21-23 | 268 | 233.87 | | | | |
| | 3.24-26 | 83 | 232.31 | | | | |
| | 4.27 & older | 13 | 278.81 | | | | |
| **PPESS Motivation Sub-Dimension** | 1.18-20 | 109 | 250.42 | 3 | 11.057 | 0.011* | 4>2 |
| | 2.21-23 | 268 | 228.8 | | | | |
| | 3.24-26 | 83 | 228.35 | | | | |
| | 4.27 & older | 13 | 348.77 | | | | |
| PPESS Self-Confidence Sub-Dimension | 1.18-20 | 109 | 253.48 | 3 | 7.036 | 0.071 | |
| | 2.21-23 | 268 | 223.58 | | | | |
| | 3.24-26 | 83 | 250.1 | | | | |
| | 4.27 & older | 13 | 291.85 | | | | |

***p<0.05**

In Table 5, possible differences between the age groups of the students and the survey sub-dimensions in the Competitive Aggressiveness and Anger Scale (CAAS) are evaluated. According to the results of the Kruskal Wallis test performed, in relation to the anger sub-dimension, no significant difference was found between the 21-23 age group and other age groups in anger level (p = 0.171). In the aggression sub-dimension, there was a significant difference in the aggression levels between the 21-23 age group and the 27 and older group (p = 0.056). The 21-23 age group had a lower level of aggression compared to the 27 and older group. When the psychological performance evaluation scale in sports (PPESS) was examined, no significant difference was found in the physical and formal anxiety levels between age groups (p = 0.64). In the motivation subscale, there was a significant difference in the motivation levels between the 21-23 age group and other age groups (p = 0.011). The 21-23 age group has a lower motivation level compared to other age groups. Regarding the self-confidence sub-dimension, no significant difference was found in the self-confidence levels between the 21-23 age group and other age groups (p = 0.071).

**Table 6.** Kruskal-Wallis Test Results for Comparing Students' Scores on the Survey Sub-Dimensions by the Year in the Program Variable

| Sub-Dimensions | Year in the Program | n | Mean Rank | s.d | X2 | p | Difference |
|---|---|---|---|---|---|---|---|
| **CAAS Anger Sub-Dimension** | 1st Year | 79 | 219.34 | 3 | 5.052 | 0.168 | |
| | 2nd Year | 92 | 247.17 | | | | |
| | 3rd Year | 110 | 257.02 | | | | |
| | 4th Year | 192 | 227.92 | | | | |
| **CAAS Aggression Sub-Dimension** | 1st Year | 79 | 252.8 | 3 | 2.307 | 0.511 | |
| | 2nd Year | 92 | 231.59 | | | | |
| | 3rd Year | 110 | 244.91 | | | | |
| | 4th Year | 192 | 228.56 | | | | |
| **PPESS Physical and Formal Anxiety Sub-Dimension** | 1st Year | 79 | 236.27 | 3 | 0.28 | 0.964 | |
| | 2nd Year | 92 | 241.55 | | | | |
| | 3rd Year | 110 | 239.87 | | | | |
| | 4th Year | 192 | 233.48 | | | | |
| **PPESS Motivation Sub-Dimension** | 1st Year | 79 | 238.96 | 3 | 0.775 | 0.855 | |
| | 2nd Year | 92 | 240.95 | | | | |
| | 3rd Year | 110 | 243.55 | | | | |
| | 4th Year | 192 | 230.55 | | | | |
| **PPESS Self-Confidence Sub-Dimension** | 1st Year | 79 | 234.98 | 3 | 4.999 | 0.172* | |
| | 2nd Year | 92 | 253.24 | | | | |
| | 3rd Year | 110 | 251.67 | | | | |
| | 4th Year | 192 | 221.67 | | | | |

***p<0.05**

The possible differences between the year in the program variable and the survey sub-dimensions in the Competitive Aggressiveness and Anger Scale (CAAS) were evaluated and presented in Table 6. Thus, a Kruskal-Wallis test was completed, and the results showed that there was no statistically significant difference between the 2nd and 3rd years in the CAAS anger sub-dimension (p=0.168). In the aggression sub-dimension, there was no significant difference in the aggression level between years (p=0.511). When the psychological performance evaluation scale in sports (PPESS) was examined, there was no significant difference in the physical and formal anxiety levels between years (p= 0.964). In the motivation sub-dimension, no significant difference (p = 0.855) was found in the motivation levels between years. Regarding the self-confidence sub-dimension, there was no significant difference in self-confidence levels between the 2nd and 4th years (p = 0.172). No statistically significant differences were found between the other years.

**Table 7.** Kruskal-Wallis Test Results for Comparing Students' Scores on Survey Sub-Dimensions by the Department Variable

| Sub-Dimension | Department | n | Mean Rank | s.d | X2 | |
|---|---|---|---|---|---|---|
| **CAAS Anger Sub-Dimension** | Physical Education and Sports Teaching | 72 | 264.28 | 3 | 4.857 | **0.183** |
| | Coaching Education | 126 | 244.27 | | | |
| | Sports Management (Regular Ed.) | 219 | 226.3 | | | |
| | Sports Management (Evening Ed.) | 56 | 227.44 | | | |
| **CAAS Aggression Sub-Dimension** | Physical Education and Sports Teaching | 72 | 249.97 | 3 | 4.648 | **0.199** |
| | Coaching Education | 126 | 254.21 | | | |
| | Sports Management (Regular Ed.) | 219 | 227.15 | | | |
| | Sports Management (Evening Ed.) | 56 | 220.13 | | | |
| **PPESS Physical and Formal Anxiety** | Physical Education and Sports Teaching | 72 | 227.05 | 3 | 1.399 | **0.706** |
| | Coaching Education | 126 | 246.95 | | | |
| | Sports Management (Regular Ed.) | 219 | 232.79 | | | |
| | Sports Management (Evening Ed.) | 56 | 243.87 | | | |
| **PPESS Motivation Sub-Dimension** | Physical Education and Sports Teaching | 72 | 237.53 | 3 | 2.479 | **0.479** |
| | Coaching Education | 126 | 239.57 | | | |
| | Sports Management (Regular Ed.) | 219 | 242.15 | | | |
| | Sports Management (Evening Ed.) | 56 | 210.41 | | | |
| **PPESS Self-Confidence Sub-Dim.** | Physical Education and Sports Teaching | 72 | 234.28 | 3 | 1.497 | **0.683** |
| | Coaching Education | 126 | 240.72 | | | |
| | Sports Management (Regular Ed.) | 219 | 240.87 | | | |
| | Sports Management (Evening Ed.) | 56 | 217.01 | | | |

***p<0.05**

In Table 7, the possible differences between the students' department variable and the survey sub-dimensions in the Competitive Aggressiveness and Anger Scale (SSAS) were evaluated. According to the results of the Kruskal-Wallis test completed, students in the coaching education department have higher anger levels than those in the physical education and sports teaching and sports management departments. However, there was no statistically significant difference (p=0.183). Although the aggression sub-dimension scores of students in the coaching education department were higher than those in other departments, there was no statistically significant difference (p = 0.199). When the psychological performance evaluation scale in sports (PPESS) was examined, it was found that the students in the coaching education department had higher levels of physical and formal anxiety than other departments. However, this difference was not statistically significant (p=0.706). In the motivation sub-dimension, it was found that the students in the sports management (Evening Education) department had lower motivation levels than other departments, and this difference was statistically significant (p=0.479). The self-confidence sub-dimension showed that students in the coaching education department had higher self-confidence levels than other departments. However, this difference was not statistically significant (p=0.683).

**Table 8.** Mann-Whitney U Test Results for Comparing the Students' Scores on Scale Sub-Dimensions by Sports Branches

| | | | | Sum of | | Significance | |
|---|---|---|---|---|---|---|---|
| **Sub-Dimensions** | **Sports Branch** | **n** | **Mean Rank** | **Ranks** | **u** | **z** | **p** |
| **CAAS Anger Sub-Dimension** | Team Sports | 236 | 244.19 | 57629.5 | 26268.5 | -1.14 | 0.253 |
| | Individual Sports | 237 | 229.84 | 54471.5 | | | |
| **CAAS Aggression Sub-Dimension** | Team Sports | 236 | 247.68 | 58452.5 | 25445.5 | -1.69 | 0.089 |
| | Individual Sports | 237 | 226.36 | 53648.5 | | | |
| **PPESS Physical and Formal Sub-Dimension** | Team Sports | 236 | 231.59 | 54655 | 26689 | -0.85 | 0.39 |
| | Individual Sports | 237 | 242.39 | 57446 | | | |
| **PPESS Motivation Sub-Dimension** | Team Sports | 236 | 245.41 | 57917 | 25981 | -1.33 | 0.181 |
| | Individual Sports | 237 | 228.62 | 54184 | | | |
| **PPESS Self-Confidence Sub-Dimension** | Team Sports | 236 | 241.82 | 57069.5 | 26828.5 | -0.44 | 0.44 |
| | Individual Sports | 237 | 232.2 | 55031.5 | | | |
| ***Significance level p<0.05** | | | | | | | |

A Mann-Whitney U test was completed to determine the differences in emotional experiences between the team sports and individual sports. According to the results presented in Table 8, there were no differences in the anger, aggression, physical and formal anxiety, motivation, and self-confidence sub-dimensions between the team and individual sports ($p>0.05$). These findings suggest that there is no clear distinction between emotional experiences based on sports branches. This research contributes to the sport psychology literature and the lack of knowledge on the similarity of emotional experiences across different sports disciplines. The results highlight the need for more comprehensive studies on athletes' emotional experiences.

**Table 9.** Correlational Analysis of Competitive Aggressiveness and Anger Scale (CAAS) and Psychological Performance Assessment Scale in Sports (SPPRS) Scores

| **Sub-Dimensions** | CAAS | CAAS.1 | CAAS.2 | PPESS | PPESS.1 | PPESS.2 | PPESS.3 |
|---|---|---|---|---|---|---|---|
| **CAAS** | 1 | | | | | | |
| **CAAS.1** | .934** | 1 | | | | | |
| **CAAS.2** | .895** | .691** | 1 | | | | |
| **PPESS** | .459** | .375** | .484** | 1 | | | |
| **PPESS.1** | .498** | .420** | .505** | .893** | 1 | | |
| **PPESS.2** | .225** | .158** | .273** | .775** | .491** | 1 | |
| **PPESS.3** | .302** | .247** | .321** | .750** | .466** | .566** | 1 |
| ****p<0.01** | | | | | | | |

The Pearson correlation analysis results of the participants' mean CAAS and PPESS scores in the study are presented in Table 9. When the correlation between the CAAS and PPESS scales was examined, a moderately positive correlation was determined between CAAS and PPESS (0.459**). This indicates that there is a positive relationship between the Competitive Aggressiveness and anger scale and the psychological performance

evaluation in sports scale, but this correlation is lower. When the CAAS and its sub-dimensions are examined, a very high and positive correlation was observed between the CAAS and CAAS.1 (0.934**). This indicates that there is a strong positive relationship between the Competitive Aggressiveness and anger scale and a sub-dimension of this scale. A very high and positive correlation was also found between CAAS and CAAS2 (0.895**). This indicates a strong positive relationship between the Competitive Aggressiveness and anger scale and another subdimension of this scale. When we look at the correlation analysis between PPESS sub-dimensions, there is a moderately positive correlation between the PPESS.1 and PPESS.2 (0.491**). This indicates a moderately positive relationship between the different subdimensions of the psychological performance evaluation in sports scale. A moderately positive correlation was found between

## DISCUSSION AND CONCLUSION

This study aimed to understand the potential relationship between aggression and anger levels and psychological performance among students of the Faculty of Sports Sciences. According to the results, various differences in students' emotional experiences were evaluated based on gender, age groups, academic years, departments, and sports disciplines. Analyses of the subdimensions of anger, aggression, physical and body-related anxiety, motivation, and self-confidence revealed a significant difference in the anger subdimension among women, while no significant differences were found for the other variables ($p = 0.011$).

In a study conducted by Bostancı et al. (8) with university students and another by Fiyakalı (23) involving high school students with divorced and non-divorced parents, no significant differences were found in anger levels between female and male participants. However, Yöndem and Bıçak (57) observed that men had significantly higher anger levels compared to women. The variability in findings across the literature may stem from societal norms, which are considered significant factors shaping how individuals experience and express emotional responses. Traditional gender norms tend to tolerate open displays of anger and aggression in men while encouraging women to suppress such emotions. This indicates that gender differences in anger levels may be influenced by these societal norms.

In our study, no significant differences were found between gender and the subdimensions of anger, aggression, physical and body-related anxiety, motivation, and self-confidence. Similarly, Öztürk (44), in his master's thesis examining the perspectives of active and inactive sports science students regarding tendencies toward violence and aggressive behavior in sports, reported no statistically significant differences in aggression levels between male and female students, regardless of whether they were active or inactive athletes. Uzun et al. (54), in their study on the aggression and anger tendencies of defensive and offensive athletes, found no significant gender differences in the anger dimension among offensive athletes ($p > 0.05$). However, significant differences were identified in the aggression subdimension between male and female offensive athletes ($p < 0.05$). Among defensive athletes, significant gender differences were observed in both anger and aggression subdimensions ($p < 0.05$). Cin et al. (14) identified statistically significant gender differences in the aggression subdimension, with findings unfavorable to males. Similarly, Türkçapar and Şahinler (51) reported significant differences in the aggression subdimension and the overall scale based on gender, with mean scores favoring males in both aggression and anger subdimensions. Şahinler et al. (46) also found significant differences in the aggression subdimensions. In Öztürk's (44) study, significant differences were found in the tendency toward violence among inactive athletes based on gender, with male participants exhibiting higher tendencies. Özgider and Akgün (42), in their study on the levels of violence and aggression among sports science students, observed that male participants were more prone to violence and aggressive behaviors than their female counterparts. Interestingly, the average scores for female participants in certain dimensions were higher than those of males.

The relationship between gender and aggression is critically influenced by societal norms and cultural context. Societal expectations often encourage men to display more overt and outwardly directed aggressive behaviors, while women may be inclined to express such emotions more subtly. These findings suggest that gender differences in aggression and related behaviors are shaped significantly by societal and cultural factors.

In our study, no significant differences were found between gender and the subdimensions of physical and body-related anxiety. While no similar studies exist in the literature, physical and body-related anxieties may be a significant concern for both men and women. However, the expression and intensity of these

anxieties can vary depending on individual characteristics, levels of physical activity, and body perception. Given that sports science students are generally physically active individuals, such anxieties may become independent of gender-based differences.

The lack of significant differences in the subdimensions of motivation and self-confidence by gender may be attributed to multiple factors, including modern societal dynamics, the equalizing influence of sports culture, and the prominence of individual factors. This finding suggests that the effects of gender differences on motivation and self-confidence may vary depending on the context.

Analysis by age groups revealed significant differences in the aggression subdimension between the 21–23 age group and those aged 27 and above ($p = 0.056$). In the motivation subdimension, the 21–23 age group exhibited lower motivation levels compared to other age groups. Şahinler et al. (46), in their study on the aggression levels of sports science students who engaged in physical activity during the COVID-19 pandemic, found significant differences in aggression levels between the 26–30 age group and the 22–25 age group, favoring the latter. Similar findings by Özgider and Akgün (42), Yaşartürk et al. (2022), and Demirhan (17) indicate that aggression levels may remain stable as individuals age, and that academic year may not affect aggressive behaviors. These results align with our findings, suggesting that life experiences, social environments, and stress factors encountered by individuals may contribute to variations in aggression levels.

No significant differences were observed in anger, aggression, physical and body-related anxiety, motivation, or self-confidence across academic years. However, a decrease in aggression levels was noted as students progressed through their academic years. Çeşit (12), Doğan (18), and Ağlamaz (1) similarly found no significant differences in aggression levels based on academic year. Conversely, Kaynak and Tunç (31), in their study on the relationship between emotional intelligence and aggression levels among education faculty students, reported significant differences. Kurtoğlu (35) found that students' aggression scale scores increased as their academic year advanced. Erşan et al. (21) identified significant differences between second- and fourth-year students in physical education teaching programs. Variations in findings across the literature may reflect the impact of academic responsibilities, stress levels, and individual development on changes in aggression and anger levels.

In the analysis of the subdimensions of anger, aggression, physical and body-related anxiety, motivation, and self-confidence based on department variables, it was observed that students in the coaching education department exhibited higher levels of anger compared to students in the physical education and sports teaching and sports management departments. However, this difference was not statistically significant. Similarly, Erşan et al. (21), in their study evaluating the aggression levels of physical education and sports school students from a sociodemographic perspective, found no statistically significant differences in the mean scores of aggression subdimensions between students in the physical education teaching and coaching education departments. Likewise, Bahadır and Erdoğan (20) and Arslanoğlu (2) reported no significant differences in aggression levels based on department variables. However, Göktaş et al. (26) identified significant differences in the trait anger subdimension among physical education and sports school students based on their department.

In our study, no statistically significant differences were observed in the subdimensions of anger, aggression, physical and body-related anxiety, motivation, and self-confidence between team and individual sports participants. However, Sadi (45), in a master's thesis examining the impact of aggression and anger levels on fair play behaviors among athletes in different sports disciplines, found that athletes involved in individual sports exhibited higher levels of anger and aggression compared to those engaged in team sports. Similarly, Tutkun (53) reported statistically significant differences in aggression levels between individual and team athletes, with individual athletes scoring higher on average. Koruç and Bayar (34) observed that male athletes participating in individual sports exhibited more aggressive behaviors than those involved in team sports.

The literature suggests that individual athletes tend to have higher levels of aggression and anger compared to team athletes. This may be attributed to the emphasis on personal success in individual sports, which could increase the pressure on athletes to prove themselves, thereby intensifying emotions such as

anger and aggression. In contrast, team sports may provide an environment where emotions can be shared and regulated through group dynamics, potentially reducing the intensity of these emotions.

Information regarding the presence of mental health issues among university student-athletes highlights an incomplete understanding in the existing literature about the extent to which these athletes benefit from mental health services (40). Lopez and Levy, along with Lubker and colleagues, noted that university athletes tend to prefer counselors and coaches with a sports background, and when such preferences are met, they provide valuable support in controlling aggression and anger, thereby positively enhancing psychological performance.

In his study, Özmen (43) identified key sources of anger, including experiences of injustice, obstacles to achieving goals, physical injuries, and frustration. These factors were highlighted as critical triggers for anger responses and were framed as the psychological foundations of anger. This perspective provides an important theoretical framework for understanding the roots of anger and aggression and for developing anger management strategies. Slaby and Guerra (48) found that aggressive behaviors during adolescence are closely associated with cognitive factors. Thus, emphasizing early psycho-educational programs focused on adolescence, particularly among university students, is of great importance. These programs can equip students with rational thinking skills, helping reduce aggressive behaviors and fostering healthier interpersonal relationships.

Most studies on emotion regulation in sports primarily focus on pre- and post-performance periods. These contexts often provide ample time for athletes to divert attention from emotional components or to direct their focus to reduce or enhance emotional experiences (22; 55). The sports environment and education for student-athletes not only enhance athletic performance but also contribute to their overall psychological well-being. Consequently, sports go beyond developing physical and motor skills, playing a significant role in supporting holistic personal development (52). In their research, Shih and Lin (47) emphasized that although anger has garnered significant attention in sports performance literature, it remains one of the most critical yet under-researched topics in sports psychology. Evidence from their study suggests that recognizing opponents' emotions can aid in accurately predicting their actions, further underscoring the importance of emotional awareness in competitive settings.

In conclusion, this study aimed to explore the potential relationship between aggression and anger levels and psychological performance among students of the Faculty of Sports Sciences. The findings reveal emotional and psychological differences based on gender groups, age groups, academic levels, and departmental variables. Notably, the emergence of gender-based emotional differences in the anger subdimension and the identification of varying levels of emotional characteristics such as aggression, motivation, and self-confidence—across age groups are particularly significant.

**Recommendations:**

1. Psycho-Educational Programs: Psycho-educational programs should be developed for students of the Faculty of Sports Sciences, especially focusing on anger management and emotional awareness. These programs can help students control their levels of aggression and anger by teaching them rational thinking skills.

2. Gender-Based Approaches: Identifying gender-based differences, especially in the anger sub-dimension, may require the development of emotional management strategies in a gender-sensitive manner. Gender-specific support and guidance programs can be created.

3. Interventions Appropriate for the Levels of Age and Year in the Program: This study highlights emotional differences across age groups and years in the program. In this context, psychological support, and intervention programs appropriate to the age and years in the program can be planned.

4. Support According to the Department Variable: It was observed that the department variable has potential effects on students' emotional and psychological characteristics. In this context, programs that support emotional health and performance can be developed specifically for each department.

5. Comprehensive Studies by Sports Types: Although no significant differences were found between team sports and individual sports, it is important to examine emotional experiences in more detail according to sport types in larger studies.

These recommendations can shape intervention and support programs to be developed to improve the emotional health of Faculty of Sports Sciences students, increase their performance, and help them cope with sports-related stress.

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# The Effect of Plyometric Exercises Using the Cluster Set Method on Certain Physical and Physiological Parameters in Female Handball Players

Sinan BUYURUKCU [1A], Mustafa KEREM [2B]

[1] *Kastamonu GSİM, Kastamonu, / TURKEY*
[2] *Kastamonu University Faculty of Sports Science, Kastamonu/ Turkey.*
*Correspondence Address: Sinan BUYURUKCU e-mail: sinanbuyurukcu@gmail.com*

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A: Orcid ID: 0009-0005-6103-9843 B: Orcid ID: 0000-0001-7861-2339

**Abstract**

This study investigated the effects of six weeks (three days per week) of plyometric training using traditional set (TS) and cluster set (CS) methods on several physical and physiological parameters in female handball players from the 2nd League. Twenty-three female athletes aged 12-15 participated, with 12 in the traditional set group (TSG) and 11 in the cluster set group (CSG). Pre- and post-tests measured physical characteristics (age, height, weight), vertical jump (VJ), standing long jump (SLJ), reactive agility test (RAT), 10m-30m speed test (ST), Pediatric RAST (PRAST) test, leg strength (LS), and back strength (BS). Data were analyzed using SPSS 22.0, with a significance level of $p<0.05$. Shapiro-Wilk's test assessed normality. Paired t-tests or Wilcoxon tests compared pre- and post-test results within groups, while independent samples t-tests or Mann-Whitney U tests compared groups. The difference between pre- and post-test scores was used to evaluate training effects. Results showed no significant changes in VJ, 30m speed, fatigue index, and leg strength in the TSG. However, the CSG showed significant improvements in VJ, reactive agility (RAT), 10m and 30m speed, and leg strength. Percentage changes (PC) were also higher in the CSG compared to the TSG. In conclusion, the CS method appears to be an effective training approach for improving the performance of these young female handball players.
**Keywords:** Handball, Cluster Set Method, Plyometric Training, Strength.

**Özet**

**Kadın Hentbolcularda Cluster Set Yöntemi ile Uygulanan Pliometrik Çalışmaların Bazı Fiziksel ve Fizyolojik Parametreler Üzerine Etkisi**

Bu çalışmanın amacı 2. Ligde oynayan kadın hentbolcuların pliometrik antrenmanlarında geleneksel set yöntemi (GSY) ve cluster set yöntemi (CSY) uygulanarak 6 hafta (haftada 3 gün) sonunda pliometrik antrenmanların bazı fiziksel ve fizyolojik parametreler üzerine etkisi incelemektir. Çalışmaya 12-15 yaşlarında 12 kişi geleneksel set grubu (TSG) ve 11 kişi cluster set grubu (CSG) olmak üzere toplam 23 kadın sporcu katıldı. Araştırma kapsamında, TSG ve CSG fiziksel özellikleri (yaş, boy uzunluğu, vücut ağırlığı), dikey sıçrama (DS), durarak uzun atlama (DUA), reaktif çeviklik testi (RÇT), 10m-30m sürat testi (ST), Pediatrik RAST (PRAST) testi, bacak kuvveti (BK), sırt kuvveti (SK) ön test ve son test şeklinde ölçümleri alındı. Verilerin analizinde SPPS 22.0 programı kullanıldı. İstatistiksel işlemlerde güven aralığı $p<0,05$ kabul edildi. Çalışma sonucunda bulunan tanımlayıcı istatistiklerin normal dağılım olup olmadığı Shapiro Wilk's testi ile anlaşıldı. Grupların ön test ve son

test sonuçları arasındaki farklılığı belirlemek için normal dağılıma uygun değişkenlerde eşleştirilmiş t-testi, uymayanlarda ise Wilcoxon testi uygulandı. Gruplar arası farklılıkların normal dağılıma uygun değişkenler için Bağımsız örneklem t-testi, uygun olmayanlar için Mann Whitney U testi uygulandı. Antrenman verilerini değerlendirmek için ön test son test arasındaki fark alındı. İncelenen parametrelere bakıldığında GSY'de göre DS, 30m Sürat, Yorgunluk ind., ve Bacak kuvvetinde ( anlamlı değişiklik yok iken, CSG de DS, Reaktif çeviklik, (RÇ), 10 m ve 30 m Sürat ve Bacak kuvvetinde anlamlılık görülmüştür. Yüzdesel değişimlerde ise CSG'nin TSG ye göre daha yüksek olduğu gözlemlenmiştir. Sonuç olarak; CSY'nin sporcuların gelişim seviyelerinde etkili bir yöntem olduğu düşünülmektedir.

**Anahtar Kelimeler:** Hentbol, Cluster Set Yöntemi, Pliometrik Antrenman, Kuvvet.

## INTRODUCTION

Sports are physical and motor activities performed individually or in teams, governed by specific competition rules and undertaken without personal gain (31). Studies have shown that strength, as a physical attribute, significantly impacts performance in various sports disciplines. Applying scientific methods to enhance athletes' performance has facilitated substantial advancements. Improvement in technical skills, speed, anthropometric measurements, and physiological conditions is essential across all sports disciplines (9).

Handball is a sport that involves various movements performed simultaneously, intending to gain a competitive edge over opponents (3). The game has evolved from a slow-paced activity to a fast and modern sport due to changes in the rules. Athletes now execute a wide range of movements, such as running, passing, and changing direction quickly (6). Over the years, modern training methods have been adopted to achieve higher performance levels (37).

To attain optimal performance in handball, a widely practiced and widespread sport, it is essential to enhance training characteristics, thoroughly understand the impact of training on the body, and develop the motor abilities of the athletes (34).

In handball, various methods enhance anaerobic performance during training, which demands general and specific endurance, short and long-distance sprints, pushing, blocking, jumping, and accurate shooting. One of these methods is plyometric training, which is recognized for improving movement speed, force adaptation, and muscle strength through various exercises (18). Plyometric training for strength development enhances intramuscular coordination and neuromuscular harmony. It provides a protective effect against injuries and improves athletic performance by ensuring joint stabilization (25). Numerous studies have been conducted on plyometric training, and it has been concluded that these studies positively affect anaerobic power and explosive strength (26).

Recent research indicates that the developmental values derived from the effects of applied training on physical and physiological parameters can be measured, and test results can be obtained. Integrating modern scientific advancements and technological devices into sports illustrates the physiological changes induced by plyometric training on athletes and the impacts of these changes. Furthermore, this integration reveals that some practices previously considered correct contain incomplete information and that more accurate effects can be achieved through scientific advancements (24).

In addition to traditional training methods, recent years have seen the emergence of new approaches. One notable example is the cluster set method (CSY), which has garnered attention in contemporary research and training applications. Unlike the traditional set method (GSY), which involves continuous application with long rest breaks between consecutive repetitions, the CSY method employs shorter, more frequent rest intervals within sets. Research indicates that strength development is less pronounced with low set numbers in GSY training, whereas higher set numbers result in more significant strength gains (5). In addition to GSY, changes in the application of sets developed by researchers have proven effective in contributing to strength development. This new method, known as CSY (Cluster Set Method), involves dividing sets into smaller subsets with short rest intervals between them (16). These rest periods, typically ranging from 10 to 30 seconds, are intended to allow the practitioner to reach the desired level between repetitions and to achieve a higher

performance level in subsequent repetitions, with these developments, new the method is called CSY (5, 16). These methods enhance strength development and athletic performance (32).

This study aimed to investigate the effects of six weeks of plyometric training, using traditional and cluster set methods, on various physical and physiological parameters such as vertical jump height, speed, agility, and strength in female handball players aged 12-15 years.

## METHOD

### Research Model

The study was designed to span six weeks, with training sessions conducted three days per week. Measurements were obtained using an experimental modeling method, including pre-test and post-test assessments. A total of 23 participants were randomly assigned to two distinct groups, with one group undergoing GSY and the other CSY.

The groups continued their training in a designated gymnasium and at scheduled times under the supervision of a trainer. The athletes performed the prescribed plyometric exercises three times a week, with at least one rest day following each training session, for six weeks, divided into GSY and CSY groups.

### Research Group

The study sample comprised 23 female athletes, aged between 12 and 15 years, all of whom held an athlete license with Kastamonu Esan Akü Merkez Secondary School Sports Club and participated in handball at the 2nd League level. Of these, 12 were assigned to the GSY (control) group and 11 to the CSY (experimental) group.

### Implemented Training Program

In the TSY and CSY training programs, athletes followed a prescribed number of sets and repetitions during the first four weeks. In the final two weeks, the number of sets remained constant while the number of repetitions was increased according to the principle of progressive overload. This approach led to an intensified training regimen in the latter part of the program.

### Traditional Set Method

The six-week plyometric training program (18 sessions) employed a traditional set (TS) methodology. During the initial four weeks, each exercise consisted of three sets of nine repetitions. Weeks five and six incorporated a progressive overload paradigm, maintaining three sets per exercise but increasing the repetitions to twelve. Inter-exercise rest intervals were standardized at 60 seconds, with a 120-second rest period specifically designated for half burpees.

### Cluster Set (Dividing Set into Sets) Method

The CSY strength training program was conducted over six weeks, encompassing 18 training days. During the program, exercises were organized into three sets with three repetitions, following the details specified in Table 3 and Table 4. Rest periods within sets were set at 10 seconds, with transition times between movements established as 40 seconds. For half burpees, rest periods within sets were 20 seconds, and transition times between movements were 80 seconds. Athletes monitored their training intensity using heart rate measurements, calculated with the formula:

Heart Rate=(220−Age)×(Percentage of Intensity).

### Measurement Instruments

Data were collected using pre- and post-tests administered to all participants before and after the six-week training program. Participants' ages were obtained from their national identity cards. Height was measured using a stadiometer. Body weight was measured using electronic scales, with participants wearing only sports shorts and a t-shirt and barefoot. Vertical jump, T-test agility, 10m-30m speed and acceleration, reactive agility, and the Pediatric RAST (Running-Based Anaerobic Sprint Test) were assessed using a Newtest Powertimer 300. Leg strength was measured using a Takei (Tkk-5402 Back-D/JAPAN) brand dynamometer, and standing long jump was also assessed.

**Ethical approval and institutional permission**

Approval was obtained from the Kastamonu University Medical Faculty Clinical Research Ethics Committee for conducting the study. Before commencing the study, participants were provided with an 'Informed Consent Form' and a 'Parental Consent Form' detailing the study's scope and information, which they were asked to complete. Our descriptive study was approved by the Non-Interventional Clinical Research Ethics Committee of Kastamonu University Faculty of Medicine (Decision No: 2022-KAEK-129).

**FINDINGS**

A total of 23 female athletes aged 12-15 participated in the study, 12 of them in the traditional set group and 11 people in the cluster set group. The participants' height was determined as 156.08±5.02, and their body weight was determined as 53.92±7.16.

**Table 1.** In-group vertical jump change results

| | | n | X±ss | t | p |
|---|---|---|---|---|---|
| TSG - VJ (cm) | Pre-test | 12 | 27,52±3,61 | -0,62 | 0,55 |
| | Post-test | | 27,80±3,97 | | |
| CSG - VJ (cm) | Pre-test | 11 | 27,36±5,63 | -2,42 | **0,04*** |
| | Post-test | | 28,77±4,42 | | |

(p<0,05)

*TSG; Traditional set group, CSG Cluster Set Group, VJ: Vertical Jump

CSY VJ measurements showed 27.36±5.63 cm in the pre-test and 28.77±4.42 cm in the post-test and a statistically significant difference between the pre-test and post-test values (p<0.05).

**Table 2.** Intra-group reactive agility test change results

| | | | n | X±ss | t | p |
|---|---|---|---|---|---|---|
| TSG | RAT (sn) | Pre-test | 12 | 2,49±0,23 | 3,87 | **0.00*** |
| | | Post-test | | 2,18±0,27 | | |
| CSG | RAT (sn) | Pre-test | 11 | 2,49±0,24 | 6,43 | **0.00*** |
| | | Post-test | | 2,01±0,19 | | |

(p<0,05)

*TSG; Traditional set group, CSG Cluster Set Group, RAT; Reactive Agility Test

When looking at the reactive agility intra-group test results in both groups; significant differences were observed (p<0.05).

**Table 3.** Reactive agility test change results between groups

| | | TSG (n=12) | CSG (n=11) | t | p | TSG | CSG |
|---|---|---|---|---|---|---|---|
| | | | | | | Change % | |
| RAT (sn) | Pre-test | 2,49±0,23 | 2,49±0,24 | -0,21 | 0,98 | %14,22 | **%23,88** |
| RAT (sn) | Post-test | 2,18±0,27 | 2,01±0,19 | 1,77 | 0,09 | | |

When the percentage change in the findings is examined, it is seen that the increase in CSG is higher than in TSG.

**Table 4.** Intra-group speed test change results

| | | | n | X±ss | t | p |
|---|---|---|---|---|---|---|
| TSG | ST 10 m (sn) | Pre-test | 12 | 2,10±0,24 | 4,59 | **0,00*** |
| | | Post-test | | 1,77±0,28 | | |
| | ST 30 m (sn) | Pre-test | 12 | 5,29±0,53 | 5,27 | **0,00*** |
| | | Post-test | | 5,19±0,48 | | |
| CSG | ST 10 m (sn) | Pre-test | 11 | 2,12±0,27 | 1,94 | 0,08 |
| | | Post-test | | 1,72±0,24 | | |
| | ST 30 m (sn) | Pre-test | 11 | 5,26±0,36 | 2,74 | **0,02*** |
| | | Post-test | | 5,11±0,36 | | |

(p<0,05)

*TSG; Traditional set group, CSG Cluster Set Group, ST; Speed Test

When the 10 m speed within-group test results were examined in both groups; significant differences were observed. When the 30 m within-group test results were examined, there was no significant difference in TSG, but a significant difference was observed in CSG (p<0.05).

**Table 5.** Speed test change results between groups

| | | TSG (n=12) | CSG (n=11) | t | p | TSG | CSG |
|---|---|---|---|---|---|---|---|
| | | | | | | Change % | |
| ST 10 m (sn) | Pre-test | 2,10±0,24 | 2,12±0,27 | 0,53 | 0,14 | %18,64 | **%23,25** |
| | Post-test | 1,77±0,28 | 1,72±0,24 | 0,41 | 0,69 | | |
| ST 30 m (sn) | Pre-test | 5,29±0,53 | 5,26±0,36 | 0,16 | 0,88 | %1,92 | **%2,93** |
| | Post-test | 5,19±0,48 | 5,11±0,36 | 0,45 | 0,66 | | |

When the interaction between the groups is examined; while there is no significance in the speed test results, it is seen that CSG is higher than TSG in percentage changes(p<0.05).

**Tablo 6.** Intra-group PRAST test change results

| | | | n | X±ss | t | p |
|---|---|---|---|---|---|---|
| TSG | Minimum (watt) | Pre-test | 12 | 1424,51±441,49 | -2,64 | **0,02*** |
| | | Post-test | | 1688±576,41 | | |
| | Maximum (watt) | Pre-test | 12 | 2522,37±797,65 | -4,49 | **0,00*** |
| | | Post-test | | 3427,81±1147,28 | | |
| | Mean (watt) | Pre-test | 12 | 1818,32±564,08 | -3,95 | **0,00*** |
| | | Post-test | | 2264,16±677,15 | | |
| | Fatigue Index (watt) | Pre-test | 12 | 34,82±9,71 | -1,41 | 0,22 |
| | | Post-test | | 50,43±19,36 | | |
| CSG | Minimum (watt) | Pre-test | 11 | 1351,74±304,91 | -2,17 | 0,06 |
| | | Post-test | | 1600,62±502,55 | | |
| | Maximum (watt) | Pre-test | 11 | 2222,64±574,95 | -4,05 | **0,00*** |
| | | Post-test | | 3788,82±1317,91 | | |
| | Mean (watt) | Pre-test | 11 | 1721,60±401,52 | -9,03 | **0,00*** |
| | | Post-test | | 2485,25±565,11 | | |
| | Fatigue Index (watt) | Pre-test | 11 | 41,77±18,29 | -3,06 | **0,02*** |
| | | Post-test | | 75,20±15,95 | | |

(p<0,05)

*TSG; traditional set group, CSG Cluster Set Group, PRAST; Pediadric Rast Test

When PRAST results are examined, TSG' While significant differences were observed in Min, Max and Mean values, no significance was observed in the fatigue index. When the CSG results are examined, while the min value is not significant, significance is observed in max, mean and fatigue index.

**Table 7.** PRAST test change results between groups

| | | TSG (n=12) | CSG (n=11) | t | p | TSG Change % | CSG Change % |
|---|---|---|---|---|---|---|---|
| Minimum (watt) | Pre-test | 1424,51±441,49 | 1351,71±304,91 | 0,46 | 0,65 | %18,49 | %18,47 |
| Minimum (watt) | Post-test | 1688±576,41 | 1600,62±502,55 | 0,39 | 0,70 | | |
| Maximum (watt) | Pre-test | 2522,37±797,65 | 2222,64±574,95 | 1,02 | 0,32 | %35,89 | **%70,46** |
| Maximum (watt) | Post-test | 3427±1147,28 | 3788,82±1317,91 | -0,70 | 0,49 | | |
| Average (watt) | Pre-test | 1818,32±564,08 | 1721,60±401,52 | 0,47 | 0,64 | %24,51 | **%44,35** |
| Abvarage (watt) | Post-test | 2264,16±677,15 | 2485,25±565,11 | -0,85 | 0,41 | | |
| Fatigue İndex (watt) | Pre-test | 34,82±9,71 | 41,77±18,29 | 1,29 | 0,21 | %44,83 | **%80** |
| Fatigue İndex (watt) | Post-test | 50,43±19,36 | 75,20±15,95 | -2,53 | **0,03*** | | |

(p<0,05)

When the percentages of interaction between groups are examined, there is no percentage difference between TSG and CSG in Min values, while percentage differences are seen in max, mean and fatigue indices.

**Table 8.** Leg strength test change results within the group

| | | n | X±ss | t | p |
|---|---|---|---|---|---|
| TSG - LS (cm) | Pre-test | 12 | 86,25±12,78 | -1,61 | 0,14 |
| | Post-test | | 92,33±18,25 | | |
| CSG - LS (cm) | Pre-test | 11 | 72,52±12,71 | -3,69 | **0,00*** |
| | Post-test | | 87,27±24,06 | | |

(p<0,05)

*TSG; traditional set group, CSG Cluster Set Group, LS; Leg Strenght

When looking at the leg strength values within the group, no significant difference was observed in TSG, while a significant difference was observed in CSG results.

**Table 9.** Leg strength test change results between groups

| | | TSG (n=12) | CSG (n=11) | t | p | TSG Change % | CSG Change % |
|---|---|---|---|---|---|---|---|
| LS (kg) | Pre-test | 86,25±12,78 | 72,52±12,71 | 2,58 | **0,02*** | %7 | **%20** |
| LS (kg) | Post-test | 92,33±18,25 | 87,27±24,06 | 0,57 | 0,57 | | |

(p<0,05)

When looking at the percentage interaction between groups; It is observed that Csg results are higher.

## DISCUSSION AND CONCLUSION

This study examined the impact of plyometric exercises, applied to both GSY and CSY groups for 6 weeks (3 days a week) and regular handball training, on various physical and physiological fitness parameters in female handball players aged 12-15. The results, derived from measurements of 23 athletes (11 in CSY and 12 in GSY), were analyzed by comparing data within and between groups.

Before the training period, the groups were homogeneous, with no significant differences in age, body weight, or height. In addition to anthropometric measurements, various tests, including VJ, SLJ, RAT, 10 m and 30 m ST, PRAST, LS, and BS, were conducted before and after the training.

A literature review revealed a scarcity of studies focusing on the effects of plyometric training in the handball branch for the CSY method. This highlights a gap in research, suggesting the need for further investigation into the benefits and efficacy of plyometric training, specifically within this context.

When we look at the studies examining the relationship between plyometric training and VJ in the literature,

Diallo et al. (7) investigated the effects of plyometric training on VJ performance. The study was conducted with 20 boys aged 12-13 years, and significant differences in VJ results were found in the experimental group. In their study, Lawton et al. (21) showed 26 young male basketball players and football players were made to bench press with a maximum of 6 repetitions with weights. It was stated that the findings obtained in CSG showed more improvement than those obtained in TSG. It was stated that CSG reached a more anaerobic level than TSG in repeated squat jumps.

In the study by Ateş and Ateşoğlu (2), the effects of plyometric training on physical and physiological parameters were examined in male football players aged 16-18. A total of 24 players participated, divided into a control group (CG) with 12 players and a workout group (WG) with 12 players. Over 10 weeks, with training sessions held twice weekly, the CG underwent standard football training, while the WG received additional plyometric training. The results indicated that the WG experienced positive improvements in vertical jump (VJ) values compared to the CG.

In a review study by Eduardo et al. (10), 56 studies were analyzed to assess the effects of plyometric training on vertical jump (VJ) development. The review concluded that plyometric training positively enhances VJ performance, as evidenced by evaluating the studies included.

Hansen et al. (17) examined the strength development of elite-level rugby players during the pre-season preparation period. 18 athletes were divided into two groups as TSG (n = 9) and CSG (n = 9). Both groups underwent 8-week lower body resistance training. According to the findings, while the two groups had a significant difference in strength and jump development, no statistical difference was found between the groups.

In their study, Moreno (28) performed two different applications of the acute effect of CSG in plyometric training. In the first application, CSG was performed as 30 seconds rest and 4 sets of 5 repetitions, and the second CSG was performed as 10 seconds rest and 10 sets of 2 repetitions. TSG was trained with 90 seconds of rest and two sets of 10 repetitions. The results related to VJ parameters were analyzed. According to the findings, it was concluded that the second CSG method performed more VJ than the first CSG and TSG.

In a study by Morales et al. (27), 19 male athletes were divided into CSG and TSG groups. The study investigated the effects of the training methods on strength development in both groups. The findings suggested that the CSG approach was more effective for strength and power development. Specifically, the speed loss between the first and sixth repetitions was 0.5% for the CSG group, compared to 3.5% for the TSG group.

Bavlı (4) investigated the impact of plyometric exercises on vertical jump (VJ) development in basketball training. The study included 24 male basketball players with an average age of 20.7±2.6 years, divided into a control group (CG, n=12) and a workout group (WG, n=12). The WG performed plyometric exercises for 30 minutes following their basketball training, while the CG participated only in basketball training. VJ measurements were recorded before and after the study. The results indicated a statistically significant improvement in VJ development for athletes who engaged in plyometric exercises.

Our research analyzed the VJ change results for the GSY and CSY groups. No statistically significant difference was found within or between the GSY groups. However, a statistically significant difference was observed within the CSY group ($p<0.05$). Between the groups, VJ improvement was 1.01% for GSY and 5.15% for CSY. Literature indicates that plyometric training generally leads to positive increases in VJ development, though some studies report no differences between groups. Our findings suggest that CSY plyometric training had a more substantial effect on VJ development than GSY.

When the studies in the literature examining the relationship between plyometric training and RAT are examined;

In the study by Dönmez (8), five female and 15 male athletes aged 18-21, all licensed and engaged in wushu, participated. The study investigated the effects of plyometric training on jumping and agility parameters. After eight weeks of plyometric training, statistically significant differences were observed in the male group's reactive agility test (RCT) results. The study concluded that plyometric training positively influenced agility performance in both men and women.

Matlak et al. (23) investigated the effects of reactive agility training (RTT) on performance in 15 amateur football players, finding a significant improvement in RTT performance. In a separate study by Erdem

and Yazar (11), 40 athletes aged 16-17 years were divided into two groups: a control group (CG) that continued traditional football training and a workout group (WG) that underwent futsal-specific training for eight weeks (3 days a week). Data analysis using the reactive agility test (RCT) showed that the WG, which engaged in futsal-specific training, exhibited more substantial positive development than the CG.

Topal (35) explored the effects of two different resistance training programs combined with plyometric training on performance parameters in basketball. The study involved 40 male basketball players aged 15-18. Reactive agility test (RCT) parameters were measured before and after the training. The findings indicated that both plyometric and resistance plyometric training were effective in improving reactive agility. Our research examined the RCT change results for GSY and CSY groups. A significant difference was found within the CSY group, but no statistically significant difference was observed. Between-group analysis showed a 14.22% increase in the GSY group and a 23.88% increase in the CSY group. Literature suggests that plyometric training enhances RCT performance. Our findings indicate that the CSY group's improvement was greater than the GSY group's.

When examining the literature on the relationship between plyometric training with Cluster Set Group (CSG) and short-distance speed tests, including the 10-meter (ST 10 m) and 30-meter (ST 30 m) speed tests:

Iacono et al. (19) reported that their study significantly improved the 10-meter speed test (ST 10 m) results among elite handball players who underwent high-intensity interval training. This indicates that high-intensity interval training effectively enhances short-distance speed performance.

In his study, Öner (30) investigated the effects of plyometric and resistance training on motor skills and performance in female tennis players. The study involved 36 participants aged 11-13, divided into three groups: a control group (CG, n=12), a resistance training group (DA, n=12), and a plyometric training group (PA, n=12). The CG continued their regular tennis training, while the DA and PA groups received additional resistance and plyometric training for 10 weeks (3 days a week) before their tennis sessions. Pre- and post-test measurements for the 10-meter speed test (ST 10 m) were conducted. The results showed that the ST 10 m averages were significantly higher in both the DA and PA groups compared to the CG. The study suggests that speed performance can be enhanced through both resistance and plyometric training.

In his study, Erol (12) conducted quick strength and plyometric training with a total of 28 basketball players aged 16 to 18, divided into a workout group (WG, n=14) and a control group (CG, n=14) over eight weeks. Pre- and post-test measurements were taken, revealing a statistically significant improvement in the WG's 30-meter speed test (ST 30 m) times. Similarly, Samur (33) investigated the effects of plyometric training on male volleyball players' vertical jump strength and performance. The study found a statistically significant improvement in ST 30 m performance for the workout group, with pre-test values of 4.36 ± 0.06 seconds and post-test values of 4.30 ± 0.05 seconds.

In the study of Gençay (14), when the averages of the ST 30 m results were compared in the measurements taken before and after the training of 15 athletes who participated in an 8-week plyometric training program, it was found that there was a statistically significant improvement in the athletes who performed plyometric training.

In his study, Turgut (36) investigated the effects of 8 weeks of plyometric training on balance, sprint, and anaerobic power performances in 40 male handball players aged 15-18. The study involved a workout group (WG, n=20) and a control group (CG, n=20). The WG participated in plyometric training before their regular handball sessions for eight weeks (3 days a week), while the CG continued their regular handball training.

The results indicated a notable improvement in sprint performance. Specifically, the 30-meter speed test (ST 30 m) times improved from 6.08 seconds in the pre-test to 5.28 seconds in the post-test. The study concluded that plyometric training effectively enhanced sprint performance and could be valuable to athlete development.

In our research, when examining the changes in the 10-meter (ST 10 m) and 30-meter (ST 30 m) speed test results for both the TSG and CSG groups, significant improvements were observed within each group. However, no statistically significant difference was found between the two groups.

Analysis revealed that the cluster set group (CSG) demonstrated greater percentage increases in speed compared to the traditional set group (TSG). Specifically, the CSG showed a 23.25% improvement in the 10-

meter sprint test, exceeding the TSG's 18.64% improvement. Similarly, while the TSG showed a 1.92% increase in the 30-meter sprint test, the CSG exhibited a larger improvement of 2.93%.

Literature supports that plyometric training can enhance speed test performance. Our findings align with these studies, indicating that the CSG group's improvement was greater than the TSG group's, reflecting a more pronounced benefit from plyometric training.

When we look at the studies in the literature examining the relationship between plyometric training and PRAST,

Ara et al. (1) discovered that boys who engaged in regular sports activities before adolescence exhibited higher anaerobic capacity and power values than those who did not participate in sports.

Similarly, Obert et al. (29) reported a 23% increase in maximum anaerobic power values in pre-adolescent children following 13 weeks of aerobic training.

In the study by Kurban and Kaya (20), boys aged 10-13 underwent eight weeks of basic technical football training. The results indicated improved anaerobic power values, demonstrating that the technical training positively impacted their performance.

Löklüoğlu (22) examined the anaerobic performances of children and adolescents involved in various sports. The study included 104 athletes aged 10-16 from different sports disciplines. The findings highlighted the high reliability of the RAST and PRAST anaerobic performance evaluations for children and adolescents.

Our research analyzed the changes in PRAST results for both TSG and CSG. Statistically significant differences were observed in the fatigue (post-test) values within and between the groups, except for the minimum (CSG) and fatigue (TSG) measurements. The percentage changes between the groups were as follows: Minimum Watt: TSG increased by 18.49% and CSG by 18.47%. Maximum Watt: TSG increased by 35.89% and CSG by 70.46%. Average Watt: TSG increased by 24.51% and CSG by 44.35%. Fatigue Watt: TSG showed an increase of 44.83%, and CSG showed an increase of 80%. The results indicate a more significant change in maximum, average, and fatigue watts in the CSG group compared to the TSG group. This finding aligns with literature suggesting that regular sports participation before adolescence contributes to higher anaerobic capacity and power values.

When we look at the studies in the literature examining the relationship between plyometric training and LS;

In the study by Ateş and Ateşoğlu (2), 24 football players aged 16-18 were divided into two groups: the control group (KG) and the plyometric group (WG). The KG continued their regular football training, while the WG received additional plyometric training twice a week for 10 weeks. The results indicated that bench press strength improved by 5.74 kg in the KG and 22.16 kg in the WG. When comparing the groups, the plyometric training was found to improve bench press strength more than the regular training alone.

In the study by Yarayan (38), a total of 40 male football players aged 13-14 were divided into two groups: the control group (CG) and the plyometric training group (WG). Over eight weeks, the effects of plyometric training on parameters such as vertical jump height, speed, strength, and agility were examined. The results showed a statistically significant improvement in bench press strength in the WG compared to the CG, indicating that plyometric training had a more pronounced effect on strength development. Similarly, Güzel (15) conducted a study with 50 female volleyball players, divided into the control group (CG) and the plyometric training group (WG). Plyometric training was applied to the WG for eight weeks. The study found that the WG exhibited significant improvements in strength, with pre-test and post-test mean values for strength increasing from 45.58±14.49 to 53.20±13.59. Additionally, plyometric training was found to impact strength and increase BMI positively.

In the study by Erzeybek et al. (13), male basketball athletes aged 19-24 were divided into three groups, each consisting of 10 participants: a basketball group, a korfball group, and a control group (CG). The CG continued their everyday activities, while the basketball and korfball groups underwent plyometric training for eight weeks, three days a week. The findings revealed that the basketball group experienced a significant improvement in bench press strength, with a final result of 29.34 kg. In comparison, the korfball group showed a result of 11.14 kg, and the control group demonstrated a result of 5.6 kg. The plyometric training applied to the basketball players led to better strength development than the training provided to the korfball and control groups.

The results obtained from the study investigating the effects of plyometric exercises applied with the Cluster Set Method (CSY) on various physical and physiological parameters in female handball players are summarized below. When examining the pre-test and post-test results for the CSG group:

Although the statistical changes in the vertical jump (VJ) results were significantly different within the groups, no significant difference was found between the groups. The change percentage (PC) distribution between the groups showed an increase of 1.01% for TSG and 5.15% for CSG. This indicates that the effect of plyometric training with the Cluster Set Method (CSG) is greater than the traditional set method (TSG) in improving vertical jump performance.

Although there was a statistically significant difference in reactive agility test (RCT) results within each group, no significant difference was observed. The percentage increase (PC) between groups was 14.22% for TSG and 23.88% for CSG. The study found that the development level in the Cluster Set Method (CSG) was higher than the traditional set method (TSG) in terms of improvement in reactive agility.

Although there was a statistically significant difference in the 10 m sprint test (ST 10 m) results within each group, no significant difference was found between the groups. The percentage increase (PC) between groups was 18.64% for TSG and 23.25% for CSG, with a higher increase in CSG. Similarly, for the 30 m sprint test (ST 30 m), although there was a statistically significant difference within each group, no significant difference was found between the groups. The percentage increase (PC) between groups was 1.92% for TSG and 2.93% for CSG, with CSG showing a greater increase than TSG.

When examining the changes in the Peak Running Anaerobic Sprint Test (PRAST) results, statistically significant differences were found for PRAST maximum, average, and fatigue values within each group. Significant differences were noted between the groups for PRAST fatigue (post-test) values.

Percentage changes in leg strength parameters revealed some notable differences between groups. While minimum power output showed similar increases (18.49% for TSG and 18.47% for CSG), the CSG demonstrated significantly greater improvements in maximum (70.46% vs. 35.89% for TSG), average (44% vs. 24.51% for TSG), and fatigue index (80% vs. 44.83% for TSG) power outputs. These findings indicate that the cluster set training method (CSG) significantly enhanced peak power, sustained power, and resistance to fatigue compared to the traditional set training method (TSG).

Statistically significant differences were observed in the bench press (LS) results between the pre-test values within and between the groups. The percentage changes (PC) between groups were as follows: **TSG**: 7% increase, **CSG**: 20% increase. The study concluded that CSG exhibited a greater improvement in bench press strength compared to TSG.

The study concluded that the Cluster Set (CSY) method demonstrated statistically superior improvements in Leg strength (LS) and fatigue in the Performance of Repeated Anaerobic Sprint Test (PRAST-Fatigue) parameters compared to the Traditional Set (TSG) method. The literature review revealed a lack of sufficient research on the effects of CSY in plyometric training, specifically for female handball players aged 12-15.

This study is believed to serve as a guide for training practitioners. Additionally, the following recommendations are suggested for those interested in incorporating Cluster Set (CSY) methods into plyometric training:

The findings demonstrate that the cluster set (CS) method elicited superior improvements compared to the traditional set (TS) method, particularly in leg strength and the fatigue index of the repeated anaerobic sprint test (PRAST). While the CS group also exhibited greater improvements in vertical jump, reactive agility, and 10m-30m speed tests, these differences did not reach statistical significance. Nevertheless, this study provides evidence supporting the efficacy of the cluster set method as a performance-enhancing training approach for young female handball players.

The findings of this study suggest several avenues for future research. First, replicating this study with younger age groups, elite athletes, and male participants would increase the generalizability of the findings across populations. Second, extending the intervention period beyond the six weeks used in this study could allow for a more comprehensive evaluation of long-term training adaptations. Third, a comparative analysis across different sport disciplines would determine the transferability and effectiveness of these training methodologies across athletic contexts. Finally, a larger sample size is recommended in future studies to increase statistical power and confidence in generalizing the results.

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# The Effect of Gender on Personality and Psychological Well-Being in Fitness Practitioners

Serdar SOLMAZ [1A] Berzan ŞİMŞEK [2B], Sıtkı ÖZBEK [3C], Büşra ÖZCAN [4D], Yunus Emre YARAYAN [5E]

[1] *Batman University, Sport Science Faculty, Batman, TÜRKİYE*
[2] *Batman University, Sport Science Faculty, Batman, TÜRKİYE*
[3] *Batman University, Sport Science Faculty, Batman, TÜRKİYE*
[4] *Siirt University. Sport Science Faculty, Siirt, TÜRKİYE*
[5] *Siirt University. Sport Science Faculty, Siirt, TÜRKİYE*
*Address Correspondence to Berzan ŞİMŞEK: e-mail: besyo.berzan.simsek@gmail.com*

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*(Date Of Received): 07.10.2024 (Date of Acceptance): 28.12.2024 (Date of Publication): 31.12.2024*
A: Orcid ID: 0000-0002-4678-9604-9604 B: Orcid ID: 0000-0003-2264-538X C: Orcid ID: 0000-0001-6280-1434
D: Orcid ID: 0000-0003-3619-8840 E: Orcid ID: 0000-0003-0582-8088

**Abstract**

This study aims to examine the interactions between gender, personality traits, and psychological well-being. The research was conducted using data obtained from 325 fitness athletes across 22 different fitness centers in Turkey. Participants ranged from 17 to 45 years old and had engaged in fitness activities for at least one year. Data were collected through both online and paper-based surveys. The study investigates the effects of personality dimensions such as extraversion and emotional stability on psychological well-being within the framework of the five-factor personality model. Findings reveal significant differences in the effects of gender on personality traits and psychological well-being, with male participants scoring significantly higher in extraversion and emotional stability than female participants. Moreover, it was concluded that the impact of gender on psychological well-being occurs indirectly through emotional stability and extraversion. These findings contribute significantly to understanding the role of gender in psychological well-being within the fitness context. The results indicate a need for further research on the effects of personality traits and gender identity on fitness experiences and psychological health.

**Keywords:** Gender, fitness, personality, psyhchological well-being.

**Özet**

**Cinsiyetin Fitness Yapan Bireylerde Kişilik ve Psikolojik İyi Oluş Üzerindeki Etkisi**

Bu çalışma, cinsiyet, kişilik özellikleri ve psikolojik iyi oluş arasındaki etkileşimleri incelemeyi amaçlamaktadır. Araştırma, Türkiye'deki 22 farklı fitness merkezinden toplam 325 fitness sporcusundan elde edilen verilerle gerçekleştirilmiştir. Katılımcılar, 17-45 yaş aralığında ve en az bir yıldır fitness aktivitesi yapmaktadır. Veriler, çevrimiçi ve kâğıt tabanlı anketler aracılığıyla toplanmıştır. Çalışmada, beş faktör kişilik modeli çerçevesinde dışadönüklük ve duygusal denge gibi kişilik boyutlarının, psikolojik iyi oluş üzerindeki etkileri incelenmiştir. Bulgular, cinsiyetin kişilik özellikleri ve psikolojik iyi oluş üzerindeki etkilerinin belirgin farklılıklar gösterdiğini ortaya koymaktadır. Özellikle erkeklerin dışadönüklük ve duygusal denge puanlarının kadınlardan anlamlı şekilde yüksek olduğu tespit edilmiştir. Ayrıca, cinsiyetin psikolojik iyi oluş üzerindeki etkisinin, duygusal denge ve dışadönüklük aracılığıyla dolaylı bir şekilde gerçekleştiği sonucuna ulaşılmıştır. Bu bulgular, fitness ortamında cinsiyetin psikolojik iyi oluş üzerindeki rolünü anlamada önemli bir katkı sağlamaktadır. Sonuçlar, bireylerin kişilik özelliklerinin ve cinsiyet kimliklerinin fitness deneyimleri ve psikolojik iyilik halleri üzerindeki etkilerinin daha kapsamlı araştırılması gerektiğini göstermektedir.

**Anahtar Kelimeler:** Cinsiyet, fitness, kişilik, psikolojik iyi oluş.

## INTRODUCTION

Gender defines an individual's genetic, physiological, and biological characteristics (1). Throughout history, sporting activities have reinforced gender differences, and combat sports have generally been under male control (2). Klein (3) has described bodybuilding as predominantly a masculine subculture. The participation of women in sports traditionally viewed as male, such as football, snowboarding, and hockey, is often met with negativity, making conditions difficult for women (4; 5; 6). Although women engage in sports dominated by men today, it is unfortunately difficult to say that this perspective has changed either in Turkey or globally (7; 8; 6). Various studies have shown that women often pursue fitness for reasons such as maintaining health, achieving a well-defined body, feeling happy, relieving stress, staying fit, and losing excess weight (9; 6). While fitness is often perceived as a sport focused on gaining muscle mass and establishing a masculine identity (10), women are also partially engaging in fitness to gain muscle mass and achieve a fitter body (6). The positive effects of sports on individuals' quality of life and mental health are well known today (11; 12). However, we do not have sufficient information about how a demanding sport like fitness affects the differences between genders and how these effects reflect on individuals' psychological well-being. This research will help us understand the differences and similarities in fitness experiences between genders and will deepen our understanding of the contributions of sports to individuals' psychological well-being. Therefore, the aim of this study is to understand how male and female fitness participants construct their psychological well-being according to their personality types.

### Personality and Psychological Well-Being

The predominant model examined in personality research is the Five Factor Personality Model (13). This model consists of five dimensions: extraversion, neuroticism (emotional stability), conscientiousness, agreeableness, and openness to experience (14). Openness to experience refers to the tendency to exhibit unique behaviors and seek diverse experiences. Conscientiousness indicates the level of an individual's goal-oriented, reliable, disciplined, and responsible nature. Extraversion describes individuals who are generally social, enjoy being with others, and are energetic, happy, and assertive, while introverted individuals prefer solitude and tend to dislike excessive talking and communication. Agreeableness refers to individuals who are trustworthy, soft-hearted, honest, selfless, serious, optimistic, willing to compromise with others, and cooperative. Neuroticism describes a tendency to experience negative emotions such as anger, anxiety, irritability, sadness, and fear. In this regard, individuals with high levels of neuroticism are often characterized as distrustful, introverted, and angry (15; 16; 17).

Personality varies among individuals due to both hereditary and environmental factors (18). Consequently, an individual's personality can change based on their environment and participation in sports activities. To evaluate and enhance psychological well-being, it is essential to consider the individual's social and cultural context (19; 20). Even within the same environment, individuals may have different ways of positively assessing themselves. These differences manifest in areas such as growth and development, life purpose, capacity to establish meaningful relationships with others, effective life management, and decision-making abilities (19). Waterman (20) defined psychological well-being as the effort to realize one's potential and achieve meaningful goals. Studies in the literature that investigate the relationship between personality and psychological well-being 20; 18; 22; 23) demonstrate that personality significantly influences psychological well-being. In this context, a positive and significant relationship is expected between the personality types and psychological well-being of individuals engaged in fitness.

### The Relationship Between Gender, Personality, and Psychological Well-Being

Various studies have been conducted to determine whether there are differences between gender and personality traits. Feminine and masculine gender roles encompass the entire spectrum of personality traits associated with women and men. Feminine gender roles are often characterized by sensitivity, understanding, emotionality, and dependence, while masculine gender roles are characterized by leadership, dominance, and independence (24). Many studies have compared women and men, revealing various differences. Some research findings point to biological differences, while a significant portion indicates that these differences stem from socio-cultural factors (25). Notably, in the personality trait of emotional stability, women have been found to score lower than men (26). A review of the literature shows that the impact of gender on personality

types has been investigated in various studies conducted at different times, yielding different results across cultures (27; 28; 29; 30). Therefore, in our study, it is expected that the personalities of women and men engaged in fitness will differ based on gender.

The concept of well-being is becoming increasingly important today (31; 32; 33). Psychological well-being is a phenomenon that focuses on an individual's skills and personal development, rooted in concepts such as "self-actualization, functionality, or maturity" in various studies (34). Individuals with high levels of psychological well-being tend to have better physical health, higher life satisfaction, and greater psychological resilience. They possess positive future expectations, experience more positive emotions, and are generally happier and more optimistic, while experiencing fewer psychological distress symptoms such as stress, depression, and anxiety (35; 36; 37; 38; 39). Research conducted at different times has shown that women's psychological well-being differs from that of men due to environmental and personality factors (40; 41; 42; 31; 43). In this context, it is expected that the psychological well-being of individuals engaged in fitness will vary according to their gender. The research model is illustrated in Figure 1.

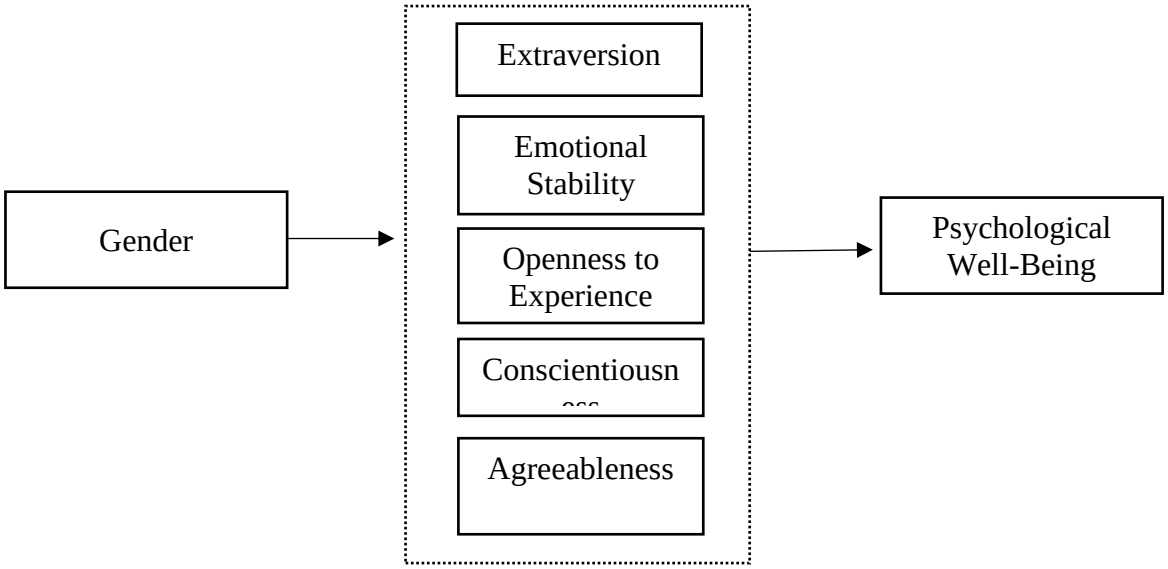


**Figure 1**. Research Model

## METHOD

### Study Group and Process

Within the scope of the study, data were collected from individuals aged between 17 and 45 years who have been engaged in fitness activities for at least one year, using both online and paper-based surveys. The sample was selected using purposive sampling to ensure that only fitness athletes meeting the criteria were included. Initially, ethical approval was obtained, and then necessary permissions were secured by contacting managers of various fitness centers. A total of 325 fitness athletes from approximately 22 fitness centers were reached.

Among the collected surveys, responses that were incomplete, invalid, or reported incorrect information were excluded from the analysis. All analyses were conducted using the data from a total of 325 valid participants. Of these participants, 181 (55.7%) were male, 144 (44.3%) were female, and the average age was 26.44 years. Participants' ages ranged from 19 to 45 years. Among the participants, 310 (95.4%) had been engaged in fitness activities for 1 to 3 years, while only 10 (4.6%) had been involved for 4 years or more. Regarding educational background, 211 (64.9%) participants were high school graduates, while 114 (35.1%) were university graduates.

To determine the necessary sample size for the study, a power analysis was conducted with the following parameters: significance level (sig.level) = 0.05, Cohen's d effect size = 0.10, and power = 0.95. The analysis indicated that a minimum of 218 participants was required for the multivariate regression analysis. Suresh and Chandrashekara (44) suggested increasing the sample size by 10% to account for the likelihood of missing or incomplete data. Following this recommendation, an ideal participation of 325 participants was established for the study.

**Data Collection Instruments**

The data for the study were collected using the "Personal Information Form," the "Ten-Item Personality Inventory," and the "Psychological Well-Being Scale."

**Ten-Item Personality Inventory**

To identify participants' personality traits, the Ten-Item Personality Inventory developed by Gosling et al. (45) and adapted into Turkish by Atak (46) was utilized. The scale consists of 10 items and five factors: Extraversion, Emotional Stability, Openness to Experience, Conscientiousness, and Agreeableness. A 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), was used for each of the 10 items. The reliability coefficients calculated for the scale's internal consistency were as follows: Openness to Experience 0.80, Agreeableness 0.80, Emotional Stability 0.86, Conscientiousness 0.84, and Extraversion 0.80.

**Psychological Well-Being Scale**

To measure participants' psychological well-being, the 8-item Psychological Well-Being Scale developed by Diener et al. (47) and adapted into Turkish by Telef (48) was employed. A 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), was used for all items in the scale. The reliability coefficient calculated for the scale's internal consistency was reported as 0.94.

**Data Analysis**

To calculate the reliability values of the data, the Cronbach's alpha ($\alpha$) coefficient was reported. Additionally, to check whether the obtained data met the univariate normality assumption, the kurtosis and skewness values were calculated. For the current study, kurtosis and skewness values within the ±2.00 range were taken as the reference values (49). Standardized factor values (Standardized $\beta$) and their z-values were used to determine the significance values of the variables. The bootstrap technique was employed to verify whether the relationships between the variables were statistically significant (50). In this study, a total of 5,000 resampling options were selected, and calculations were made with a 95% confidence interval (51).

Statistical analyses of the data obtained for the study were conducted using the SPSS and R software packages (52;53). Additionally, for the multiple regression analysis conducted using the R program, the "lavaan," "semPlot," and "pwr" packages were utilized (54; 55; 56).

**RESULTS**

The correlations related to the variables, along with various descriptive statistics, are presented in Table 1. It was determined that all relationships among the variables in the current study were statistically significant. Additionally, the kurtosis and skewness values fell within the recommended reference ranges, indicating that the univariate normality assumption was met (See Table 1).

**Ethical approval and institutional permission**

This study was approved by Batman University Ethics Committee with 05.09.2024 and decision no: 2024/06.

## FINDINGS

**Table 1.** Descriptive Statistics and Correlation Values Between Variables

| Variables | | $\bar{x}$ | SS | Skewness | Kurtosis | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | Gender | **-** | **-** | **-** | **-** | **1** | | | | | | |
| **2.** | Extraversion | **4.50** | **1.69** | **-.0.40** | **-1.28** | .24** | **1** | | | | | |
| **3.** | Emotional Stability | **4.04** | **1.42** | **-0.26** | **-085** | .25** | .55** | **1** | | | | |
| **4.** | Openness to Experience | **4.38** | **1.19** | **-0.90** | **0.54** | -.20** | .19** | .04 | **1** | | | |
| **5.** | Conscientiousness | **4.02** | **1.70** | **-0.23** | **-1.34** | .45 | .26** | .18** | **.28**** | **1** | | |
| **6.** | Agreeableness | **4.79** | **1.54** | **-0.55** | **-0.72** | .54 | .34** | .26** | .28** | .40** | **1** | |
| **7.** | Psychological Well-Being | **4.38** | **1.03** | **-0.63** | **0.51** | .17** | .45** | .39** | .13* | .24** | .24** | **1** |

**** p < 0.01, * p < 0.05,** M = mean, Sd = standard deviation

To determine the causal relationship between the personality traits of fitness athletes and various types of self-confidence, a path analysis was conducted using the "lavaan" package. The results of the analysis are presented in Figure 1.

Upon examining Figure 1, it can be observed that there is no significant relationship between gender and the personality traits of conscientiousness and agreeableness. On the other hand, extraversion (b = .24, p < .001, z = 4.46, [95% CI: 0.461, 1.184]) has a significant effect on emotional stability (b = .24, p < .001, z = 4.44, [95% CI: 0.385, 0.993]) and openness to experience (b = -.20, p < .001, z = -3.78, [95% CI: -0.747, -0.237]) based on gender. However, gender does not have a significant direct effect on psychological well-being.

When examining the effects of personality traits on psychological well-being, extraversion (b = .28, p < .001, z = 3.72, [95% CI: 0.083, 0.267]) and emotional stability (b = .19, p < .001, z = 2.63, [95% CI: 0.036, 0.248]) were found to have a positive and significant effect.

In the model where personality traits act as mediators, only extraversion (b = .06, p < .001, z = 2.92, [95% CI: 0.048, 0.240]) and emotional stability (b = .04, p < .05, z = 2.18, [95% CI: 0.010, 0.185]) were identified as having a mediating role between gender and psychological well-being. Finally, it was determined that all predictor variables accounted for 25% of the variance in external self-confidence ($R^2$ = .25).

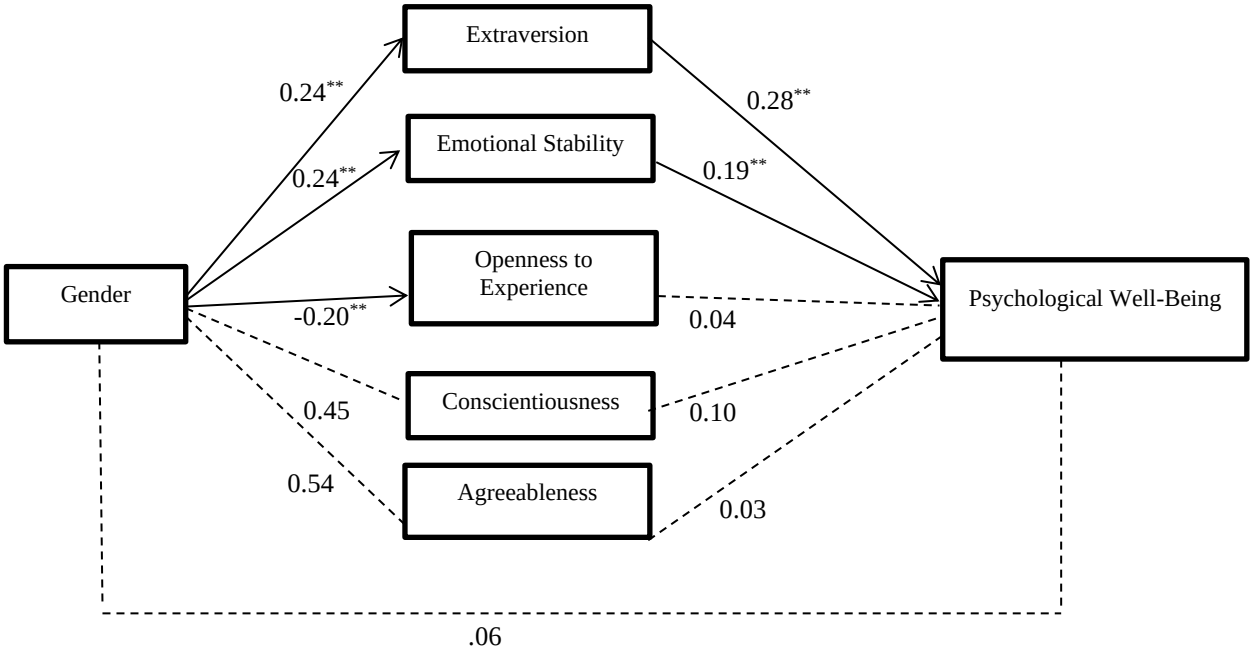


**Figure 1.** Results of Regression Analysis

## DISCUSSION AND CONCLUSION

Although personality traits may differ between men and women, these differences have minimized over time due to increasing gender equality. In fact, it is known that female athletes exhibit positive differences in certain personality traits compared to their male counterparts (27). Therefore, this study aimed to determine the influential role of gender in the effects of personality traits on the psychological well-being of male and female fitness athletes, as well as to identify the mediating role of personality types.

As a result of the conducted study, it was found that the personality traits of extraversion and emotional stability significantly differed between women and men. Within the study sample, male fitness athletes exhibited higher levels of emotional stability and extraversion compared to their female counterparts. This finding aligns with studies conducted across different age groups, cultures, and sample populations (27; 29; 30). The primary reason for the differences, particularly in the dimension of emotional stability, is often attributed to genetic and biological factors, with cultural influences also supporting this assertion in various studies and meta-analyses (57; 26). Furthermore, within the context of social role theory, it has been suggested that the differences in personality traits stem from societal expectations and that personality is shaped by these expectations (58). This situation can be interpreted as a result of gender expectations and roles according to social role theory. In societies where traditional values are strong and gender roles are emphasized, emotional instability may be rooted in the entrenched roles of women, while extraversion may be more pronounced in men. Additionally, the general expectation that men should be strong and emotionally stable supports the findings of the current study within the framework of social role theory. However, it would be erroneous to expect the same results across all cultures (59).

Another finding of our study is that the personality trait of openness to experience is higher in women compared to men. Gjerde & Cardilla (60) noted in their study on young and adolescent individuals that women exhibit a more internal and emotional demeanor, while men are more resilient, self-confident, and open to experience. However, Schmitt et al. (30) found that in their study conducted across 55 different cultures, women in 18 cultures had higher levels of openness to experience than men. When evaluated among athletes, this trait shows variability depending on whether they are professional or amateur, as well as between team sports and individual sports (61; 62; 63). Changing societal attitudes toward gender roles may also influence the results of this study. Feminist movements and masculine types of women may express themselves more freely in various sports activities. Particularly, fitness, which has traditionally been viewed as a male-dominated sport, may have gained prominence among women as well. Best & Williams (64) demonstrated that feminine and masculine types of women may differ across various cultures. We can assert that fitness, once regarded as a masculine sport, is now embraced by these types of women. The relationship between personality and sports varies and is complex according to different studies, and clear results are often lacking (62; 65).

In the relationship between personality and psychological well-being, both extraversion and emotional stability have shown positive and significant correlations. A meta-analysis conducted by De Neve & Cooper (66) revealed positive and negative relationships between extraversion and neuroticism, respectively. Similarly, Salami (67) found significant relationships between extraversion, neuroticism, and psychological well-being in a study involving adolescents. Abbott et al. (68) also discovered that extraversion and neuroticism have a significant impact on psychological well-being in their research involving 1,134 adolescents and young women. It has been particularly observed that individuals with extraverted personalities tend to be more social and are inclined to develop positive relationships with others. On the other hand, emotional stability is expected to have a positive effect on psychological well-being. Emotional stability can enhance individuals' coping skills for stress, thereby positively influencing overall life satisfaction and happiness.

The limited effect of gender on psychological well-being can largely be explained by socio-cultural factors. Over time, the flexibility of traditional gender roles has allowed individuals to develop their personal traits and potential (61, 62). The provision of equality in educational and economic opportunities, in particular, has been a significant factor in bringing the psychological well-being levels of both women and men closer together (27). Additionally, in collectivist cultures, the availability of social support networks for both genders contributes to maintaining mental health. The participation of individuals who engage in fitness in self-actualization processes, supported by their social environment, may strengthen this effect. Furthermore, our

study has shown that personality traits such as emotional stability and extraversion significantly influence the relationship between gender and psychological well-being. Especially among male athletes, the prominence of these traits may positively impact their psychological well-being. A similar study conducted in Chinese culture by Li et al. (69) revealed that men have higher levels of extraversion, aligning with our findings. Moreover, Weissman et al. (70) suggested that mental health issues, such as anxiety and depression, which are more frequently observed in women, could help explain these differences. Fitness can encourage individuals to both engage with a social environment and develop self-confidence beyond cultural norms. The increasing awareness of psychological health and the proliferation of support systems in modern societies further reinforce this effect. Therefore, it can be argued that psychological well-being is more meaningfully explained by individual differences, such as personality traits, rather than gender. In this context, the results of our study demonstrate that personality traits like extraversion and emotional stability are strong determinants of psychological well-being, regardless of gender.

**Recommendations and Limitations**

The findings of this study suggest that the effects of gender on personality traits and psychological well-being should be examined in a larger sample across different sports disciplines. Future research is recommended to involve more diverse samples, taking into account various age groups and levels of athletic experience. Additionally, considering gender identity and societal gender roles as dynamic processes influencing personality and psychological well-being may provide deeper insights into these relationships. Conducting longitudinal studies can elucidate the temporal changes in personality traits and their effects on psychological well-being. Incorporating more objective methods, such as observations and biological measurements, alongside self-report instruments during data collection is crucial for minimizing potential biases. Investigating the effects of cultural and social factors on personality development in different cultural contexts will contribute to our understanding of how these relationships are shaped by culture-specific dynamics.

The study's findings are limited due to its focus solely on fitness athletes, which decreases the generalizability of the results. Moreover, the cross-sectional design of the study complicates causal inferences. Data collection based on self-report methods may increase the risk of social desirability bias. Additionally, the study is culturally specific; thus, it cannot be claimed that the findings are applicable across different cultures. Future research is suggested to conduct comparative studies across various sports and cultural contexts.

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# Investigation of Mental Endurance Levels of Turkish Folk Dance Competition Athletes According to Various Variables

Zeynel TURAN [1A]

[1] 1Burdur Mehmet Akif Ersoy University, Turkish Music State Conservatory, Turkish folk dances department, Border, TÜRKİYE
Address Correspondence to Zeynel TURAN: e-mail: zeynelturan@hotmail.com

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A: Orcid ID: 0000-0002-6620-1273

**Abstract**

Folk dances are not only a form of cultural expression, but also represent a perfect combination of physical activity and coordination. In addition to being a cultural and artistic activity, the subject and purpose of this study is to examine the Mental Endurance Levels of the competition athletes performing folk dances, which are accepted as a sport branch, in terms of various variables. A total of 383 folk dance athletes, 216 women and 167 men, participated in this study, which is a descriptive research based on the Scanning model, one of the quantitative research methods, from 18 provinces as licensed in the teams competing in the "youth" category Turkish Championships organised by the Turkish Folk Dance Federation in the 2023-2024 season. In the study, "Mental Endurance Inventory in Sport" was used to determine the mental endurance levels of folk dance athletes. Independent Samples t-Test and One Way Anova from parametric tests were used in the measurements. According to the results of the research, it was determined that there was a statistically significant difference in favour of male athletes according to gender in the folk dance competition athletes participating in the study. While there was no significant difference according to the age variable, it was determined that there was a significant difference according to the year of doing sports. There was no significant difference between the groups according to the weekly training number variable.

**Keywords:** Folk dances, mental endurance, competition athletes.

**Özet**

**Türk Halk Oyunları Yarışma Sporcularının Zihinsel Dayanıklılık Düzeylerinin Çeşitli Değişkenlere Göre İncelenmesi**

Halk oyunları, sadece kültürel bir ifade biçimi olmanın ötesinde, aynı zamanda fiziksel bir aktivite ve koordinasyonun mükemmel bir birleşimini de temsil etmektedir. Kültürel ve sanatsal bir faaliyet olmasının yanısıra bir spor dalı olarak da kabul edilen halk oyunlarını icra eden yarışma sporcularının Zihinsel Dayanıklılık Düzeylerinin Çeşitli Değişkenler Bakımından incelenmesi bu çalışmanın konusunu ve amacını oluşturmaktadır. Nicel araştırma yöntemlerinden, Tarama modeline dayalı, Betimsel bir araştırma olan bu çalışmaya Türkiye Halk Oyunları Federesyonunca 2023-2024 sezonunda düzenlenen "gençler" kategorisi Türkiye Şampiyonasında yarışan takımlarda lisanslı olarak 18 ilden yarışmaya katılan 216'sı kadın, 167'si erkek olmak üzere toplam 383 halk oyunu sporcu katılmıştır. Araştırmada, halk oyunu sporcularının zihinsel dayanıklılık seviyelerini tespit etmek amacıyla "Sporda Zihinsel Dayanıklılık Envanteri" kullanılmıştır. Ölçümlerde Parametrik testlerden Independent Samples t-Test ve One Way Anova kullanılmıştır. Araştırma sonucuna göre, çalışmaya katılan halk oyunları yarışma sporcularında cinsiyete göre erkek sporcular lehine istatistiki bakımdan anlamlı fark olduğu belirlenmiştir. Yaş değişkenine göre anlamlı fark bulunamazken, spor yapma yılı değişkenine göre anlamlı fark olduğu tespit edilmiştir. Haftalık antrenman sayısı değişkenine göre gruplar arasında anlamlı bir fark olmadığı görülmüştür.

**Anahtar Kelimeler:** Halk oyunları, zihinsel dayanıklılık, yarışma sporcuları.

## INTRODUCTION

Traditional folk dances are one of the cultural products that have a great contribution to the protection of cultural heritage by transferring the history, values, beliefs, rituals and social structure of a society from generation to generation. Folk dances, which symbolize the behaviors of the culture of a community or ethnic group, are one of the cultural building blocks that enable a society to express aspects of its cultural and social life through music, figures and movement structures. These movements often carry a specific meaning and include references to traditional stories or the history of the community. Gestures are used to express emotions, stories or characters. From this point of view, folk dances can be explained as a folk art in which physical movements and gestures are used together, traditional music, rhythm and traditional clothing become a whole and come to life in the human body.

Folk dances are not only a form of cultural expression, they also represent a perfect combination of physical activity and coordination. In addition to being a cultural and artistic activity, dance is also recognized as a branch of sport (18, 1, 64). Folk dances, which are observed to have an important role in the development of individuals in physical and mental aspects, are a physical activity that involves more intense and difficult combinations of physical movements than most types of sportive activities with the intense mobility it contains (48). According to Gerek (17), folk dances, which are one of the cultural products, should be evaluated as a sports activity, considering that folk dances, which are one of the cultural products, have a competition and competition environment like all sports branches, are evaluated by referees within the framework of certain rules, players show physical activity during the competition, and competitions are held in front of the audience.

Several studies (26, 67, 24, 28, 73, 65) addressed the physical characteristics of dancers, their mental, psychological and sociological dimensions in different age groups, and their training and physical capacity-enhancing aspects in the field of sports sciences. At the same time, in these studies, it is revealed that folk dances are accepted as a sport branch, dancers should have physical abilities that require high-level coordination, flexibility and endurance, and on the other hand, it is also necessary to use the mental skills necessary for success in a competitive environment effectively.

The definition of traditional dance as a sport has transformed this art form into a discipline that is not only a means of aesthetic expression, but also includes the principles of sports sciences such as disciplined training, competition preparations and training psychology. In the Katen (32) study on the emotional state of dancers in the competition environment, Katen said, "Mind and body are not separate or separable elements. The greater the risk, the greater the possible emotional effects", drawing attention to the emotional state that competitions create in the mind and body of dancers.

Considering that the main goal in the majority of folk dance activities is to participate in folk dance competitions organized by institutions and organizations and win awards; "mental endurance", which is an important factor in optimizing the performance of folk dance athletes, increasing their success and overcoming the difficulties they face throughout their sports life, emerges as an important psychological state that needs to be overcome and developed by working on it.

Mental toughness is one of the psychological factors that occur in athletes during training or matches (60). Mental toughness, which is a concept that includes an athlete's ability to cope with stress, focus, maintain motivation and overcome difficulties, is an issue that has a positive effect on athletes' performance and has a positive effect on achieving their goals. This can also be considered as a psychological state that can help athletes to be resistant to stress (38).

The concept of mental toughness, which refers to the ability of athletes to cope with stress, pressure, and challenges while maintaining a strong sense of determination and belief in their ability to achieve their goals, is a psychological state that, according to Yılmaz (76), is very important in continuing the work started without allowing it to negatively affect performance without losing focus and motivation in failure, unexpected and difficult situations.

When mental toughness, which is accepted as one of the important psychological characteristics in reaching elite performance level, is evaluated in general (22, 5, 4, 29, 36, 39) failure in situations such as competitions and training, increased sense of responsibility, self-confidence due to the belief that they are superior to their competitors despite the pressures they are exposed to, better able to fight and despite the stress factors around the individual, determined and confident, health, performance and psychology is interpreted as a state of being able to improve. Although folk dances have their own distinctive characteristics, the preparation processes in the background are based on physical and mental processes, as in most professional sports branches. This process also requires attention and focus, emotional control and creativity. Therefore, it is very important for folk dance competition athletes to develop their endurance by going through physical, mental and psychological preparation stages.

This study aims to understand the mental endurance levels of athletes especially in the field of folk dances. In many studies, both applied and observational, there are studies on Mental Endurance on athletes and different sports branches (57, 9, 69, 71) are observed. However, when the relevant literature is scanned to the extent that it can be reached, it is quite remarkable that there are no studies on the subject in the field of "folk dances" and makes it valuable to examine this issue.

From this point of view, the subject and purpose of this study is to examine the Mental Endurance Levels of the competition teams competing in the "youth" category Turkish Championship organized by the Turkish Folk Dance Federation in the 2023-2024 season in terms of various variables.

For this purpose, the individuals who participated in the study;

1- Gender

2- Age

3- Duration interested in folk dances

4- Weekly training days

5- According to the daily training hours, answers will be sought to the questions of the level of mental endurance of folk dance athletes.

## METHOD

### Research Model

This research was designed as a descriptive research based on quantitative research method and survey model. Survey models are research approaches that aim to describe a past or present situation as it exists (31). In descriptive design; “what a situation, condition, person, relationship is” means description, description and clarification. Thus, it provides basic information about the characteristics of certain variables (15).

### Population-Sample (Research Group)

The population of the research is the folk dance athletes who are licensed athletes in associations, institutions and organizations engaged in educational activities in different provinces of Turkey in the 2023-2024 academic year and who participate in folk dance activities. The sample of the research consists of a total of 383 folk dance athletes, 216 of whom are women and 167 of whom are men, who participated in the competition as licensed athletes in the teams competing in the "youth" category Turkish Championship organized by the Turkish Folk Dance Federation in the 2023-2024 season.

Since the competition was a Turkish championship, finalist teams from almost all regions of Turkey participated in the competition. In the study, 18 provincial competition teams from 6 regions of Turkey (Thrace, Marmara, Aegean, Mediterranean, Eastern Anatolia, Central Anatolia) participated. In terms of scope, it can be said that the study has a large population to cover the whole Turkey. All athletes participating in the study were evaluated according to the parameters of their demographic and physical characteristics and the results obtained were tried to be explained in a descriptive way.

**Data Collection Tools**

In the study, the "Mental Endurance Inventory in Sports" developed by Sheard, Golby and Van Wersch (56), whose Turkish adaptation was tested for validity and reliability by Altıntaş and Koruç (2), was used to determine the mental endurance levels of folk dance athletes. The inventory, which consists of 3 sub-dimensions (Confidence, Control, Continuity) and 14 items, is a four-point Likert type. Cronbach's Alpha reliability coefficient was found to be .70. The Cronbach's Alpha reliability coefficient of the trust sub-dimension was found to be .66, the reliability coefficient of the continuity sub-dimension was found to be .56 and the reliability coefficient of the control sub-dimension was found to be .60.

**Data Analysis**

The data obtained from the folk actors participating in the research were analyzed using SPSS (version 20.0) program. "Frequency and percentage" calculations were made in order to determine the characteristics of the folk actors participating in the research regarding the predetermined variables.

In terms of examining the variables determined in the research, normality test was performed on the data and it was determined that it was suitable for normal distribution. In this case, the study was continued with parametric tests. In order to determine whether there is a significant difference between the scores obtained from the scale, Independent Samples t-Test and One Way Anova tests were applied. In the arithmetic averages and standard deviation values of the variables, 0.05 significance level was accepted statistically.

**Table 1.** Test for Conformity of Data to Normal Distribution

| Scale and Subscales | N | Min | Max. | Mean | SD | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| Total Score | 383 | 30,00 | 55,00 | 42,31 | 4,77 | ,244 | -,152 |
| Trust | 383 | 10,00 | 24,00 | 18,95 | 2,94 | -,057 | -,385 |
| Continuity | 383 | 7,00 | 16,00 | 13,23 | 2,05 | -,446 | -,386 |
| Control | 383 | 6,00 | 16,00 | 10,33 | 1,86 | ,295 | -,057 |

**Ethical approval and institutional permission**

Ethics committee approval was obtained with the decision of Burdur Mehmet Akif Ersoy University Non-Interventional Clinical Research Ethics Committee dated 03.01.2024 and numbered 2024/1-GO2024/2. During the current research, the "Higher Education Institutions Scientific Research and Publication Ethics Directive" was followed.

## FINDINGS

In this section, the results of the analyzes made in the direction of the level of mental endurance of the folk dance competition athletes participating in the research according to various variables are included.

**Table 2.** Demographic Characteristics of Participants

| Variables | Groups | N | % |
|---|---|---|---|
| **Gender** | Female | 216 | 56,4 |
| | Male | 167 | 43,6 |
| **Age** | 14 | 17 | 4,4 |
| | 15 | 72 | 18,8 |
| | 16 | 91 | 23,8 |
| | 17 | 128 | 33,4 |
| | 18 | 75 | 19,6 |
| **Participating Provinces** | Adana | 35 | 9,1 |
| | Amasya | 8 | 2,1 |
| | Ankara | 32 | 8,4 |
| | Aydın | 11 | 2,9 |
| | Balıkesir | 26 | 6,8 |
| | Bitlis | 12 | 3,1 |
| | Çorum | 9 | 2,3 |
| | Denizli | 32 | 8,4 |
| | Elâzığ | 32 | 8,4 |
| | Gümüşhane | 21 | 5,5 |
| | İstanbul | 41 | 10,7 |
| | Konya | 31 | 8,1 |
| | Kocaeli | 8 | 2,1 |
| | Nevşehir | 12 | 3,1 |
| | Sivas | 11 | 2,9 |
| | Tekirdağ | 26 | 6,8 |
| | Trabzon | 11 | 2,9 |
| | Van | 25 | 6,5 |
| **Years of practicing folk dance sport** | 1-2 Years | 145 | 37,9 |
| | 3-4 Years | 58 | 15,1 |
| | 5-7 Years | 71 | 18,5 |
| | 8 Years and over | 109 | 28,5 |
| **Number of Weekly Trainig** | 2 | 100 | 26,1 |
| | 3 | 126 | 32,9 |
| | 4 | 37 | 9,7 |
| | 5 | 99 | 25,8 |
| | 6 | 12 | 3,1 |
| | 7 | 9 | 2,3 |

According to Table 2, the total number of folk dance competition athletes who participated in the study was 383 and 216 of them were female (56.4%) and 167 (43.6%) were male athletes. The age range of the athletes participating in the study was between 14 and 18 years old. Athletes from 18 different provinces of Turkey participated in the study. The years of doing folk dance sports vary between 1 and 8 years. The number of weekly training days of the athletes participating in the study varies between 2 and 7 days.

**Table 3.** T-Test results of mental toughness scores according to gender variable

| Scale and Subscales | Gender | N | X̄±SD | t | df | p | η² |
|---|---|---|---|---|---|---|---|
| **Total Score** | Female | 216 | 41,12±4,36 | -3,394 | 381 | ,001 | ,029 |
| | Male | 167 | 42,76±5,11 | | | | |
| **Trust** | Female | 216 | 18,17±2,99 | -3,746 | 381 | ,000 | ,036 |
| | Male | 167 | 19,28±2,74 | | | | |
| **Continuity** | Female | 216 | 13,00±1,95 | -,290 | 381 | ,772 | ,000 |
| | Male | 167 | 13,06±2,17 | | | | |
| **Control** | Female | 216 | 9,94±1,76 | -2,450 | 381 | ,015 | ,016 |
| | Male | 167 | 10,41±1,97 | | | | |

According to Table 3, it was determined that there was a statistically significant difference (p=,001) in favor of male athletes (x=42,76) in terms of gender variable (p<0,05). When the effect values are examined, it is seen that all sub-dimensions except the continuity sub- dimension have a moderate effect in favor of male athletes (p2=,036 - ,016) (p2>,001) in terms of gender variable.

**Table 4.** Anova Test Results according to age variable

| Scale and Subscales | Age | N | X̄±SD | f | p | Tukey |
|---|---|---|---|---|---|---|
| **Total Score** | 14 | 17 | 42,88±4,75 | 5,329 | ,000 | 18>15-16-17 |
| | 15 | 72 | 40,37±4,30 | | | |
| | 16 | 91 | 41,58±4,63 | | | |
| | 17 | 128 | 41,57±4,42 | | | |
| | 18 | 75 | 43,76±5,37 | | | |
| **Trust** | 14 | 17 | 18,76±2,61 | 6,323 | ,000 | 18>15 |
| | 15 | 72 | 17,55±2,72 | | | |
| | 16 | 91 | 18,49±2,79 | | | |
| | 17 | 128 | 18,64±3,00 | | | |
| | 18 | 75 | 19,90±2,87 | | | |
| **Continuity** | 14 | 17 | 13,82±2,03 | ,846 | ,497 | - |
| | 15 | 72 | 12,81±1,85 | | | |
| | 16 | 91 | 13,08±1,99 | | | |
| | 17 | 128 | 13,01±2,02 | | | |
| | 18 | 75 | 13,01±2,32 | | | |
| **Control** | 14 | 17 | 10,29±1,31 | 3,438 | ,009 | 18>17 |
| | 15 | 72 | 10,00±1,78 | | | |
| | 16 | 91 | 10,00±2,00 | | | |
| | 17 | 128 | 9,91±1,60 | | | |
| | 18 | 75 | 10,84±2,16 | | | |

According to Table 4, the total scores of folk dance competition athletes from the mental toughness in sport inventory show a statistically significant difference (p<,05) (p=,000). As a result of the Tukey test conducted to determine from which groups this difference originated, it is seen that 18-year-old athletes have higher scores in the sub-dimensions of "Trust and Control" than all other age group athletes according to the total scores**.**

In the "Trust" sub-dimension, the mean scores of 18-year-old athletes were higher than those of 15-year-old athletes, and in the "Control" sub-dimension, the mean scores of 18-year-old athletes were higher than those of 17-year-old athletes.

**Table 5.** Anova test results according to years of practicing sports

| Scale and Subscales | Years of Sport | N | X̄±SD | f | p | Tukey |
|---|---|---|---|---|---|---|
| **Total Score** | (1) 1-2 Years | 145 | 40,78±3,98 | 6,773 | ,000 | 4>1 |
| | (2) 3-4 Years | 58 | 41,53±5,16 | | | |
| | (3) 5-7 Years | 71 | 41,78±4,86 | | | |
| | (4) 8 Years and over | 109 | 43,43±5,08 | | | |
| **Trus** | (1) 1-2 Years | 145 | 18,08±3,04 | 5,812 | ,001 | 4>1,2 |
| | (2) 3-4 Years | 58 | 18,29±2,45 | | | |
| | (3) 5-7 Years | 71 | 18,71±2,74 | | | |
| | (4) 8 Years and over | 109 | 19,56±2,96 | | | |
| **Continuity** | (1) 1-2 Years | 145 | 12,58±1,95 | 4,619 | ,003 | 4>1 |
| | (2) 3-4 Years | 58 | 13,27±2,02 | | | |
| | (3) 5-7 Years | 71 | 13,01±1,91 | | | |
| | (4) 8 Years and over | 109 | 13,50±2,17 | | | |
| **Control** | (1) 1-2 Years | 145 | 10,11±1,81 | ,717 | ,542 | - |
| | (2) 3-4 Years | 58 | 9,96±1,93 | | | |
| | (3) 5-7 Years | 71 | 10,05±1,63 | | | |
| | (4) 8 Years and over | 109 | 10,35±2,05 | | | |

A statistically significant difference (p<0,5) was observed between the groups in terms of the scores of the athletes who participated in the study according to their years of practicing sports (p=.000). As a result of the Tukey test conducted to determine which groups this difference originated from, it is seen that the athletes who have been performing folk dance for 8 years or more have higher scores in the sub-dimensions of "Trust and Continuity" compared to all other athletes.

In the "Trust" sub-dimension, it was concluded that the average scores of the athletes who performed folk dance for 8 years and more were higher than the athletes who performed folk dance for 1-2 and 3-4 years, and in the "Continuity" sub-dimension, the athletes who performed folk dance for 8 years and more were higher than the athletes who performed folk dance for 1-2 years.

**Table 6.** Anova Test Results According to Wekly Training Hours Variable

| Scale and Subscales | Weekly Training | N | X̄±SD | f | p |
|---|---|---|---|---|---|
| **Total Score** | 2 | 100 | 40,76±5,09 | 2,093 | ,066 |
| | 3 | 126 | 42,32±4,80 | | |
| | 4 | 37 | 42,00±4,35 | | |
| | 5 | 99 | 42,35±4,47 | | |
| | 6 | 12 | 39,91±2,99 | | |
| | 7 | 9 | 43,22±5,82 | | |

It was determined that there was no statistically significant difference between the groups according to the number of weekly training (P>.05) (p=.066).

**Table 7.** Anova Test Results According to Daily Training Hours Variable

| Scale and Subscales | Daily Training Hours | N | X̄±SD | f | p |
|---|---|---|---|---|---|
| **Total Score** | 1 saat | 11 | 44,00±5,00 | 1,267 | ,285 |
| | 2 saat | 286 | 41,86±4,94 | | |
| | 3 saat | 54 | 41,07±4,08 | | |
| | 4 saat | 32 | 42,15±4,01 | | |

It was determined that there was no statistically significant difference between the groups according to the daily training hours variable (P>.05) (p=.285).

## DISCUSSION

Mental resilience in dance has been a topic of interest in recent years. Studies generally underline the importance of dance in the context of mental toughness and emphasize the psychological aspects of dance performance, self-efficacy in dance, and the importance of applying sport psychology to dancers (11, 25, 47, 45, 72). The function of mental endurance in sports is to enable folk dance athletes to develop resistance to the challenges they experience during the training process and during the competition, and to avoid stress by taking control of behavior during the competition.

Since the rhythmic movements in folk dances are usually performed with musical accompaniment and at the right rhythmic times, folk dance performers need to have a high level of neuromuscular coordination (77). These qualities are necessary for dance performance and are similar to the qualities required in other sports branches. However, dancers also have unique characteristics that distinguish them from other athletes (52). The movements performed in harmony with the rhythm of the music are performed both individually and collectively.

Koutedakis et al (37), who define dancers as athletes who perform, mention the importance of understanding the physiological and psychological elements of dance. These factors consist of technical, physical, mental and emotional characteristics that determine the quality of performance. Mental focus and endurance are also related to the dancer's mental focus on the choreography. The dancer's mind must be ready to make the right movements by focusing on the choreography.

According to the results of this research conducted to examine the mental endurance levels of folk dance competition athletes, it was determined that there was a statistically significant difference in favor of male athletes according to the gender variable in the folk dance competition athletes participating in the study. It was seen that the mean scores of male athletes were higher than female athletes in the sub-dimensions of Confidence and Control, except for the Continuity sub-dimension. This result is explained by O'Brien et al. (42) as "inequality in sports, body image problems and increasing mental challenges faced by young female athletes".

This result obtained in this study coincides with some studies in the literature (43, 44,16, 58, 35, 60, 61, 71, 35) overlaps with the study results.

Contrary to this result, Sevinç et al. (55) concluded that mental endurance levels differed significantly from male athletes in favor of female athletes according to gender variable. In addition, unlike the result of the study, there are also studies in the literature that concluded that there is no statistically significant difference in the mental endurance levels of athletes in terms of gender variable (62, 75, 30, 21, 8, 10).

Folk dance trainings are usually spent in the form of demonstrating and teaching the steps of the game. Although the trainings are done with different age groups and for different purposes, it is necessary to determine a final goal in order to reduce the mental and psychological effects of the activity and to make physical preparation (3).

When the mental endurance levels of folk dance competition athletes are analyzed according to the age variable, which is another problem of the research, there is a statistically significant difference over the total scores. As a result of the Tukey test conducted to determine from which groups this difference originates, it is seen that 18-year-old athletes have higher scores in the "Trust and Control" sub-dimensions than all other age group athletes according to total scores. In the "Trust" sub-dimension, the mean scores of 18-year-old athletes were higher than those of 15-year-old athletes, and in the "Control" sub-dimension, the mean scores of 18-year-old athletes were higher than those of 17-year-old athletes. This situation can be explained as an increase in the mental resilience levels of individuals as a result of the difficulties they face and the experiences they have gained in life.

In the related literature review, parallel to the results of this study according to the age variable, there were studies in which the level of mental resilience gave parallel results with age (33, 74, 22, 9, 4, 14, 64). In the literature, unlike the results of the research, Kayhan et al. (33), Çakıcı et al. (7) concluded that the mental endurance levels of athletes engaged in individual and team sports did not create a statistically significant difference according to age.

As in all sporting competitions, there is a preparation period for folk dance teams to enter the competition (13). In their study, Lakes et al. (40) reported that experienced dancers have more self-perceived physical, social and cognitive benefits compared to novice dancers. They emphasize that dedicated dancers have higher physiological and psychological well-being such as physical fitness and mood.

It was seen that there was a statistically significant difference between the folk dance competition athletes who participated in the study according to the variable of years of sport. As a result of the Tukey test conducted to determine from which groups this difference originated, according to the total scores, it is seen that the athletes who have been performing folk dance for 8 years or more have higher scores in the sub-dimensions of "Trust and Continuity" than all other athletes. In the "Confidence" sub-dimension, it was concluded that the average scores of the athletes who performed folk dance for 8 years and more were higher than the athletes who performed folk dance for 1-2 and 3-4 years, and in the "Continuity" sub- dimension, the athletes who performed folk dance for 8 years and more were higher than the athletes who performed folk dance for 1-2 years. This situation can be explained as an increase in their self-confidence by developing skills in stress management by starting folk dance studies at an early age and developing skills in stage experiences they have gained over the years, adapting to changing situations in training and competitions, and taking behavioral control in the face of the difficulties they have experienced, creating a positive increase in their mental endurance levels. This result obtained in the study coincides with the studies that obtained similar results in the literature according to the variable of years of doing sports (57, 68, 23, 27, 39, 63, 59). Contrary to the result of the study, Efe (12) concluded that there was no significant relationship between the year of doing sports and the mental endurance levels of athletes.

In the study, no statistically significant difference was found between the groups when the weekly training number variable was analyzed. It can be said that this situation may be due to the fact that individuals interested in folk dances regularly train on certain days and hours of the week, whether there is a competition or not. From another point of view, it can also be said that it may be due to the fact that they perform on stage on certain days and weeks, national holidays and celebrations other than competitions, and that they are constantly confronted with the audience in tourism promotion activities such as Turkish nights, and because of this situation, they have confidence in their own abilities and believe that they are better than their competitors. This finding coincides with other studies in the literature (67, 29, 19). In contrast to this result, concluded that there was a significant difference (6, 53) between the number of weekly training sessions and mental endurance.

## CONCLUSIONS AND RECOMMENDATIONS

Today, sports science and psychology emphasize that performance is not only based on physical abilities, but also on mental factors. Different branches, disciplines and competition types of sports require the examination of the factors affecting the mental endurance of the athlete. In this context, competition sports, which include traditional and cultural elements such as folk dance, emerge as a special performance area that requires the athlete to use many physical and mental skills simultaneously.

Folk dance competition athletes can emotionally affect the audience while providing them with an artistic experience. Athletes are often, if not always, in an effort to do their best and achieve high performance. A competition performance includes important components such as the quality of the movement sequence, technical skills, emotional expression and stage preparation, as well as the ability to move in synchronization with the music, to display creative and technical skills, to move in harmony with the costume and stage design, and to make an emotional connection with the audience. Due to the nature of the competition, the ultimate goal of all teams is to win first place, so the importance of physical preparation as well as the application of artistic and sporting skills, nutrition monitoring, and planning and management of training sessions can be shown as key elements of success in the competition.

According to the results of this research conducted to examine the mental endurance levels of folk dance competition athletes, it was determined that there was a statistically significant difference in favor of male athletes according to the gender variable in the folk dance competition athletes participating in the study. Except for the Continuity sub-dimension, the mean scores of male athletes in the Confidence and Control sub-dimensions were higher than those of female athletes. When the mental endurance levels of folk dance

competition athletes were examined according to the age variable, there was a statistically significant difference over the total scores. It was seen that there was a statistically significant difference between the competition athletes according to the year of doing sports. It was seen that there was no statistically significant difference between the groups according to the weekly training number variable.

Determining the mental endurance levels of folk dance competition athletes in order to train elite level athletes is very important in terms of both increasing the performance of the ensembles that will participate in the competition in the future and the techniques to be applied by coaches/trainers. In this context, based on the results of this study, evaluating the mental endurance levels of folk dance competition athletes can help us better understand and improve the performance of athletes in terms of both dance training and performance optimization, as well as offer new perspectives to training programs.

In the light of these fındings, it can be suggested to increase the number of samples in future studies, to determine the age range differently and to examine different parameters by conducting similar studies with athletes competing in different categories. According to the results of such studies, folk dance competitions can improve the mental endurance of athletes. In this study, only the mental endurance level of folk dances branch was taken as a basis, it may be recommended to examine the relationship between athletes' physical fitness status and mental endurance levels in future studies. In addition, it may be recommended to examine what kind of changes the experimental studies create in the mental endurance levels of the athletes.

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# Bibliometric Analysis of Postgraduate Theses on E-sports in Turkiye

Bayram Sönmez ÜNÜVAR [1A], Tahir KESKİN [2B],

Mesut ERGAN [3C], Ferdi BAŞKURT[3D]

[1] *KTO Karatay University, Faculty of Health Sciences, KONYA*
[2] *Bingöl University, Faculty of Physiotherapy and Rehabilitation, BINGOL*
[2] *Süleyman Demirel University, Faculty of Health Sciences, ISPARTA*

*Address Correspondence to Bayram Sönmez ÜNÜVAR: e-mail: sonmezunuvar@gmail.com*


*Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*

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A: Orcid ID: 0000-0003-2095-3645 B: Orcid ID: 0000-0002-9237-3300
C: Orcid ID: 0000-0002-9712-5154 D: Orcid ID: 0000-0002-8997-4172

**Abstract**

This study presents a bibliometric analysis of postgraduate theses focused on e-sports in Turkiye. The analysis covers searches conducted with the keywords "E-Sports", "Esports", and "Electronic Sports" on the National Thesis Center of the Council of Higher Education (YÖK). The data collected using the thesis examination form were organized Microsoft Excel. Theses were analyzed using SPSS version 27 to calculate descriptive statistics and identify trends within the data. A total of 108 theses were examined; the majority of which were written in Turkish (88.88%) and at the master's level (89.81%). Most of theses concentrated in disciplines such as sports (51 theses), communication sciences (7 theses), public relations, business administration, and psychology (6 theses each). While most of the theses come from social sciences institutes (34.25%), the most common supervising titles are associate professors (45.37%). Terms such as "E-sports", "esports", and "electronic sports" are commonly used in the theses. Bahçeşehir and Gazi Universities (6 theses each) are the universities with the highest number of theses in this field. An increase in the number of studies on e-sports has been observed since 2008, particularly in 2022 and 2023 (28 theses each). The most frequently used indexes include "Electronic sports", "Sports", and "E-sports". The findings of this study help us understand the general state and future potential of e-sports research in Turkiye. This study can serve as a guide for future research in the field of e-sports for both academics and industry representatives.

**Keywords:** Academic Dissertation, Bibliometrics, Computer Games, Sports, Video Games.

**Özet**

**Türkiye'de E-spor Konusunda Yapılan Lisansüstü Tezlerin Bibliyometrik Analizi**

Bu çalışma, Türkiye'deki e-spor odaklı lisansüstü tezlerin bibliyometrik analizini sunmaktadır. Analiz, YÖK Ulusal Tez Merkezi'nde "E-Spor", "Espor" ve "Elektronik Spor" anahtar kelimeleriyle yapılan aramaları kapsamaktadır. Tez inceleme formu kullanılarak toplanan veriler Microsoft Excel'de düzenlendi. Tezler, betimleyici istatistikleri hesaplamak ve verilerdeki eğilimleri belirlemek amacıyla SPSS sürüm 27 kullanılarak analiz edildi. Toplam 108 tez incelenmiş; bunların çoğunluğu Türkçe (%88,88) ve yüksek lisans (%89,81) düzeyinde yazılmıştır. Tezlerin çoğu spor (51 tez), iletişim bilimleri (7 tez), halkla ilişkiler, işletme ve psikoloji (her biri 6 tez) gibi disiplinlerde yoğunlaşmıştır. Tezlerin çoğu sosyal bilimler enstitülerinden gelirken (%34,25), en sık danışmanlık yapanlar doçent unvanına sahip öğretim üyeleridir (%45,37). Tezlerde "E-spor", "espor" ve "elektronik spor" terimleri yaygın olarak kullanılmıştır. Bahçeşehir ve Gazi Üniversiteleri (6'şar Tez) bu alandaki tezlerin en fazla yapıldığı üniversitelerdir. 2008'den itibaren e-spor üzerine yapılan araştırmaların sayısında 2022 ve 2023 (28'şer Tez) yıllarında artış gözlemlenmiştir. En sık kullanılan indeksler arasında "Elektronik spor", "Spor" ve "E-spor" bulunmaktadır. Bu çalışmanın bulguları, Türkiye'deki e-spor araştırmalarının genel durumu ve gelecekteki potansiyelini anlamamıza yardımcı olmaktadır. Bu çalışma hem akademisyenlere hem de endüstri temsilcilerine e-spor alanında yapılacak olan gelecekteki araştırmalar için bir rehber sağlayabilir.

**Anahtar Kelimeler:** Akademik Tezler, Bibliyometrik, Bilgisayar Oyunları, Spor, Video Oyunları

## INTRODUCTION

In recent years, electronic sports (e-sports) has rapidly evolved from a niche activity into a thriving global industry. Unlike traditional sports, e-sports involves organized, multiplayer video game competitions, particularly among professional players, attracting millions of viewers and generating significant economic impact (1,2). The growing popularity of e-sports, especially among younger audiences, has not only captured the attention of the gaming community but also emerged as a subject of serious academic inquiry across various disciplines, including sports science, psychology, communication studies, and business (3,4)

Turkiye is one of the rapidly growing countries in e-sports. In our country, there are many players, teams, and organizations operating in both professional and amateur levels of e-sports. This rapid growth and interest have also led to an increase in academic research on e-sports in Turkiye. (5–7). However, despite this growth, a comprehensive bibliometric analysis of postgraduate theses focusing on e-sports in Turkiye has yet to be conducted, leaving a gap in understanding the academic landscape in this emerging field.

Bibliometric studies, which involve the quantitative analysis of academic literature, have become increasingly important in mapping the evolution of research within specific fields (8,9). By examining patterns in publication output, citation networks, and research themes, bibliometric analyses provide valuable insights into the development of scholarly disciplines (10,11). In the context of e-sports, such an analysis can reveal trends in research focus, identify key contributors, and highlight potential gaps in the literature. These insights are crucial for guiding future research directions and ensuring that emerging fields like e-sports receive the academic attention they deserve.

The primary aim of this study is to conduct a bibliometric analysis of postgraduate theses on e-sports in Turkiye, examining the numerical distribution, methodologies employed, topics explored, and contributions to academic literature. By analyzing these theses, this study seeks to identify current trends, potential gaps, and future directions for research in the field of e-sports. Understanding the academic focus and evolution of e-sports research in Turkiye will provide valuable insights for both academics and industry professionals, guiding future research and fostering the acceptance of e-sports as a legitimate academic discipline.

Additionally, this study will draw comparisons with international trends in e-sports research, offering a broader perspective on the global evolution of the field. The findings are expected to serve as a foundational reference point, encouraging more extensive research and collaboration in e-sports, both within Turkiye and on an international scale. This will ultimately contribute to the recognition of e-sports as a significant and legitimate area of academic study.

## METHOD

*Study Design*

This study employs a bibliometric analysis to examine postgraduate theses focused on e-sports in Türkiye. Bibliometric analysis is a research method that uses quantitative analysis and statistics to evaluate academic literature. It involves the systematic measurement and analysis of various aspects of publications, such as citation counts, authorship patterns, and publication trends, to gain insights into the development and impact of a specific field or discipline. This study specifically analyzes the content, distribution, and trends within postgraduate theses related to e-sports, offering a comprehensive overview of the academic focus on this emerging field in Türkiye.

The study was conducted by retrieving data from the Higher Education Council's (YÖK) "National Thesis Center" website. The search terms "E-Sports," "Esports," and "Electronic Sport" were used as title keywords in the "Search Terms" section of the website (12). The search included theses that were available up to April 2024. All accessible theses identified during this search were examined from a bibliometric perspective to provide a detailed analysis of the academic landscape of e-sports research in Türkiye.

*Research Groups*

The inclusion criteria for the study are as follows: the thesis must be available in the Higher Education Council's (YÖK) National Thesis Center, it must be a master's, doctoral, or specialization thesis, and it must be written in Turkish or English. Exclusion criteria include cases where the thesis title contains the aforementioned keywords but the actual study is not related to this topic, theses conducted at universities abroad, and theses inaccessible to the researcher.

*Data Collection Tools*

The thesis examination form developed by the researchers was used to analyze the theses. The thesis examination form includes the following questions:

1. What is the type of postgraduate thesis?
2. What is the distribution of languages in postgraduate theses?
3. What is the distribution of postgraduate theses according to subject areas?
4. How is the distribution of postgraduate theses according to institutes?
5. What is the distribution of theses according to publication years?
6. Which indices are used in postgraduate theses?
7. What is the distribution of theses according to the universities they were conducted in?
8. What are the titles of the supervising faculty members?
9. Which keywords appear in the titles of the theses?

*Data Analysis*

The data collected using the thesis examination form were organized and analyzed using Microsoft Excel. A total of 108 theses were analyzed using SPSS version 27 (IBM Corp., Armonk, NY, USA) to calculate descriptive statistics and identify trends within the data. For each thesis, key demographic and bibliometric information—such as thesis title, publication year, author, and university name—was recorded in individual rows of an electronic spreadsheet. The analysis included calculating the frequency (n) and percentage (%) of each variable, providing a detailed statistical overview of the postgraduate theses in the context of e-sports research in Türkiye. Descriptive statistics were used to present the data. Figures were generated using Microsoft Excel and Word Cloud Generator to visually represent the data.

**Ethical approval and institutional permission**

Since the current research does not involve data collection from participants, it does not require any Ethics Committee approval.

## FINDINGS

**Table 1.** Distribution of Graduate Theses According to Variables

| | Variables | n | (%) |
|---|---|---|---|
| **Thesis Type** | Master's Degree | 97 | 89,81 |
| | Doctoral | 11 | 10,18 |
| **Thesis Language** | Turkish | 96 | 88,88 |
| | English | 12 | 11,11 |
| **Subject Areas** | Sport | 51 | 47,22 |
| | Communication Sciences | 7 | 6,48 |
| | Public relations | 6 | 5,55 |
| | Business Administration | 6 | 5,55 |
| | Psychology | 6 | 5,55 |
| | Physiotherapy and Rehabilitation | 5 | 4,62 |
| | Others | 27 | 25 |
| **Institutes** | Institute of Social Sciences | 37 | 34,25 |
| | Institute of Health Sciences | 33 | 30,55 |
| | Graduate School of Education | 30 | 27,77 |
| | Institute of Education Sciences | 3 | 2,77 |
| | Institute of Natural Sciences | 2 | 1,85 |
| | Winter Sports and Sports Sciences Institute | 2 | 1,85 |
| **Thesis Advisor** | Assistant Professor | 27 | 25 |
| | Associate Professor | 49 | 45,37 |
| | Professor | 32 | 29,62 |
| **Terms** | E-sports | 67 | 62,03 |
| | Esports | 24 | 22,22 |
| | Electronic Sports | 17 | 15,74 |

n: number of participants, %: percentage

A search using the keywords "E-sports", "Esports", and "Electronic Sports" yielded a total of 110 theses. Two theses were excluded from the study as they did not meet the inclusion criteria. Thus, the study focused on a total of 108 theses, comprising 97 master's theses and 11 doctoral theses. It was observed that 96 of the included theses were written in Turkish, while 12 were written in English.

When examining the subject areas of the theses, it was determined that they predominantly focused on sports (51 theses), communication sciences (7 theses), particularly public relations, business, and psychology (6 theses each), and physiotherapy and rehabilitation (5 theses). Additionally, other subject areas included anthropology, nutrition and dietetics, computer engineering sciences, science and technology, geography, labor economics and industrial relations, economics, industrial product design, physiology, journalism, law, interior architecture and decoration, otolaryngology, social services, and management information systems.

Upon reviewing the institutes where the theses were conducted, it was found that 37 theses were from social sciences institutes, 33 from health sciences institutes, 30 from graduate education institutes, 3 from education sciences institutes, and 2 each from science and winter sports and sports sciences institutes.

When examining the distribution of academic advisors' titles in the theses, it was found that 27 advisors held the title of assistant professor, 49 held the title of associate professor, and 32 held the title of full professor.

Upon analyzing the expressions used in the titles of the theses, it was observed that the term "e-sports" appeared in 67 theses, "esports" in 24 theses, and "electronic sports" in 17 theses.

**Table 2.** Distribution of Postgraduate Theses by University

| **University** | **Number of Thesis** |
|---|---|
| Bahçeşehir University | 6 |
| Gazi University | 6 |
| İstanbul University | 5 |
| Anadolu University | 4 |
| İstanbul Bilgi University | 4 |
| Atatürk University | 3 |
| Bolu Abant İzzet Baysal University | 3 |
| Çanakkale Onsekiz Mart University | 3 |
| Eskişehir Teknik University | 3 |
| İstanbul Gedik University | 3 |
| İstanbul Gelişim University | 3 |
| The Others | 75 |
| Total | 108 |

When examining the distribution of theses by universities, it was observed that the highest number of theses were prepared at Bahçeşehir University and Gazi University (6 theses each). Following them were Istanbul University with 5 theses, and Anadolu University and Istanbul Bilgi University with 4 theses each. Atatürk University, Bolu Abant İzzet Baysal University, Çanakkale Onsekiz Mart University, Eskişehir Technical University, Istanbul Gedik University, and Istanbul Gelişim University each had 3 theses prepared.

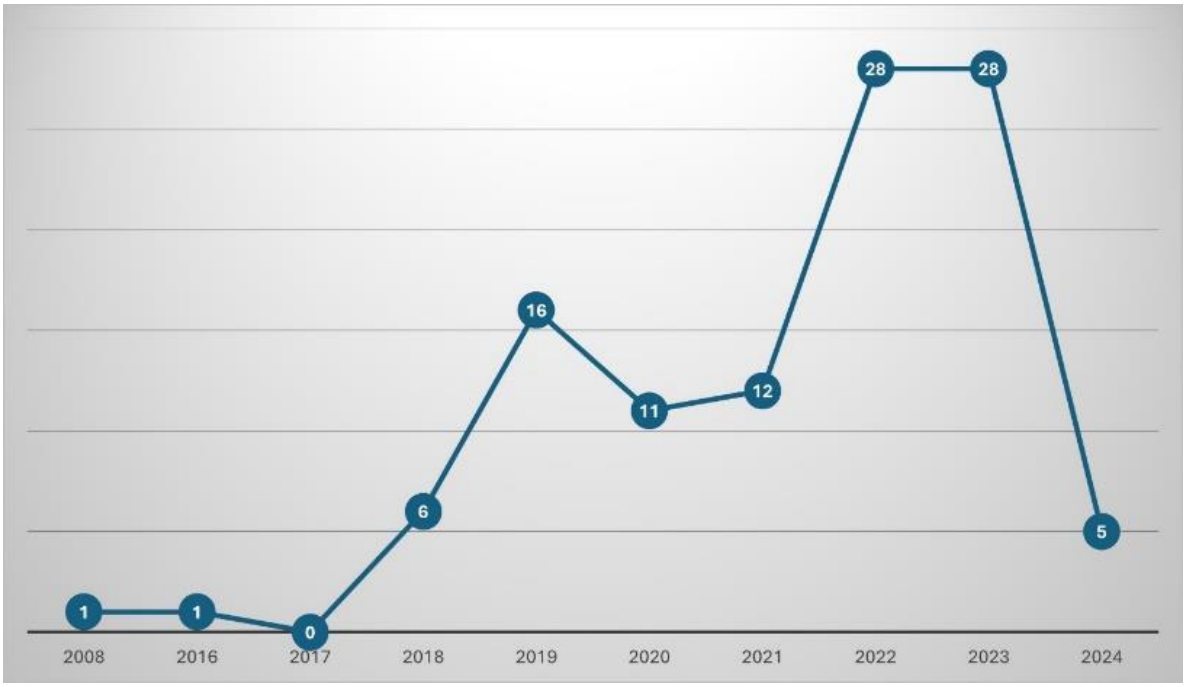


**Figure 1.** Distribution of theses titled e-sports by years.

When examining the distribution of theses on e-sports by year, it was determined that the first thesis was conducted in 2008, with the most intensive research activity observed in 2022 and 2023, each with 28 theses (Figure 1).


**Figure 2.** Indexes Used in Graduate Theses

When examining the indices used in the theses, it was found that the most commonly used index was electronic sports (42 theses). This was followed by sports (28 theses), digital games (14 theses), e-sports (11 theses), motivation (11 theses), computer games (9 theses), sports activities (9 theses), games (8 theses), and sports marketing (5 theses) indices (Figure 2).

## DISCUSSION AND CONCLUSION

E-sports has emerged as a prominent research area in recent years. In this study, a bibliometric analysis of postgraduate theses on e-sports conducted in Turkiye was carried out, and the findings were examined. These findings indicate the general profile and trends of academic research on e-sports in Turkiye.

Firstly, it was observed that the examined postgraduate theses fall into two different types. These theses include master's theses and doctoral theses, with master's theses being particularly more prevalent among the two types. Similarly, studies conducted with similar search models have highlighted the higher prevalence of master's studies compared to doctoral thesis studies (13–15). This suggests significant interest in academic research on e-sports and anticipates more postgraduate studies in this field in the future. However, the absence of specialization theses on e-sports in the medical field is noteworthy. This may indicate less interest among medical researchers in e-sports-related topics or their yet to fully explore opportunities in this area. Particularly, research by sports physicians on e-sports injuries could contribute to the development of this field (16,17).

The examination revealed that the majority of the examined postgraduate theses were written in Turkish. Various reasons may contribute to the prevalence of Turkish theses in the Higher Education Council's (YÖK) National Thesis Center. Firstly, the language of instruction in Turkish higher education institutions is generally Turkish (18). Therefore, students are expected to write their theses in their native language. Additionally, according to the rules set by the YÖK, theses in graduate programs where the language of instruction is Turkish must be written in Turkish. However, a small number of theses were observed to be written in English. With the reasoned opinion of the advisor and relevant board decisions, theses can be written in English provided that a comprehensive Turkish summary is provided (18). Furthermore, many studies in the literature have found similar results supporting our study (13,14). This linguistic diversity can contribute to the dissemination and development of scientific knowledge in the e-sports field, fostering a more

comprehensive understanding. In addition, upon examining the titles of the advisors, it is observed that doctoral instructors, associate professors, and professors advise theses. This demonstrates that e-sports research is taken seriously in the academic community and that researchers from different academic levels are working in this field.

When examining the institutes where the theses were conducted, it is observed that the majority of the theses related to e-sports were conducted in the Social Sciences Institute, indicating pioneering research in this area. However, it is also noted that the Health Sciences and Graduate Education Institutes have been active in research in this field. This indicates that e-sports research is conducted across a wide range of disciplines and that different academic disciplines contribute to this field. When examining the subject areas, it is observed that e-sports is associated not only with sports sciences but also with communication sciences, business, psychology, and other disciplines (19–21). These findings indicate that e-sports is not just a sports activity but also has social and psychological dimensions. This shows that e-sports is a multidisciplinary field and attracts interest from researchers from different disciplines (22).

When examining the distribution of research by publication years, an increasing trend in research related to e-sports over time is observed. It is determined that the first thesis was conducted in 2008, with the most intense research activity occurring in 2022 and 2023 (23). The e-sports industry has gained significant momentum in recent years (24). With major tournaments, professional leagues, and investments from game studios, the popularity of e-sports has increased (24). This indicates that e-sports is attracting increasing academic interest and that research in this field is expected to continue to grow in the future. This popularity may have led academics and researchers to show more interest in this area.

When examining the distribution of theses by universities, it is observed that research related to e-sports is conducted at various universities. This distribution reflects the interest of different universities and academic units in the e-sports field. When looking at the distribution of postgraduate theses according to the universities examined in the study, it is notable that Bahçeşehir and Gazi Universities host the highest number of theses. In our country, Bahçeşehir University has established its own university e-sports team and provides scholarships to athletes (5). Other universities such as Istanbul University, Anadolu University, and Istanbul Bilgi University also have a significant number of theses indicating important research activities in the e-sports field by both academics and these universities. The studies conducted at different universities reflect a wide range of research and academic activities in the e-sports field. This indicates that research on e-sports promotes inter-university collaboration and knowledge sharing.

When examining the most commonly used indices in postgraduate theses, it is observed that theses generally revolve around specific indices. These indices include keywords such as "Electronic sports," "Sports," and "E-sports" (25,26). It is seen that the majority of research conducted in the e-sports field focuses around these keywords to determine basic concepts and connections. Additionally, specific terms such as games, computer games, and motivation are commonly used (6). This indicates that researchers tend to associate e-sports with specific subgroups or scales and conduct more specific studies in this regard.

The findings of the study indicate that the use of different combinations of the terms "E-spor," "espor," and "elektronik spor" reflects researchers' and academics' different preferences for defining and focusing on e-sports. Particularly, the more widespread use of the term "e-spor" suggests that this term is accepted among researchers and academics and is more commonly encountered in the literatüre (27). However, the use of the terms "esports" and "electronic sports" also indicates that these terms are preferred in specific situations and may be used to express a particular emphasis (23,28). For example, while the term "esports" may be a more abbreviated version, the term "elektronik spor" may be used as a more comprehensive or formal expression. This finding underscores the necessity for awareness of terminology in e-sports research. Researchers and academics should be careful to ensure consistency in the terms used in studies conducted in the e-sports field and should consider terminology more carefully to understand what emphasis or meaning each term conveys.

This study had some limitations. It only covered postgraduate theses obtained from the National Thesis Center in Turkiye. Not considering other academic sources or international research may have limited the scope of the study. Additionally, the study only considered searches conducted using the keywords "E-spots"

"Esports" and "Electronic Sports" Not considering research conducted outside of these terms or theses containing different subtopics may have also limited the scope of the study.

Future studies could compare e-sports research in Turkiye with the international literature to examine the state of e-sports research in different countries. This could help us understand how e-sports is approached globally. In addition to postgraduate theses, considering other academic publications such as journal articles, conference papers, and book chapters could provide a more comprehensive analysis of research conducted in the e-sports field.

The findings of this study provide an important source of information about the current state of e-sports research in Turkiye. This information could serve as a guide for future research in e-sports for both academics and industry representatives. Analyzing postgraduate theses related to e-sports could increase awareness among healthcare professionals, educators, and researchers and facilitate the promotion of a multidisciplinary approach. Encouraging collaboration between universities and across different disciplines could help make e-sports research more effective. Furthermore, it could serve as a fundamental reference point for e-sports to gain more academic recognition in Turkiye and encourage researchers to delve deeper into this field.

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# The Relationship Between Upper Extremity Anthropometric Measurements and Bioimpedance Analysis with Grip Strength in Female Elite Handball Players

Burcu KAMAŞAK ARPAÇAY [1A], Ersan KARA [2B], Emre UĞUZ [1C], Esra BAYRAMOĞLU DEMİRDÖĞEN [3D], Ekrem YILMAZ [2E], Tufan ULCAY [1F], Özkan GÖRGÜLÜ [4G]

[1] *Kırşehir Ahi Evran University, Faculty of Medicine, Department of Anatomy, Kırşehir, TÜRKİYE*
[2] *Kırşehir Ahi Evran University, Faculty of Sport Sciences, Department of Coaching Education, Kırşehir, TÜRKİYE*
*3 Kırşehir Ahi Evran University, Rectorship, Pilot University Coordinatorship of Health, Kırşehir, TÜRKİYE*
[4] *Kırşehir Ahi Evran University, Faculty of Medicine, Department of Biostatistics and Medical Informatics, Kırşehir, TÜRKİYE*
*Address Correspondence to Burcu KAMAŞAK ARPAÇAY, E-mail: brc1608@hotmail.com*

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A: Orcid ID: 0000-0001-5340-1260 B: Orcid ID: 0000-0003-3815-7276 C: Orcid ID: 0000-0001-7813-3290
D: Orcid ID: 0000-0001-9950-1873 E: Orcid ID: 0000-0002-3645-3947 F: Orcid ID: 0000-0003-2203-3850
G: Orcid ID: 0000-0002-6802-4450

**Abstract**

Handball players need to have upper extremity power and sufficient grip strength to be successful. In this context, it was aimed to determine the relationship between upper extremity anthropometric measurements and bioelectrical impedance analysis with grip strength in elite handball players. The study was conducted on 95 female elite handball players aged 18-24. Athletes with any trauma, musculoskeletal system problems, metabolic or systemic diseases that could affect the upper extremity were not included in the study. Stadiometer, electronic scale, digital caliper, inflexible tape measure, hand dynamometer, pinch meter and skinfold caliper were used for anthropometric measurements, while Tanita MC-780 was used for bioelectrical impedance analysis. Upper extremity length, arm circumference, arm span, forearm length, forearm circumference, hand length, hand width, hand span, wrist medio-lateral diameter, wrist dorso-volar diameter, wrist circumference, tip pinch, key pinch, palmar pinch were found to be statistically significantly positively correlated with grip strength. A positive significant correlation was identified between grip strength and weight, body mass index, basal metabolic rate, waist/hip ratio from bioelectrical impedance analysis. The positive correlation between grip strength and athletes' anthropometric variables demonstrated the effect of hand anthropometry on grip strength in athletes who use their hands to grip a ball or an opponent. The results of this study can be useful for optimizing training programs as well as providing practical applications for talent selection of handball players.

**Keywords:** Anthropometry, Bioelectrical Impedance Analysis, Grip Strength, Handball, Upper Extremity.

**Özet**

**Elit Kadın Hentbolcularda Üst Ekstremite Antropometrik Ölçümleri ve Biyoimpedans Analizi ile Kavrama Kuvveti Arasındaki İlişki**

Hentbolcularda başarılı olmak için üst ekstremite gücüne ve yeterli kavrama gücüne sahip olmak gerekir. Bu bağlamda elit hentbolcularda üst ekstremite antropometrik ölçümleri ve biyoelektrik empedans analizi ile kavrama kuvveti arasındaki ilişkinin belirlenmesi amaçlanmıştır. Çalışma 18-24 yaş aralığında 95 kadın elit hentbolcu üzerinde gerçekleştirilmiştir. Üst ekstremiteyi etkileyebilecek herhangi bir travma, kas-iskelet sistemi problemi, metabolik veya sistemik hastalığı olan sporcular çalışmaya dahil edilmemiştir. Antropometrik ölçümler için stadiometre, elektronik terazi, dijital kumpas, esnek olmayan mezura, el dinamometresi, pinchmetre ve skinfold caliper kullanılırken, biyoelektrik empedans analizi için Tanita MC-780 kullanılmıştır. Üst ekstremite uzunluğu, kol çevresi, kol açıklığı, ön kol uzunluğu, ön kol çevresi, el uzunluğu, el genişliği, el açıklığı, bilek medio-lateral çapı, bilek dorso-volar çapı, bilek çevresi, uç sıkıştırma, anahtar sıkıştırma, palmar sıkıştırma ile kavrama kuvveti arasında istatistiksel olarak anlamlı pozitif korelasyon vardı. Biyoelektrik empedans analizinden kilo, vücut kitle indeksi, bazal metabolizma hızı, bel/kalça oranı ile kavrama kuvveti arasında pozitif anlamlı korelasyon belirlendi. Kavrama kuvveti ile sporcuların antropometrik değişkenleri arasındaki pozitif korelasyon, el antropometrisinin topu veya rakibi kavramak için ellerini kullanan sporcularda kavrama kuvveti üzerindeki etkisini gösterdi. Bu çalışmanın sonuçlarının, antrenman programlarının optimize edilmesinde ve hentbolcuların yetenek seçiminde pratik uygulamalar sağlanmasında faydalı olabileceği düşünülmektedir.

**Anahtar Kelimeler:** Antropometri, Biyoelektrik Empedans Analizi, Kavrama Kuvveti, Hentbol, Üst Ekstremite.

## INTRODUCTION

Handball is a team sport marked by bursts of high-intensity actions like sprinting, jumping, and shooting, combined with periods of lower-intensity activities such as running, walking and standing (13). Success in handball is influenced by a combination of technical and tactical skills, as well as specific anthropometric traits and physical performance abilities (26). While the measurement of technical and tactical skills can be confused by subjectivity, the assessment of anthropometric and physical profiles provides objective data and makes it possible to identify areas on which to focus training (1).

An athlete's physical and anthropometric traits can be crucial prerequisites for excelling in a particular sport. The selection of talented athletes is primarily based on physical parameters, who has more advantages in terms of mechanics, and anthropometric measurements play an important role in the analysis of movements. Anthropometric measurements are necessary to determine the sports in which individuals should be guided, to assess the effects of training on morphological structure, and to monitor athletes' performance levels (20, 24).

Grip strength refers to the maximum force exerted during the powerful flexion of all fingers under normal biomechanical conditions. This strength is crucial for catching and throwing objects in various sports disciplines. When the fingers are longer and the hand surface variables are larger than necessary, gripping an object becomes more efficient and less tiring (8, 25). Grip measurements have been correlated with various body composition such as waist/hip ratio, body mass index, and biomarkers of aging (11, 23). The effects of various exercise protocols used by athletes can also influence grip strength (23).

It is known that athletes who perform well in certain sports tend to have a specific body type. Handball players are observed to be tall, have long arms and legs, and are able to utilize their strength most effectively relative to their body weight. Additionally, despite their body weight being above the general average, their body fat percentage is below the average (28).

Variations in anthropometric and performance characteristics among male team handball players across different playing levels are common (12, 14, 29). Studies have shown that elite male have anthropometric and performance characteristics considered more favorable for team handball compared to their lower standard counterparts (14, 29). Such data are less common in female, highlighting the need to determine the essential

characteristics required to compete in elite female handball (9, 29). In this context, it was aimed to determine the relationship between upper extremity anthropometric measurements and bioimpedance analysis and grip strength in elite female handball players.

## METHOD

### Participants

A total of 95 elite female handball players aged 18-24, who participated in the Turkish Female Second League Handball Tournament, with sports experience ranging from 5 to 10 years, were included in our study. An elite athlete is defined as someone who has qualified for a national team at either the junior or senior level, or who has been part of a recruitment squad for that team (22).

Athletes with any trauma, musculoskeletal problems, congenital anomalies, metabolic or systemic diseases that could affect the upper extremity were excluded from the study.

### Measurements

Height was measured using a stadiometer (Seca Wall Mounted Stadiometer) and weight was measured by digital scales (Sanitas SGS 43 Digital Glass Scale) and body mass index (BMI) was calculated using the kg/m2. Upper extremity length, arm length, arm circumference, arm span, forearm length forearm circumference, hand length, hand width, hand span, wrist medio-lateral diameter, wrist dorso-volar diameter, wrist circumference, triceps skinfold thickness, biceps skinfold thickness, grip strength, tip pinch, key pinch, palmar pinch were measured. For anthropometric measurements, a digital caliper (Mitutoyo 200 mm Digital Caliper, Kanagawa, Japan), inflexible tape measure, hand dynamometer (Baseline Digital Smedley Hand Dynamometer), pinch meter (Jamar Digital Pinchmeter 50 LB), and skinfold caliper (Holtain Skinfold Caliper) were used. Anthropometric measurements were made from the participants' dominant extremities. All measurements was done by a single researcher to avoid individual bias and two measurements were taken to reduce the error rate, and the average of these measurements was considered.

The bioimpedance analysis (BIA) measurements were taken by TANITA MC-780 such as lean mass (%), muscle mass (%), fat mass (%), total body fluid (lt), basal metabolic rate (kcal), mineral (%), waist/height ratio, waist/hip ratio. Participants followed any specific preparation protocols before BIA measurements, such as fasting or hydration control, which could influence the results.

### Statistical Analysis

Kolmogorov-Smirnov and Shapiro-wilk tests were used for normality assumption. Spearman correlation analysis was used for correlation between variables. Descriptive statistics of the variables were summarized as mean∓standard deviation or median (25th percentile-75th percentile) depending on the variable type and whether the assumptions were met. The sample size of the study was calculated with the G* Power 3.1.9.6 (Frans Faul, Universitat Kiel, Germany) program (effect size d=0.6; power (1-ß) =0.80). Statistical analyzes of the study were performed using Statistical Package for Social Sciences version 29.0 software for Windows (IBM SPSS Statistics,Version 29.0. Armonk, NY: IBM Corp., USA). The significance level was accepted as $p<0.05$.

### Ethical approval and institutional permission

Informed consent was obtained from all participants, and the study was approved by the ethics committee of Kırşehir Ahi Evran University (Ethics Approval Number: 2022-15/132).

## FINDINGS

The mean age of individuals was calculated as 19.01±1.74 years. Descriptive statistics of the variables that are the subject of the study were given in Table 1.

**Table 1:** Anthropometric measurement and BIA results of female elite handball players

| VARIABLES | N=95 |
|---|---|
| Upper Extremity Length (mm) | 74.05±3.09 |
| Arm Length (mm) | 36.00 (35.00-37.25) |
| Arm Circumference (mm) | 27.00 (25.25-29.00) |
| Arm Span (mm) | 164.00 (160.00-167.75) |
| Forearm Length (mm) | 21.50 (20.50-23.50) |
| Forearm Circumference (mm) | 24.00 (23.00-24.75) |
| Hand Length (mm) | 173.39 (169.57-177.99) |
| Hand Width (mm) | 77.36±4.25 |
| Hand Span (mm) | 190.34 (183.57-198.14) |
| Wrist Dorso-volar Diameter (mm) | 37.26 (35.97-38.27) |
| Wrist Medio-lateral Diameter (mm) | 52.74±2.88 |
| Wrist Circumference (mm) | 16.00 (15.00-16.25) |
| Triceps Skinfold Thickness (mm) | 16.30 (13.00-19.00) |
| Biceps Skinfold Thickness (mm) | 7.00 (6.00-8.00) |
| Grip Strength (kg) | 28.20 (25.55-31.15) |
| Tip Pinch (kg) | 8.08±2.85 |
| Key Pinch (kg) | 15.01±3.03 |
| Palmar pinch (kg) | 13.06±2.94 |
| Height (m) | 1.65±0.06 |
| Weight (kg) | 59.88±8.81 |
| BMI (kg/m$^2$) | 21.82±2.56 |
| Lean Mass (%) | 78.73 (75.36-81.04) |
| Muscle Mass (%) | 74.75 (71.57-76.90) |
| Fat Mass (%) | 21.27 (18.96-24.64) |
| Total Body Fluid (lt) | 58.30 (55.75-60.28) |
| Basal Metabolic Rate (kcal) | 1500.04±122.12 |
| Mineral (%) | 4.10 (3.97-4.21) |
| Waist/Height ratio | 0.44 (0.40-0.46) |
| Waist/Hip ratio | 0.74±0.04 |

Values are expressed as mean ± 4tandard deviation and the median (25$^{th}$ percentile-75$^{th}$ percentile). BMI: Body mass index.

A statistically significant strong positive correlation was detected between grip strength and key pinch ($\varrho$= 0.532; $p<0.001$). There was a moderately positive correlation between grip strength and upper extremity There was a moderately positive correlation between grip strength and upper extremity length, arm span, forearm circumference, hand length, hand span, wrist medio-lateral diameter, wrist dorso-volar diameter, wrist circumference, tip pinch, palmar pinch ($p<0.01$). A statistically significant weak positive correlation was found between grip strength and arm circumference, forearm length, hand width ($p<0.05$) (Table 2). No statistically significant correlation was found between grip strength with arm length, triceps skinfold thickness, biceps skinfold thickness and height.

Among the BIA parameters, weight, BMI, basal metabolic rate and waist/hip ratio were found to be statistically significantly moderately positive correlated to grip strength (Table 2). No statistically significant correlation was found between other BIA parameters and grip strength.

**Table 2:** Correlation results between grip strength with anthropometric measurements and BIA of female elite handball players

| VARIABLES | rho (ϱ) | p |
|---|---|---|
| Upper Extremity Length (mm) | 0.388** | **0.005** |
| Arm Length (mm) | 0.096 | 0.358 |
| Arm Circumference (mm) | 0.225* | **0.030** |
| Arm Span (mm) | 0.348** | **0.001** |
| Forearm Length (mm) | 0.223* | **0.041** |
| Forearm Circumference (mm) | 0.463** | **<0.001** |
| Hand Length (mm) | 0.308** | **0.004** |
| Hand Width (mm) | 0.252* | **0.015** |
| Hand Span (mm) | 0.319** | **0.005** |
| Wrist Dorso-volar Diameter (mm) | 0.311** | **0.008** |
| Wrist Medio-lateral Diameter (mm) | 0.331** | **0.001** |
| Wrist Circumference (mm) | 0.366** | **<0.001** |
| Triceps Skinfold Thickness (mm) | 0.032 | 0.760 |
| Biceps Skinfold Thickness (mm) | 0.039 | 0.711 |
| Tip Pinch (kg) | 0.391** | **<0.001** |
| Key Pinch (kg) | 0.532** | **<0.001** |
| Palmar pinch (kg) | 0.384** | **<0.001** |
| Weight (kg) | 0.382** | **<0.001** |
| Height (cm) | 0.182 | 0.081 |
| BMI (kg/m$^2$) | 0.356** | **<0.001** |
| Lean Mass (%) | -0.030 | 0.779 |
| Muscle Mass (%) | -0.031 | 0.769 |
| Fat Mass (%) | 0.029 | 0.785 |
| Total Body Fluid (lt) | 0.060 | 0.566 |
| Basal Metabolic Rate (kcal) | 0.360** | **<0.001** |
| Mineral (%) | 0.025 | 0.809 |
| Waist/Height ratio | 0.162 | 0.121 |
| Waist/Hip ratio | 0.312** | **0.006** |

Significant according to ** $p<0.01$ and * $p<0.05$. BMI: Body mass index.

## DISCUSSION AND CONCLUSION

For ball games where the hand is used, knowledge of hand morphology and functional characteristics is important for performance (4). Grip strength is an important indicator of performance in many sports branches as well as providing effectiveness and efficiency during sports activities (27).

It was concluded that the dominant physical requirements of handball are maximum strength and muscle power in the upper extremity (6). In this context, the correlation between upper extremity anthropometric measurements and BIA parameters of elite female handball players and grip strength was examined in our study. While there was a significant relationship between grip strength and other parameters except arm length and skinfold thickness from anthropometric measurements, there was a significant correlation between grip strength and BMI, basal metabolic rate and waist/hip ratio from BIA parameters.

In a study conducted by Saki (19) on 120 female handball players, it was found that there was no significant correlation between upper extremity length and grip strength. In a study conducted by Koley et al. (10) on 101 Indian female handball players, it was reported that there was no significant correlation between upper extremity length and grip strength. In our study, unlike studies in the literature, a significant moderate positive correlation was found between upper extremity length and grip strength.

Saki (19) reported that there was no significant correlation between arm length and grip strength. In a study conducted by Adheke et al. (2) on a total of 62 athletes (38 males and 24 females), who were involved in sporting activities such as weightlifting, basketball, handball and tennis; a significant positive correlation was

found between arm length and grip strength in both genders. Koley et al. (10) found that there was significant correlation between arm length and grip strength. In a study conducted by Yıldırım et al. (28) on 65 Turkish male handball players, a significant correlation was found between arm length and grip strength. Similar to Saki (19), there was no significant correlation between arm length and grip strength in our study.

Saki (19) found that there was no significant correlation between arm circumference and grip strength. Koley et al. (10) reported that there was significant correlation between arm circumference and grip strength. In a study conducted by Pekmez (18) on 30 Turkish elite handball players aged 17-34 years and 30 Turkish youth academy handball players aged 12-18 years, it was found that there was a significant positive correlation between arm circumference and grip strength in elite and youth academy handball players. In our study, there was significant correlation between arm circumference and grip strength.

Vila et al. (26) reported that the mean arm span of handball players was found to be 171.57±9.20 cm. This value in our study was found lower than the results of Vila et al. (26). In a study conducted by Zapartidis et al. (29) on a total of 121 adolescent handball players, it was found that there was significant correlation between arm span and grip strength. Similar to studies in the literature, a significant correlation was found between arm span and grip strength in our study (rho=0.348, p=0.001).

Adheke et al. (2) found that there was a significant correlation between forearm length and grip strength in both genders. In a study conducted by Fallahi & Jadidian (8) on a total of 40 male athletes, including 14 national basketball players, 10 collegian handball players, 7 collegian volleyball players and 9 collegian wrestlers, it was found that there was significant positive correlation between forearm length and grip strength. Saki (19) reported that there was no significant correlation between forearm length and grip strength. Koley et al. (10) found that there was no significant correlation between forearm length and grip strength. In Yıldırım et al. (28)'s study, it was reported that there was no significant correlation between forearm length and grip strength. In our study, there was significant correlation between forearm length and grip strength.

In Saki (19)'s study, it was reported that there was a significant correlation between forearm circumference and grip strength (p=0.034). Yıldırım et al. (28) stated that there was a significant correlation between forearm circumference and grip strength (r=0.540, p=0.00). Pekmez (18) reported that there was significant positive correlation between forearm circumference and grip strength in elite handball players and youth academy handball players (for elite handball players r=0.617, p=0.00; for youth academy handball players r=0.56, p=0.00). Fallahi & Jadidian (8) found that there was a significant correlation between forearm circumference and grip strength (r=0.445). Similar to studies in the literature, there was significant moderate positive correlation between forearm circumference and grip strength in our study (rho=0.463, p<0.001).

Saki (19) stated that there was a significant correlation between hand length and grip strength. Koley et al. (10) found that there was significant correlation between hand length and grip strength. Fallahi & Jadidian (8) reported that there was significant correlation between hand length and grip strength. In Adheke et al. (2)'s study, it was reported that there was no significant correlation between hand length and grip strength in both genders. In our study, there was significant moderate positive correlation between hand length and grip strength.

Adheke et al. (2) reported that there was a significant correlation between hand width and grip strength in both genders. Koley et al. (10) stated that there was significant correlation between hand width and grip strength. Fallahi & Jadidian (8) found that there was significant correlation between hand width and grip strength. In our study, there was significant correlation between hand width and grip strength, the result of our study was consistent with the literature.

Fallahi & Jadidian (8) stated that there was significant correlation between hand span and grip strength. In a study conducted by Chahal & Kumar (5) on 37 male basketball players, significant correlation was found between hand span and grip strength. In our study, there was significant moderate positive correlation between hand span and grip strength.

Yıldırım et al. (28) found that there was no significant correlation between wrist medio-lateral diameter and grip strength. Contrary to Yıldırım et al. (28), there was significant moderate positive correlation between wrist medio-lateral diameter and grip strength in our study. In our study, a significant moderate positive

correlation was found between wrist dorso-volar diameter and grip strength, but no study was found in the literature which we could compare our results.

Yıldırım et al. (28) reported that there was significant correlation between wrist circumference and grip strength (r=0.300, p=0.015). In Pekmez (18)'s study, it was stated that there was significant correlation between wrist circumference and grip strength in elite handball players and youth academy handball players (for elite handball players r=0.751, p=0.00; for youth academy handball players r=0.645, p=0.00). Fallahi & Jadidian (8) found that there was significant correlation between wrist circumference and grip strength (r=0.625). In our study, the measurement result between wrist circumference and grip strength was consistent with the literature (rho=0.366, p<0.001).

In a study conducted by Mullerpatan et al. (15) on a total of 1005 healthy participants, 413 males and 592 females, the tip pinch was found to be 3.96±1.4 kg in males and 3.28±1 kg in females. In our study, the tip pinch of handball players was found to be 8.08±2.85 kg. The difference between the results of athletes and sedentary individuals is remarkable. In a study conducted by Ulcay et al. (25) on a total of 32 athletes, it was found that there was no significant correlation between tip pinch and grip strength in male athletes, while there was significant correlation between tip pinch and grip strength in female athletes. Similar to Ulcay et al. (25), there was significant moderate positive correlation between tip pinch and grip strength in our study.

In our study, the key pinch of handball players was found to be 15.01±3.03 kg. In studies conducted on healthy sedentary individuals (3, 15), this value was found to be lower than in the athletes in our study. Ulcay et al. (25) found that there was significant correlation between key pinch and grip strength in both genders. In our study, there was significant strong positive correlation between key pinch and grip strength. The results of our study are compatible with Ulcay et al. (25)'s.

In our study, the palmar pinch of handball players was found to be 13.06±2.94 kg. In study conducted by Mullerpatan et al. (15) on healthy sedentary individuals, this value was found to be lower than in the athletes in our study. The difference between the result of this variable in our study and the result of Mullerpatan et al. (15) is striking. Ulcay et al. (25) reported that there was significant correlation between palmar pinch and grip strength in both genders. In our study, there was significant moderate positive correlation between palmar pinch and grip strength.

Koley et al. (10) stated that there was significant correlation between weight and grip strength. In a study conducted by Chittibabu (7) on 144 male handball players, significant correlation was found between weight and grip strength. In our study, there was significant moderate positive correlation between weight and grip strength. The results of our study are compatible with the literature.

Koley et al. (10) stated that there was significant correlation between height and grip strength. Fallahi & Jadidian (8) found that there was significant correlation between height and grip strength. In Zapartidis et al. (29)'s study, it was reported that there was significant correlation between height and grip strength. Contrary to other studies, there was no significant correlation between height and grip strength in our study.

In a study conducted by Nikolaidis & Ingebrigtsen (16) on 96 male handball players, 57 adolescents and 39 adults, significant negative correlation was found between BMI and grip strength in adolescent handball players, while no significant correlation was found between BMI and grip strength in adult handball players. Fallahi & Jadidian (8) found that there was no significant correlation between BMI and grip strength. In our study, there was significant correlation between BMI and grip strength.

Although there are studies (16, 17, 21) that found a significant correlation between grip strength and lean mass, muscle mass, fat mass, body fluid and minerals in handball players, no significant correlation was found in our study.

In a study conducted by Sliz et al. (21) on a total of 24 female handball players (15 junior, 9 senior), the basal metabolic rate of junior handball players was found to be 1435.2±110.11 kcal and the basal metabolic rate of senior handball players was found to be 1398.56±90.15 kcal. In our study, the mean basal metabolic rate of female elite handball players was found to be 1500.04±122.12 kcal. The mean basal metabolic rate of female elite handball players in our study was higher than the mean basal metabolic rate of junior and senior handball

players in the study of Sliz et al. (21). No study has been found examining the correlation between basal metabolic rate and grip strength in athletes.

Trivedi et al. (23) on a total of 48 athletes, a significant correlation was found between waist/hip ratio and grip strength. In our study, there was significant moderate positive correlation between waist/hip ratio and grip strength, similar to Trivedi et al. (23).

A significant correlation was found between grip strength and anthropometric measurements and BIA parameters in our study. Our results in elite female handball players will provide a comparison and understanding of how grip strength is affected between genders and between handball players at different professional levels. Some anthropometric measurements can affect a player's performance in sports activities. A larger hand surface may allow for more efficient shooting and passing when there are longer and stronger extremities and fingers. Upper extremity dimensions and grip strength greatly affect offensive and defensive movements during a match. Therefore, the correlation results of this study can be useful for optimizing training programs as well as providing practical applications for talent selection of handball players. Some anthropometric variables of the arm, forearm, hand and wrist and pinch forces and body composition variables, which are good determinants of grip strength, may be useful in determining sportive abilities in other grip sports as well as handball.

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# Moods and Prosocial Motivation Levels of Athletes

Burcu Sıla GÖNCÜ [1A], Yakup KILIÇ [2B], İlimdar YALÇIN [3C]

[1] *Bingol University, Sport Science Faculty, Department of Physical Education and Sports, Bingöl, TÜRKİYE*
[2] *Fırat University, Sport Science Faculty, Department of Coaching Training, Elazığ, TÜRKİYE*
[3] *Bingol University, Sport Science Faculty, Department of Coaching Training, Bingöl, TÜRKİYE*
*Address Correspondence to Burcu Sıla GÖNCÜ: e-mail: burcuslagoncu@gmail.com*


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A: Orcid ID: 0000-0003-3484-6584 B: Orcid ID: 0000-0003-4889-5571 C: 0000-0001-8431-6835

**Abstract**

This study aimed to determine the relationship between moods and prosocial motivation levels in sport. The research group consisted of 386 (145 females, 241 males) participants who had sports background. Personal information form, Brunel Mood Scale and Prosocial Motivation Scale were used as data collection tools. The analysis of the obtained data showed that the data were normally distributed. As a result of the data obtained, t-test and Pearson Correlation test were applied. According to the results, it was determined that females had a higher level of confusion dimension than males in the mood scale. It was determined that there was a positive correlation between the sports experience and the vitality dimension and a negative correlation between the fatigue dimension. A negative low-level significant relationship was detected between Brunel mood scale dimensions of anger, confusion, depression, fatigue and tension and prosocial motivation dimension. Besides, a positive low-level significant relationship was found between the vitality dimension and prosocial motivation. As a result, it was determined that there was a decrease in negative moods and an increase in positive moods of athletes with more experience in sports. However, it was observed that the increase in prosocial motivation level was positively related to positive moods and negatively related to negative moods.

**Keywords:** Athlete, positive-negative mood, prosocial motivation.

**Özet**

**Sporcuların Ruh Halleri ve Prososyal Motivasyon Düzeyleri**

Bu araştırmanın amacı, sporda ruh halleri ile prososyal motivasyon düzeylerinin arasındaki ilişkiyi belirlemektir. Araştırma grubu, spor geçmişi olan 386 (145 kadın, 241 erkek) katılımcıdan oluşmaktadır. Veri toplama aracı olarak kişisel bilgi formu, Brunel Ruh hali Ölçeği ile Prososyal Motivasyon Ölçeği kullanılmıştır. Elde edilen verilerin analizi sonucunda verilerin normal dağılım gösterdiği belirlenmiştir. Elde edilen verilerin analizinde t testi ve Pearson Korelasyon testi uygulanmıştır. Elde edilen bulgu sonuçlarına göre; ruh hali ölçeğine göre kadınların şaşkınlık boyutunun erkeklere oranla daha yüksek düzeyde olduğu belirlenmiştir. Spor yapma yılı ile canlılık boyutu arasında pozitif ilişki; yorgunluk boyutu arasında ise negatif ilişki olduğu belirlenmiştir. Brunel ruh hali ölçeği kızgınlık, şaşkınlık, depresyon, yorgunluk ve gerginlik boyutları ile prososyal motivasyon boyutu arasında negatif düşük düzey anlamlı ilişkinin olduğu belirlenmiştir. Canlılık boyutu ile prososyal motivasyon arasında ise pozitif düşük düzey anlamlı ilişkinin olduğu belirlenmiştir. Sonuç olarak; spor yapma yılı yüksek olan sporcuların olumsuz ruh hallerinde düşüş meydana gelirken olumlu ruh hallerinde artış olduğu belirlenmiştir. Bununla birlikte prososyal motivasyon düzeyi artışının olumlu ruh halleri ile pozitif; olumsuz ruh halleri ile negatif ilişkili olduğu görülmüştür.

**Anahtar Kelimeler:** Sporcu, pozitif-negatif ruh hali, prososyal motivasyon.

## INTRODUCTION

It can be observed that human is a social being and constantly exhibits certain behaviors in society. The source of these behaviors has been a subject of curiosity for centuries and has attracted the attention of humanity. In this context, behaviors and the factors affecting behaviors have been studied in detail by human beings. As a matter of fact, the concept of "motivation" has been included among the factors affecting behavior in the literature. In the conceptual context, motivation is described as an internal or external force that directs people to perform the behavior (1, 22, 36, 12) and it is important in determining the reasons for the exhibited behaviors (18). In this context, the concept of motivation, which greatly affects people in social and personal terms, can be expanded (20). Moreover, Lazauskaite-Zabielske et al. (29) also mentioned that motivation is not only the power that enables people to act, but also that it can be realised to benefit other people and explained this definition with the concept of "prosocial motivation".

Prosocial motivation, which is confused with the concept of intrinsic motivation in the literature (18, 33, 45), is important in terms of exhibiting behavior according to the needs of society, being motivated for positive behavioral change (16) and evaluating one's two-way emotions (11). As a matter of fact, Batson (4) expressed the emotions in the concept of prosocial motivation as selfishness/egoism and altruism/selflessness. Therefore, it can be thought that prosocial motivation can shape the emotional state by affecting the mood of the individual. In the studies with supportive results, it has been determined that people with a balanced mood are willing to exhibit socially positive behavior (7, 25, 32) and this is directly related to prosocial motivation (41, 20). In this context, the concept of prosocial motivation is the desire to help and cooperate with people; It can be said that the concept of mood is shaped by the emotional state. As a matter of fact, when these two concepts affect sports and athletes, we support cooperation and solidarity in terms of team sports; It can increase the quality of life by positively affecting motivation and mood in individual sports.

This study aimed to evaluate sports in terms of emotional concepts regarding the research conducted on athletes. The obtained results indicate that exercise can greatly affect the behavior of athletes, which is significant in terms of performance (13, 24). Studies are showing that performance is positively associated with prosocial motivation (19) and mood (28, 31). In the literature review, it was determined that the concept of mood and motivation was subject to different studies. In this direction, when the motivation for prosocial behavior is examined, it can be mentioned that it is related to social bonding and sense of belonging, while the general mood level is thought to have important effects due to the activation of positive emotions. In exercise and sports environments where social bonds and relationships are important, there are no studies specifically examining the relationship between mood and prosocial motivation. The power and direction of the relationship between the moods and prosocial motivation of athletes and how this situation develops during performance are not known. Therefore, there is a need to examine the relationship between these two variables, which are considered to be effective on athletes.

## METHOD

### Data Design

The data of the study were collected by questionnaire method for easier evaluation (2) and analysed using the relational model, which was one of the survey models. This model is a method used to determine the existence or degree of relationships between variables. This study had a quantitative approach (21). In the study, the relationship between athletes' moods and prosocial motivation levels was statistically analysed.

### Research Group

The research consisted of 145 women (age= 20,84 ± ,180; sport experience= 4,89 ± ,267) and 241 men (age= 22,65 ± ,251; sport experience= 6,88 ± ,291) and a total of it consists of 386 participants. In this context, it includes individuals active in various sports branches. These include tennis, football, volleyball, basketball, fitness, wrestling, taekwondo, boxing, handball, athletics.

### Data Collection Tools

Personal information form, Brunel Mood Scale and Prosocial Motivation Scale were used as data collection tools.

***Personal Information Form***

Questions were asked to determine the descriptive information of the participants. Through these questions, it was aimed to obtain the participants' gender, sport experience, sports types and branch information.

***Prosocial Motivation Scale***

Prosocial motivation scale was developed by Grant and Sumanth (17). The Turkish adaptation of the scale was performed by Kesen and Akyüz (23). There were no reverse items in the scale, consisted of a single dimension and 5 (five) questions. The scale was designed with 5-point Likert method. Scale statements are stated as 1: Never, 2: Rarely, 3: Sometimes, 4: Often, 5: Always. In the adapted study, the Cronbach alpha reliability coefficient was reported as $\alpha$= ,84. In the present study, this coefficient was found to be $\alpha$=,87.

***Brunel Mood Scale***

Brunel mood scale was developed by Terry et al (40). The scale was adapted into Turkish by Soylu et al (34). The scale included 6 sub-dimensions (Anger, Confusion, Depression, Fatigue, Tension and Vitality) and 24 items in total. The scale was determined by 5-point Likert method. Scale statements are stated as 1: Never, 2: Very little, 3: Partially, 4: Increasingly, 5: Extremely. In the adapted study, Cronbach alpha reliability coefficient values were as follows: $\alpha$=,83 for anger, $\alpha$=,81 for Confusion, $\alpha$=,81 for depression, $\alpha$=,81 for fatigue, $\alpha$=,88 for tension and $\alpha$=,75 for vitality. In the present study, this values were found as $\alpha$=,79 for the anger, $\alpha$=,67 for the confusion, $\alpha$=,79 for the depression, $\alpha$=,83 for the fatigue, $\alpha$=,79 for the tension and $\alpha$=,65 for the vitality.

**Analysis of Data**

SPSS 25.0 statistical software was used to analyse the obtained data in the study. The significance level was accepted as p<,05. To evaluate the normal distribution of the data, skewness and kurtosis values were examined over all scale sub-dimensions and it was determined that they were within the reference range of ±1,5. In this context, the reference interval of ±1,5 suggested by Tabachnick and Fidell (39) was considered and it was accepted that the data were normally distributed according to the results obtained. Independent sample t test for two-variable groups and Pearson Correlation test were applied to examine the relationship between variables.

**Ethical Approval and Institutional Permission**

For this research, ethical permission was received from Bingöl University, Health Sciences Research and Publication Ethics Committee "Decision: 4, dated 15/06/2023, numbered 23/14".

## FINDINGS

In this section, the relationship between the moods and prosocial motivation variables of the athletes participating in the study, the effect-based analysis and the detailed analysis of the differences between various demographic variables were given in the tables 1-4.

**Table 1.** Evaluation of Scale Dimensions According to Gender

| Scales | Sub-dimensions | Gender | N | $\overline{X}$±Sd | t | p |
|---|---|---|---|---|---|---|
| **Brunel Mood Scale** | Anger | Female | 145 | 9,59±3,63 | -,501 | ,616 |
| | | Male | 241 | 9,78±3,63 | | |
| | Confusion | Female | 145 | 9,93±3,16 | 2,043 | **,042*** |
| | | Male | 241 | 9,22±3,38 | | |
| | Depression | Female | 145 | 9,57±3,57 | -,238 | ,812 |
| | | Male | 241 | 9,66±3,59 | | |
| | Vitality | Female | 145 | 13,41±3,59 | -1,200 | ,231 |
| | | Male | 241 | 13,85±3,45 | | |
| | Fatigue | Female | 145 | 11,40±4,11 | ,933 | ,352 |
| | | Male | 241 | 11,01±3,94 | | |
| | Tension | Female | 145 | 10,66±3,86 | 1,643 | ,101 |
| | | Male | 241 | 10,04±3,48 | | |
| **Prosocial Motivation Scale** | Prosocial Motivation | Female | 145 | 18,99±4,07 | 1,104 | ,270 |
| | | Male | 241 | 18,51±4,11 | | |

***p<0,05**

When Table 1 was analysed, a statistically significant difference was found between mood and gender variable. In this context, it was observed that female participants had a higher level of confusion tendency compared to male participants. On the other hand, there was no statistically significant difference in prosocial motivation levels in the context of gender variable.

**Table 2.** Evaluation of Scale Dimensions According to Sport Type

| Scales | Sub-dimensions | Sport Type | N | $\overline{X}$±Sd | t | p |
|---|---|---|---|---|---|---|
| **Brunel Mood Scale** | Anger | Team | 177 | 9,76±3,48 | ,504 | ,742 |
| | | Individual | 202 | 9,63±3,78 | | |
| | Confusion | Team | 177 | 9,41±3,03 | ,034 | ,723 |
| | | Individual | 202 | 9,53±3,56 | | |
| | Depression | Team | 177 | 8,67±3,09 | ,023 | ,397 |
| | | Individual | 202 | 8,97±3,66 | | |
| | Vitality | Team | 177 | 13,66±3,49 | ,908 | ,985 |
| | | Individual | 202 | 13,66±3,54 | | |
| | Fatigue | Team | 177 | 11,05±3,88 | ,567 | ,617 |
| | | Individual | 202 | 11,25±4.15 | | |
| | Tension | Team | 177 | 10,22±3,67 | ,373 | ,529 |
| | | Individual | 202 | 9,98±3,80 | | |
| **Prosocial Motivation Scale** | Prosocial Motivation | Team | 177 | 3,78±,80 | ,630 | ,284 |
| | | Individual | 202 | 3,69±,83 | | |

When Table 2 was analysed no statistically significant difference was found between the mood variable and the sport type variable.

**Table 3.** Pearson Correlation Results of Brunel Mood and Prosocial Motivation Scale Dimensions According to Sports Experience Variable

| Scales | Variables | | Sports Experience |
|---|---|---|---|
| Brunel Mood Scale | Anger | r | -,002 |
| | | p | ,965 |
| | Confusion | r | -,065 |
| | | p | ,202 |
| | Depression | r | -,073 |
| | | p | ,150 |
| | Vitality | r | **,109*** |
| | | p | ,033 |
| | Fatigue | r | **-,101*** |
| | | p | ,048 |
| | Tension | r | -,033 |
| | | p | ,515 |
| Prosocial Motivation Scale | Prosocial Motivation | r | ,083 |
| | | p | ,104 |

**N:386, *p<,05**

When Table 3 was analysed, a positive and low-level statistically significant relationship was found between sports experience and vitality sub-dimension of the Brunel Mood Scale (p<,05). Moreover, a negative and low-level statistically significant relationship was detected between the sports experience and fatigue sub-dimension (p<,05).

**Table 4.** Pearson Correlation Results of Brunel Mood Scale and Prosocial Motivation Scale Dimensions

| Variables | | M1 | M2 | M3 | M4 | M5 | M6 | PM1 |
|---|---|---|---|---|---|---|---|---|
| Anger (M1) | | 1 | | | | | | |
| Confusion (M2) | r | ,726** | | | | | | |
| | p | ,000 | 1 | | | | | |
| Depression (M3) | r | ,732** | ,798** | 1 | | | | |
| | p | ,000 | ,000 | | | | | |
| Vitality (M4) | r | -,067 | -,161** | -,249** | 1 | | | |
| | p | ,191 | ,002 | ,000 | | | | |
| Fatigue (M5) | r | ,627** | ,743** | ,748 | -,223** | 1 | | |
| | p | ,000 | ,000 | ,000 | ,000 | | | |
| Tension (M6) | r | ,741** | ,778** | ,738** | -,036 | ,650** | 1 | |
| | p | ,000 | ,000 | ,000 | ,480 | ,000 | | |
| Prosocial Motivation (PM1) | r | -,258** | -,213** | -,245** | ,251** | -,247** | -,175** | 1 |
| | p | ,000 | ,000 | ,000 | ,000 | ,000 | ,001 | |

**N:386, **p<,01**

Brunel Mood Scale Sub-Dimensions: M1, M2, M3, M4, M4, M5, M6 / Prosocial Motivation Scale: PM1

According to the results of the Pearson Correlation analysis; It was determined that there was a negative low-level significant relationship between prosocial motivation and anger, confusion, depression, fatigue and tension sub-dimensions. Moreover, there was a positive low-level significant relationship between the prosocial motivation and the vitality sub-dimension.

## DISCUSSION AND CONCLUSION

In this study, the theoretical relationship between moods and prosocial motivation levels of individuals engaged in sports was examined. The results of the study show that there was a significant relationship between the participants' moods and their prosocial motivation levels. Accordingly, it can be said that negative-positive moods such as anger, confusion, depression, vitality, fatigue and tension can be determinative in terms of prosocial motivation in athletes. It is thought that moods and prosocial behavior, which are emotional evaluations, may be significant factors that cannot be ignored in terms of sportive performance. In this context, mood states, which have important effects on the individual in terms of emotional-cognitive aspects, may have the potential to affect the individual positively or negatively in competition environments (31). Besides, the concepts of moods and prosocial motivation, which are so important in the affective process of life, bring to mind the idea that they can develop in parallel with each other. Güran and Tösten (20) stated in their study that prosocial motivation was associated with positive and negative mood and could develop through certain parameters. In this context, it may be possible to evaluate the motivation of individuals as a significant factor in terms of their moods. Likewise, there were studies in the literature indicating that the level of prosocial motivation was positively related to positive moods (well-being, etc.) and negatively related to negative moods (46, 10, 27). As a result, the relationship between positive-negative moods and prosocial motivation increased the motivation status in positive moods, while it was confirmed that it caused a decrease in motivation status in negative situations.

When the participants' mood dimensions and prosocial motivation dimension were evaluated according to gender, it was determined that the confusion sub-dimension of the Brunel mood scale was higher in male participants than in female participants. The fact that females experience emotional processes more intensely suggests that it may trigger negative moods compared to males. Beedie et al. (5); Goleman (15) and Du (9) found that negative moods were higher in males than females in their studies. It was determined that the prosocial motivation dimension did not show a significant difference according to the gender variable. Can and Aykaç (6), Dong et al. (8) and Kwon et al. (26) reported that there was no significant relationship between gender characteristics and prosocial motivation level.

When the participants' mood dimensions and prosocial motivation dimension were evaluated according to their sport type, no significant difference was found in mood dimensions and prosocial motivation dimension. Therefore, the findings obtained suggest that sport types do not have a determining effect on mood and prosocial motivation level. Some studies in the literature suggest that the sport type variable (individual and team sports) may be effective on the psychological structures and social communication of individuals (3, 37). However, the findings obtained are in the direction that there is no difference according to the sport type variable. There are studies that support that the sport type variable does not affect the individuals in psychological terms (14, 38). The reason for this situation can be said to be related to the psychologically similar desires of the participants who do individual and team sports.

Within the scope of the relational model in the research, it was determined that there was a negative relationship between "sports experience and mood dimensions" on negative moods and a positive relationship on positive moods. The reason for this situation is the positive effects of sports on people in physical and psychological terms. It is thought that situations such as planning, fair play, experience, cooperation and problem solving in sports will also benefit the social lives of individuals. In the relevant literature, there were studies supporting the results of this study. Lowther and Lane (30) and Soylu et al. (35) reported that physical activity affects mood in their studies. It has been determined that physical activity intensity is negatively associated with negative moods and positively associated with positive moods (44, 43, 47, 42). It was determined that there was no significant relationship between sports experience and prosocial motivation dimension. In this perspective, literature reviews were insufficient to establish a connection between these two concepts. Therefore, it highlights the importance of making an effort to understand this concept well in future studies. In this context, the relationship between the concepts can be improved by establishing a strong theoretical basis in the field.

As a result; it was emphasized in the study that the mood states of the people who engaged in sports were a significant factor in terms of their social motivation. In this process, it was determined that the negative moods experienced by female participants were higher than male participants. With the increase in the year

of doing sports, there was a decrease in negative moods and an increase in positive moods. Positive or negative moods and prosocial motivation in sports inevitably affect people psychologically. Positive effects are observed on the mood level of sports experience. It may be suggested to develop systems that can encourage these physical sports activities and guide talented athletes at the beginning.

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# Examining the Effect of 3/7 Strength Training Method on Various Maximal Strength, Fatigue and Body Composition Parameters

Behnam CÜCÜ [1A], Mert AYDOĞMUŞ [2B],

Mustafa Nurullah KADI [3C], Mustafa Nurullah KADI [4D]

[1] *Gazi University Institute of Health Sciences, Department of Physical Education and Sports ANKARA/Türkiye*
[2] *Karabük University Hasan Doğan School of Physical Education and Sports KARABÜK/Türkiye*
[3] *Bitlis Eren University School of Physical Education and Sports BITLIS/Türkiye,*
[4] *Süleyman Demirel University, Faculty of Health Sciences, ISPARTA*

*Address Correspondence to Behnam CÜCÜ: e-mail: behnam.3678@gmail.com*



*(Date Of Received): 10.06.2024 (Date of Acceptance19.08.2024 (Date of Publication): 31.12.2024*
A: Orcid ID: 0000-0002-9683-7811 B: Orcid ID: 0000-0001-8763-1777
C: Orcid ID: 0000-0003-4863-9340 D: Orcid ID: 0000-0003-4863-9340

**Abstract**

This study was conducted to examine the effectiveness of the 3/7 strength training method, a new strength training method, compared to the 4x6 strength training method. The research group consisted of a total of 32 volunteer participants. These participants were divided into 3/7 (n=11) and 4x6 (n=11) training groups and a control group (n=10) consisting of individuals who did not participate in any strength training program. Afterwards, people in the 3/7 and 4x6 strength training groups regularly performed strength training, which included the movements specified in the program, two days a week, with 48 hours of rest between training sessions, according to the determined program. Before the studies started and at the end of the studies, anthropometric data such as fat mass, lean mass, body weight, body fat percentage (BFP), body mass index (BMI) of the participants included in the study were measured and then, shoulder press (SP), bench press (BP) and squat (S) as maximal strength measurements; the number of repetitions in the BP, S and SP as the fatigue parameters were recorded. The data were analysed using SPSS 21.0 statistical package programme. Wilcoxon Signed Rank Test was used to compare the pre-test and post-test values within the groups and Mann-Whitney U Test was used to compare between the groups. According to the pre-test and post-test measurement data, significant differences were observed in all parameters of the participants who applied the 3/7 protocol. When the pre-post test measurement data of participants who applied the 4x6 protocol were examined, significant improvements were observed in all parameters except BMI and body weight measurements. Regarding the results of the control group, there was a significant difference due to the increase in fat mass, body weight, BFP

and BMI values, while a significance was also detected in BP and S measurements among the fatigue number of repetitions (FNR) values, and no significance was found in any of the remaining parameters. When the groups applying the 3/7 and 4x6 protocols were evaluated, participants applying the 3/7 protocol showed more significant improvements in the FNR-S measurement compared to the 4x6 training group , although there was no significant difference in all remaining values, it was observed that people in the 3/7 training group had better values. In conclusion, it was observed that the 8-week 3/7 protocol resulted in significant positive improvements in various body composition, fatigue and strength parameters of individuals.

**Keywords:** Maximal strength, strength training, fatigue, 3/7 method, body composition.

**Özet**

**3/7 Kuvvet Antrenman Metodunun Çeşitli Maksimal Kuvvet, Yorgunluk ve Vücut Kompozisyonu Parametreleri Üzerine Etkisinin İncelenmesi**

Bu çalışma, yeni bir kuvvet antrenmanı yöntemi olan 3/7 kuvvet antrenmanı yönteminin etkinliğini 4x6 kuvvet antrenmanı yöntemine kıyasla incelemek amacıyla yapılmıştır. Araştırma grubu toplam 32 gönüllü katılımcıdan oluşmuştur. Bu katılımcılar 3/7 (n=11) ve 4x6 (n=11) antrenman grupları ile herhangi bir kuvvet antrenman programına katılmayan bireylerden oluşan kontrol grubu (n=10) olarak ayrılmıştır. Sonrasında 3/7 ve 4x6 kuvvet antrenman gruplarındaki kişiler belirlenen programa göre haftada iki gün ve antrenman seanslarının olduğu günler arasında 48 saat dinlenme olacak şekilde programdaki belirtilen hareketleri içeren kuvvet antrenmanını düzenli olarak uygulamışlardır. Çalışmaya dahil olan katılımcılardan çalışmalar başlamadan önce ve çalışmaların bitiminde; yağ kütlesi, yağsız kütle, vücut ağırlığı, vücut yağ yüzdesi (VYY), vücut kütle indeksi (VKİ) gibi antropometrik veriler alınmış ve ardından maksimal kuvvet ölçümü olarak shoulder press (SP), bench press (BP) ve squat (S); yorgunluk parametresi için ise BP, S ve SP egzersizlerindeki tekrar sayıları alınarak kaydedilmiştir. Veriler SPSS 21.0 istatistik paket programı kullanılarak analiz edilmiştir. Grup içi ön-test ve son-test değerlerinin karşılaştırılmasında Wilcoxon İşaretli Sıralar Testi, gruplar arası karşılaştırmalarda ise Mann-Whitney U Testi kullanılmıştır. Ön test ve son test ölçüm verilerine göre 3/7 protokolünü uygulayan katılımcıların tüm parametrelerinde anlamlı farklılıklar gözlenmiştir. 4x6 protokolünü uygulayan bireylerin ön-son test ölçüm verilerine bakıldığında ise VKİ ve vücut ağırlığı ölçümleri dışındaki bütün parametrelerde anlamlı düzeyde gelişmeler görülmüştür. Kontrol grubu sonuçlarına bakıldığında yağ kütlesi, vücut ağırlığı VYY, VKİ değerlerindeki artıştan dolayı anlamlı farklılık bulunurken, yorgunluk tekrar sayısı (YTS) değerlerinden BP ve S ölçümlerinde de anlamlılık tespit edilmiş olup, kalan hiçbir parametrede anlamlılığa rastlanmamıştır. 3/7 ile 4x6 protokolünü uygulayan gruplar değerlendirildiğinde ise YTS-S ölçümünde 3/7 protokolünü uygulayan katılımcılar 4x6 antrenman grubuna kıyasla daha anlamlı gelişmeler gösterirken, geriye kalan tüm değerlerde anlamlı farklılığa rastlanmasa da 3/7 antrenman grubundaki kişilerin daha iyi değerlere sahip olduğu saptanmıştır. Sonuç olarak; gerçekleştirilen 8 haftalık 3/7 protokolünün bireylerin çeşitli vücut kompozisyonu, yorgunluk ve kuvvet parametreleri üzerinde olumlu düzeyde önemli gelişmelere neden olduğu gözlenmiştir.

**Anahtar Kelimeler:** Maksimal kuvvet, kuvvet antrenmanı, yorgunluk, 3/7 yöntemi, vücut kompozisyonu.

## INTRODUCTION

Exercise activities are loved and encouraged by people of all ages and levels due to the benefits they provide for people. Individuals participate in these activities for many reasons, such as preventing or reducing various diseases, enjoyment, improving the quality of life and athletic performance. Although some people are cautious about exercise activities due to reasons such as injury (25), today's technological developments, studies and experienced trainers can eliminate these concerns and exercise programs can be adapted to people of all ages and levels (10). While carrying out sports activities, it is very important to implement these activities in an organized manner. In this case, the term training comes to the fore. Training is defined as activities in which the development of individuals is monitored in a pedagogically and systematically planned manner (1).

Muscle strength is called the ability of muscles to contract and resist this resistance when they encounter any resistance (23). Considering the strength needs of individuals in their daily lives, whether they are athletes or not, it is very important to improve the strength parameter. Because strength is a feature that is required not only in areas where strength parameters are needed, but also where important components such as speed and endurance are required and in order to reveal these parameters appropriately; it is a necessary component also for sedentary individuals to live a better-quality life. Ivey et al. (10) revealed in a study they conducted that regular strength training had positive effects on people's hypertrophy and muscle strength, regardless of age and gender. The mentioned effects have caused this concept to be the subject of many studies. Strength training is a type of training performed at certain intensities against any resistance. It can be applied for various purposes such as general well-being, reducing body fat percentage, increasing muscle cross-sectional area, and providing the physical skills required for military training and becoming a firefighter (3). When organizing strength training, components such as intensity, volume, duration, intensity, rest, movement tempo and frequency should be appropriately adjusted and applied for the purpose to be achieved (13). Although rest periods are not given much importance compared to other components, they are very important as they directly affect performance and exercise efficiency (14). In some studies, supporting this view, it has been reported that short rest intervals are more effective on the cross-sectional area of the muscles compared to long rest intervals (4,7).

The 3/7 training protocol is a strength training method that aims to increase metabolic stress, which is an important issue especially for short rest intervals and strength gains. This protocol consists of performing the exercises with medium-high intensity loads (≥ 70%), 3-4-5-6-7 repetitions, 5 sets and very short rest periods (≥ 15 seconds). The 3/7 protocol is quite different, especially in terms of total training time (≥ 5 minutes) (14). Stragier et al. (24) suggested that elbow flexion training using the 3/7 protocol was a more effective method on the participants' maximal strength, fatigue and hypertrophy parameters compared to the 8×6 method. In another study, it is claimed that the 3/7 protocol used in the bench press exercise causes better improvements in the participants' maximal strength values compared to the 4×6 method. When the studies are examined, it is seen that this method is an effective method in terms of developing maximal strength. It is also emphasized that this method may create more metabolic stress compared to methods with similar volume and intensity but longer rest periods (14).

At present, many strength training methods are used around the world. However, people's increasing strength needs for various reasons in their normal lives, limited time, health problems such as injuries and the inadequacy of traditional methods requires the need for different methods. As a result of the observations made during the research, it is seen that the 3/7 protocol was completed in much shorter times without compromising the gains obtained. It is thought that this situation further increases the importance of our research, especially in this period when time is limited and rapid performance development is much more necessary. When similar studies are examined, it is seen that more studies are needed on the effectiveness of this method on maximal strength, fatigue and body composition values in basic movements such as squat, shoulder press and bench press. For this reason, the aim of the study was to examine the effectiveness of this new method (the 3/7 method) on maximal strength, fatigue and various body composition values in different movements.

## METHOD

### Research Model

In this study, the pre-post test control group model, one of the experimental methods, was used.

### Research Group

The research was carried out in Çankırı province. 32 sedentary people, aged between 16 and 22, who had no health risks in participating in exercise programs and who had not practiced strength training in the last 6 months, were included in the study on a voluntary basis. Volunteer participants

were divided into three groups: 3/7 (n=11) and 4x6 (n=11) training group and control group (n=10). The exercise program was completed by the participants without any problems.

**Data Collection Tools**

Measurements taken from the participants were taken twice, before starting the study and at the end of the study. Participants over the age of 18 themselves, and participants who were under the age of 18 themselves and their parents were asked to sign informed consent forms. Before starting the exercise program, adaptation training was carried out 2 days a week for 2 weeks to prevent injuries and to perform the exercise forms properly.

**Height**

A SECA brand stadiometer was used to measure the height of the individuals. Participants were asked to have their bodies upright and their feet bare.

**Body Composition**

Fat mass, body weight, BFP, fat-free mass and BMI measurements used in the research were performed using the Tanita-MC 580 brand bioelectric impedance analyzer. Necessary warnings were given to people not to consume any food or engage in exercise before the measurement.

**1 Repetition Maximum (1RM) Strength**

In the study, 1RM values of individuals in shoulder press (SP), bench press (BP) and squat (S) movements were used. Since classical maximal force determination methods will increase the risk of injury in people who have not done strength exercises before, it is stated that it is more appropriate to use maximum force estimation equations in these individuals (9). Therefore, the Brzycki formula was used when determining the maximal strength of individuals in the study. After the participants warmed up with low weights for 10 minutes, they performed the exercises with weights that would not cause any deterioration in the form of the exercises. If the subjects exceeded 10 repetitions with the weights they chose, they were asked to stop and after resting, they added some more weight and performed the exercises again. Participants were stopped when they performed 10 repetitions or less in the exercises, and the weight they lifted and the number of repetitions they completed were entered into the formula. Considering the research, it has been suggested that in maximum force prediction equations performed with submaximal weights, the predictive power of the equations is stronger when the number of repetitions in the movements is ≤10 (19). Brzycki formula; 1RM = Weight Lifted / [1.0278 – (0.0278 x Number of Reps)] (5).

**Fatigue Number of Repetitions (FNR)**

Fatigue number of repetitions measurements in SP, S and BP movements were used in the research. While these measurements were being made, the participants included in the study were asked to perform as many repetitions as they could in all movements with weights corresponding to 70% of their previously calculated maximum strength (24). Importance was given to performing the movements with the correct form; when the movements were not performed with the appropriate technique, the measurement was terminated, and the last number of repetitions performed with the correct form was recorded.

**Strength Training Programs Applied**

Both training methods were applied two days a week for 8 weeks and 48 hours were left between training sessions. Participants performed a warm-up period consisting of 3 sets and the movements performed in the study, before starting the training throughout the study; 1 set of 10 repetitions, 1 set of 8 repetitions, 1 set of 6 repetitions were performed with 30%-40%-50% of 1RM, respectively. In the 3/7 strength training method, individuals perform 5 sets and 3-4-5-6-7 repetitions respectively with 70%

of their maximum strength. Participants rest for 15 seconds between sets (24). Although the 4x6 strength training method is a more traditional method, in this method participants still perform movements with 70% of their maximum strength in 4 sets and 6 repetitions in each set. Individuals rest for 150 seconds between sets (14).

The participants included in the study were helped, at least in a small way, when they had difficulty in reaching the required number of repetitions. When people practiced each movement without support for two consecutive workouts, the loads were increased by at least 2.5 kg. While the participants were performing the movements, care was taken to ensure that their tempo was at a moderate level and that the final test measurements were made 48-72 hours after the last training session, at the same time as the pre-training measurements (14). The 8-week training program was terminated without any adverse events.

**Analysis of Data**

The data obtained in this study were analyzed using the SPSS 21.0 statistical software program. As a result of the analyses, the data were evaluated by calculating the arithmetic mean and standard deviation values. When the data was examined, it was determined that it did not show a normal distribution and therefore non-parametric tests were preferred in the study. The Wilcoxon Signed Rank Test was used to compare the pre-post test results of the groups. The Mann-Whitney U Test was preferred to compare the groups with each other.

Effect size (r) results were obtained by dividing the Z value obtained by the Wilcoxon Signed Rank Test by the square root of the sum of the people participating in the measurements in the groups ($Z/\sqrt{n}$). The effect size results resulting from the calculation were analyzed according to Cohen's classification (0.1 low effect - 0.3 medium effect - 0.5 and above high effect) (18). In the study, the statistical significance level was accepted as $p<0.05$.

**Ethical approval and institutional permission**

Ethics committee approval for the study was received by Karabük University Social and Human Sciences Research Ethics Committee. (Meeting No: 2021/02).

**Table 1.** Demographic İnformation of The Participants

| | Group | N | $\bar{X}$ | SD |
|---|---|---|---|---|
| **Age (years)** | 3/7 | 11 | 17,90 | 2,165 |
| | 4x6 | 11 | 17,72 | 1,272 |
| | control | 10 | 17,70 | 1,888 |
| **Height (cm)** | 3/7 | 11 | 166,00 | 11,991 |
| | 4x6 | 11 | 166,45 | 9,437 |
| | control | 10 | 164,70 | 10,499 |
| **Body weight (kg)** | 3/7 | 11 | 63,90 | 14,239 |
| | 4x6 | 11 | 67,77 | 15,448 |
| | control | 10 | 62,01 | 12,421 |
| **BMI** | 3/7 | 11 | 23,15 | 4,882 |
| | 4x6 | 11 | 24,40 | 5,456 |
| | control | 10 | 22,71 | 2,800 |

## FINDINGS

The average body weight, age, BMI and height of the people included in the study are presented in Table 1.

**Table 2.** Comparison of Pre-Post Test Data of The Training Group Applying The 3/7 Protocol

| | Pre-Test | | | Post-Test | | | % Change | r | Z | p |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | | | | |
| **Body Weight (kg)** | 11 | 63,90 | 14,239 | 11 | 62,20 | 12,067 | -2,66 | 0,436 | -2,046 | 0,041* |
| **BMI** | 11 | 23,15 | 4,882 | 11 | 22,57 | 4,165 | -2,50 | 0,424 | -1,989 | 0,047* |
| **Fat Mass (kg)** | 11 | 16,59 | 9,510 | 11 | 14,03 | 7,783 | -15,43 | 0,625 | -2,936 | 0,003* |
| **BFP (%)** | 11 | 24,70 | 10,701 | 11 | 21,81 | 9,899 | -11,70 | 0,625 | -2,934 | 0,003* |
| **Lean Mass (kg)** | 11 | 47,31 | 8,889 | 11 | 48,15 | 8,913 | 1,77 | 0,569 | -2,673 | 0,008* |
| **1RM-S (kg)** | 11 | 40,71 | 22,240 | 11 | 96,74 | 35,158 | 137,63 | 0,625 | -2,934 | 0,003* |
| **1RM-BP (kg)** | 11 | 27,09 | 7,774 | 11 | 36,37 | 8,314 | 34,25 | 0,625 | -2,934 | 0,003* |
| **1RM-SP (kg)** | 11 | 17,33 | 4,923 | 11 | 28,81 | 8,693 | 66,24 | 0,626 | -2,937 | 0,003* |
| **S-FNR** | 11 | 22,72 | 7,551 | 11 | 64,63 | 13,071 | 184,46 | 0,625 | -2,934 | 0,003* |
| **BP-FNR** | 11 | 13,45 | 3,266 | 11 | 27,27 | 6,482 | 102,75 | 0,625 | -2,936 | 0,003* |
| **SP-FNR** | 11 | 13,27 | 2,796 | 11 | 28,45 | 7,434 | 114,39 | 0,625 | -2,934 | 0,003* |

*p<0,05, r= Effect Size, S= Squat, BP= Bench Press, SP= Shoulder Press, FNR= Fatigue Number of Repetitions, RM= Maximal Repetition

When Table 2, which compares the pre-tests and post-tests of the participants who applied the 3/7 protocol, is examined; there are significant differences in all parameters ($p<0.05$).

As a result of the 8-week training period, high effect size values were detected in lean mass, fat mass and BFP measurements. While the parameters S, BP and SP among the 1RM values, and SP, S, BP among the FNR values have high effect size results, BMI and body weight have medium effect size values. No value with a low effect size could be detected.

**Table 3.** Comparison of Pre-Post Test Data of The 4x6 Strength Training Group

| | Pre-Test | | | Post-Test | | | % Change | r | Z | p |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | | | | |
| **Body Weight (kg)** | 11 | 67,77 | 15,448 | 11 | 67,43 | 15,243 | -0,50 | 0,132 | -0,623 | 0,533 |
| **BMI** | 11 | 24,40 | 5,456 | 11 | 24,30 | 5,482 | -0,40 | 0,114 | -0,535 | 0,593 |
| **Fat Mass (kg)** | 11 | 18,53 | 9,018 | 11 | 17,39 | 9,551 | -6,15 | 0,493 | -2,314 | 0,021* |
| **BFP (%)** | 11 | 26,36 | 8,608 | 11 | 24,60 | 9,016 | -6,67 | 0,575 | -2,701 | 0,007* |
| **Lean Mass (kg)** | 11 | 49,24 | 9,565 | 11 | 50,13 | 8,719 | 1,80 | 0,369 | -1,735 | 0,083 |
| **1RM-S (kg)** | 11 | 39,59 | 17,599 | 11 | 83,54 | 27,374 | 111,01 | 0,625 | -2,934 | 0,003* |
| **1RM-BP (kg)** | 11 | 28,12 | 9,960 | 11 | 35,40 | 11,038 | 25,88 | 0,625 | -2,936 | 0,003* |
| **1RM-SP (kg)** | 11 | 17,63 | 6,064 | 11 | 26,97 | 8,959 | 52,97 | 0,625 | -2,936 | 0,003* |
| **S-FNR** | 11 | 20,81 | 9,516 | 11 | 49,45 | 18,726 | 137,62 | 0,598 | -2,805 | 0,005* |
| **BP-FNR** | 11 | 14,36 | 2,838 | 11 | 24,27 | 7,001 | 69,01 | 0,626 | -2,938 | 0,003* |
| **SP-FNR** | 11 | 14,45 | 4,131 | 11 | 26,90 | 6,876 | 86,15 | 0,626 | -2,937 | 0,003* |

*p<0,05, r= Effect Size, S= Squat, BP= Bench Press, SP= Shoulder Press, FNR= Fatigue Number of Repetitions, RM= Maximal Repetition

When the pre-post test measurements of the participants in the 4x6 strength training group in Table 3 are examined; significance was detected in BFP, fat mass, SP, S and BP measurements among the 1RM values, and in SP, S and BP measurements in FNR values. No significance was detected in lean mass, body weight and BMI measurements.

The effect size results at the end of the study period shows that while BFP, SP, S, BP among the 1TM values and SP, S, BP among the FNR values have high effect size values, lean mass and fat mass have medium effect size values, and BMI and body weight measurements have low effect size values.

**Table 4.** Comparison of The Control Group Pre-Post Test Values

| | Pre-Test | | | Post-Test | | | % Change | r | Z | p |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | $\bar{X}$ | SD | N | $\bar{X}$ | SD | | | | |
| **Body Weight (kg)** | 10 | 62,01 | 12,421 | 10 | 62,94 | 11,683 | 1,49 | 0,467 | -2,193 | 0,028* |
| **BMI** | 10 | 22,71 | 2,800 | 10 | 23,01 | 2,483 | 1,32 | 0,449 | -2,109 | 0,035* |
| **Fat Mass (kg)** | 10 | 12,49 | 4,817 | 10 | 13,28 | 4,128 | 6,32 | 0,467 | -2,193 | 0,028* |
| **BFP (%)** | 10 | 20,25 | 6,600 | 10 | 21,39 | 6,257 | 5,62 | 0,467 | -2,194 | 0,028* |
| **Lean Mass (kg)** | 10 | 49,54 | 11,004 | 10 | 49,70 | 10,926 | 0,32 | 0,261 | -1,228 | 0,219 |
| **1RM-S(kg)** | 10 | 38,20 | 10,809 | 10 | 37,15 | 9,540 | -2,74 | 0,184 | -0,866 | 0,386 |
| **1RM-BP (kg)** | 10 | 26,58 | 8,322 | 10 | 26,01 | 8,156 | -2,14 | 0,227 | -1,068 | 0,285 |
| **1RM-SP (kg)** | 10 | 17,17 | 3,452 | 10 | 18,84 | 4,710 | 9,72 | 0,380 | -1,785 | 0,074 |
| **S-FNR** | 10 | 18,40 | 4,647 | 10 | 20,00 | 5,849 | 8,69 | 0,438 | -2,056 | 0,040* |
| **BP-FNR** | 10 | 13,20 | 1,873 | 10 | 14,30 | 1,888 | 8,33 | 0,492 | -2,309 | 0,021* |
| **SP-FNR** | 10 | 14,50 | 3,135 | 10 | 14,40 | 3,747 | -0,68 | 0,053 | -0,250 | 0,803 |

*p<0,05, r= Effect Size, S= Squat, BP= Bench Press, SP= Shoulder Press, FNR= Fatigue Number of Repetitions, RM= Maximal Repetition

Examining the Table 4, among the pre-post test measurements of the participants in the control group; while there was no significant difference in fat-free mass, SP, S and BP among the 1RM values, and SP among the FNR values ($p>0.05$), significant differences were observed as there were increases in fat mass, body weight, BFP, BMI and S and BP among the FNR values ($p <0.05$).

When the effect size values at the end of the 8-week training period were examined, no high effect size values were observed in the participants in the control group. BFP, body weight, fat mass, BMI and SP among the 1RM values, BP and S among the FNR values had medium effect size values. A low effect was observed in lean mass, BP and S among the 1TM values, and SP among the FNR values.

**Table 5.** Comparison of Post-Tests of Participants Applying The 3/7 and 4x6 Protocols

| | Group | N | $\bar{X}$ | SD | Z | p |
|---|---|---|---|---|---|---|
| **Body Weight (kg)** | 3/7 | 11 | 62,20 | 12,067 | -0,723 | 0,470 |
| | 4x6 | 11 | 67,43 | 15,243 | | |
| **BMI** | 3/7 | 11 | 22,57 | 4,165 | -0,854 | 0,393 |
| | 4x6 | 11 | 24,30 | 5,482 | | |
| **Fat Mass (kg)** | 3/7 | 11 | 14,03 | 7,783 | -0,689 | 0,491 |
| | 4x6 | 11 | 17,39 | 9,551 | | |
| **BFP (%)** | 3/7 | 11 | 21,81 | 9,899 | -0,689 | 0,491 |
| | 4x6 | 11 | 24,60 | 9,016 | | |
| **Lean Mass (kg)** | 3/7 | 11 | 48,15 | 8,913 | -0,624 | 0,533 |
| | 4x6 | 11 | 50,13 | 8,719 | | |
| **1RM-S (kg)** | 3/7 | 11 | 96,74 | 35,158 | -0,625 | 0,532 |
| | 4x6 | 11 | 83,54 | 27,374 | | |
| **1RM-BP (kg)** | 3/7 | 11 | 36,37 | 8,314 | -0,165 | 0,869 |
| | 4x6 | 11 | 34,40 | 11,038 | | |
| **1RM-SP (kg)** | 3/7 | 11 | 28,81 | 8,693 | -0,362 | 0,717 |
| | 4x6 | 11 | 26,97 | 8,959 | | |
| **S-FNR** | 3/7 | 11 | 64,63 | 13,071 | -1,974 | 0,048* |
| | 4x6 | 11 | 49,45 | 18,726 | | |
| **BP-FNR** | 3/7 | 11 | 27,27 | 6,482 | -1,417 | 0,156 |
| | 4x6 | 11 | 24,27 | 7,001 | | |
| **SP-FNR** | 3/7 | 11 | 28,45 | 7,434 | -0,462 | 0,644 |
| | 4x6 | 11 | 26,90 | 6,876 | | |

*p<0,05, S= Squat, BP= Bench Press, SP= Shoulder Press, FNR= Fatigue Number of Repetitions, RM= Maximal Repetition

On the table 5, where the post-test measurements of the training groups are compared, no significance was found in lean mass, BMI, body weight, BFP, fat mass, S, SP and BP among the 1RM values, and SP and BP among the FNR values. In the S-FNR measurement, a significance was observed in favor of the participants in the group applying the 3/7 protocol ($p < 0.05$).

## DISCUSSION AND CONCLUSION

The research was carried out to investigate the effectiveness of the 3/7 strength training method, which is a newer training method compared to traditional training methods, by comparing it with the 4x6 strength training method, which is one of the traditional methods. The study included 32 participants aged between 16-22, who volunteered to participate in the study and did not have any health problems. Those who met the criteria for participation in the study were divided into 3 groups: 4x6 and 3/7 strength training groups and the control group, and the values measured as a result of the applied strength training were compared statistically. The findings obtained as a result of the analyzes were examined by scanning the literature.

When the body composition values of the participants in all groups in the current study were examined; significant differences were observed in BMI, BFP, lean mass, fat mass and body weight measurements compared to the pre-test measurements of the post-test measurements of the people in the 3/7 training group. Based on the findings of the study, it was determined that the 3/7 training method applied regularly for eight weeks had positive effects on all body composition measurements of the participants. In the 4x6 strength training group, a significant improvement was observed in BFP, lean mass and fat mass values. There was a significant difference in BMI, body weight, lean mass and fat

mass values in the participants in the control group. However, as can be seen from the percentage change values, this difference is due to the increase in these values. The reason for this may be that they were inactive due to the epidemic during the eight-week training period and that they lived a sedentary life because they were affected by this process. When the effect size values of the study were examined, it was seen that the participants in the 3/7 strength training group showed high effect values in more variables compared to those in the other two groups.

When the literature was examined, no study was found examining the effectiveness of the 3/7 strength training method on body composition measurements in sedentary individuals between the ages of 16-22. For these reasons, the studies whose analysis results are given below also included studies in different age groups and using different strength training methods.

Perez-Gomez et al. (20) stated in their study that the strength training they applied for 10 weeks did not have any significant effect on the participants' BFP, BMI and fat mass values, and that there were statistically significant increases in their lean mass values. Lo et al. (17) divided 30 male students into 3 groups, namely endurance, strength, and control groups, and conducted a study for 24 weeks, showing that no significant difference was observed between the groups in BMI, BFP, fat mass and body weight values, and similarly, they stated that the lean mass values of the participants in the strength training group increased significantly compared to those in the other groups. In a different study, similar to the study in question, individuals who had not participated in any strength training program for the last 5 months performed exercises for different muscle groups. It was stated that at the end of the training period, the participants did not show significant improvements in any body composition values, and the protocol applied only had a low effect on lean mass, muscle mass and fat mass values (15). Similar to the study conducted in middle-aged men, it was found that as a result of 16-week strength training for large muscle groups with increasing intensity every 4 weeks, although the body weight values of the participants decreased, no significance was found, but significant decreases were observed in BFP values (11).

When the findings and results of the studies conducted in the literature are compared with the results of the study conducted to investigate the effectiveness of the 3/7 strength training method, it is seen that although there are different studies, they support the results of the conducted studies, while some studies in the literature, on the other hand, do not have similar results. The reasons for this may be differences in exercise programs, strength training methods applied, training duration, and gender and age of the participants. Considering the results obtained in the researched and above-mentioned studies, it is seen that strength training methods, including the 3/7 strength training method, positively affect body composition parameters.

When the maximum strength measurements of the participants in the groups before and after the training were examined; it was determined that there were significant increases in all maximal strength measurements of people in the 4x6 and 3/7 training groups. Based on these results, it is determined that both training methods cause significant improvements in all maximum strength values of the participants. However, in the control group, no significant difference was found in maximal strength measurements at the end of the study.

When looking at the maximum strength values of the groups; It was observed that the 3/7 and 4x6 strength training groups showed a significant increase in strength compared to the control group in all maximal strength measurements at the end of 8-week training. When the training groups were compared, although there was no significant difference in the maximum strength values, it was observed that the individuals in the 3/7 training group had much better values in all maximal strength measurements compared to the participants in the 4x6 training group. Considering the effect size (r) values, it was determined that the effect values were high in all pre- and post-test comparisons of the 4x6 and 3/7 training groups, while no high effect value was observed in any variable in the control group.

When we look at the studies in the literature, in another study, similar to the current study where the 3/7 strength training method was examined, 38 people between the ages of 18 and 26 who had never applied any strength training program before were divided into 3 groups: 4x6, 8x6 and 3/7 strength

training groups. During training, individuals applied the bench press (BP) movement with loads corresponding to 70% of their maximal strength. At the end of the study, while significant increases were detected in the BP values of the participants in all training groups, similar to our research, it was stated that this increase was more pronounced in the 3/7 training group (14). Similarly, Stragier et al. (24) in their study examining the 3/7 training method, they divided a total of 30 people between the ages of 18 and 32, who had not implemented any strength training program in the 6 months before participating in the study, into 3/7 and 8x6 strength training groups. During the study, participants performed elbow flexion exercises with 70% of their maximum strength 2 days a week for 12 weeks. Considering the study results, it is reported that although there were significant increases in the elbow flexion movement measurements of the participants in both training groups, similar to our study and the previous study mentioned above, this increase was greater in the participants in the 3/7 training group, both as a percentage change value and as a maximal strength value. The findings obtained from the two studies mentioned above, which are similar to our research, support the findings we put forward in our study. In a study examining the effectiveness of different numbers of sets on maximal strength, participants performed various lower body and upper body exercises of 8-12RM, divided into groups as 1 set, 3 sets and 5 sets, for 24 weeks. Considering the study results, it was reported that significant improvements were observed in the maximal strengths of the three groups in the exercises (21). Kim et al. (12) examined the effectiveness of traditional and super slow training methods on maximal strength in their study. In the study, participants were made to perform various exercises that activated the chest, shoulder and leg muscles, with loads corresponding to 50-80% of their maximal strength, similar to our research. As a result of the measurements made at the end of the training period, significant increases were observed in the maximal strength of the participants in both training groups. When the studies are examined, most of the studies have similar results to our study. Considering the findings we obtained in the study and the studies in the literature mentioned above, it is seen that the 3/7 strength training method and other training methods applied, whose effectiveness we examined, positively affect the maximum strength values of individuals.

When the fatigue repetition numbers (FRN) in the study are examined, it is seen that there were significant increases in the FRN values of the participants in both training groups. Although the FRN squat (S) value was significant among the training groups, it was determined that individuals in the 3/7 training method showed higher repetition increases in all other values, including percentage change values, compared to individuals in the 4x6 training method. In addition, when the effect size values were examined, while both training groups had high effect values, no high effect values were found in any measurement in the control group.

In the study examining the 3/7 training method, that we examined in our study, participants had the elbow flexion exercise performed with 70% of their maximum strength for 12 weeks. While significant increases in FRN values were detected in both training methods used in the study at the end of the training period, when the training groups were compared, it was revealed that the participants who applied the 3/7 method showed better development compared to the 4x6 training group (24). In a different study investigating the effects of different training frequencies on individuals' performance, 39 healthy participants who did not regularly apply a strength exercise program were included and various lower body and upper body exercises were performed at different frequencies for 8 weeks with increasing intensities every two weeks. In order to determine the FRN values of the participants, they were asked to perform as many repetitions as they could in the selected movements before and after the training, with 60% of their pre-test maximum strength. At the end of the 8-week exercises, it was reported that all groups except the control group showed significant improvements in the FRN values in the selected exercises (2). Chulvi-Medrano et al. (6) in their study conducted with 20 healthy participants who were recreationally interested in sports, they had the participants perform BP and lat pull down movements according to manual strength training and traditional strength training principles. Participants were asked to repeat push-ups and pull-ups as many times as they could before and after the training. At the end of the study, it was stated that while the FRN values of the participants in both training groups increased, this increase did not cause any significance. While most of the studies

examined are parallel to our research, the study of Chulvi-Medrano et al. does not support our research results. This may be due to the application of different training programs, intensity of exercises and rest periods.

This study was limited to 8 weeks and the criterion of not having participated in any strength training programme in the last 6 months was sought in the participants included in the study. In addition, the variables examined in the study were limited to 1RM, fatigue number of repetitions and various body composition values.

In conclusion, both strength training methods, performed regularly for 8 weeks, resulted in significant improvements in participants' various maximum strength, fatigue and body composition parameters. When we compare the training methods between themselves, it is seen that although the two methods caused improvements in the mentioned parameters, the participants in the group applying the 3/7 protocol showed better development in these parameters. One of the important advantages of the 3/7 training method is that the exercises are performed in less than 5 minutes, which is especially important for people who have time constraints to exercise. In addition, this method can be very important in situations such as easy inclusion in exercise sessions to train specific muscle groups and in cases where there is little time allocated to physical fitness.

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# The Relationship Between Selected Physical and Motor Characteristics with Dribble-Shooting Performance of 9-10 Years Old Female Basketball Players

Gürol GÜNER [1A], Yeliz PEHLİVAN [2B], Murat TUTAR [3C]

[1] *Bakırköy Youth and Sports District Directorate, Istanbul, TÜRKIYE*
[2] *Istanbul Health Sciences University, Hamidiye Faculty of Life Sciences, Exercise and Sport Sciences Department, Istanbul, TÜRKİYE*
[3] *Istanbul Gedik University, Faculty of Sport Sciences, Department of Exercise And Sport Sciences, Exercise and Sport Sciences Programme Istanbul, TÜRKİYE*
*Address Correspondence to Yeliz PEHLİVAN: e-mail: yeliz.yol@sbu.edu.tr*

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A: Orcid ID: 0009-0002-7915-2711 B: Orcid ID: 0000-0002-0859-6238 C: Orcid ID: 0000-0002-9082-397X

**Abstract**

Basketball is a sport that combines physical abilities and technical skills. Dribble-shooting is one of the basic skills of this sport, and it is important to have certain physical and motor characteristics to perform it successfully. The physical development of 9-10-years-old female basketball players continues rapidly, and physical fitness levels may vary during this period. This study investigated the relationship between selected physical and motoric characteristics of 9-10-years-old female basketball players and their performance in dribble-shooting. Forty female basketball players with a mean age of 9.50±0.51 years participated in the study. The data obtained in the study were evaluated using SPSS 26.00 programme. Descriptive statistics (min., max., mean and standard deviation) were given while evaluating the data. After the normality distribution was made in the analysis of the data, the relationships between the data were evaluated by Spearman correlation since the data were not parametric. The results obtained were evaluated at $p<0.05$ significance level. After physical measurements, balance, flexibility, speed, hand grip, agility, jumping, ball throwing, and dribble-shooting performance tests were performed. No correlation was found between selected physical and motor characteristics such as age, height, body weight, flexibility, jumping, hand grip, ball throwing, agility, 20-meter sprint, balance, and arm length, with the dribble-shooting performance of 9-year-old female basketball players. As a result, there is no relationship between the selected physical and motoric characteristics of 9-10 years old female basketball players and their mobile shooting (lay-up) skills.

**Keywords:** Basketball, correlation, female, dribble-shooting, motoric characteristics

**Özet**

**9-10 Yaş Arası Kız Basketbolcuların Seçili Fiziksel ve Motorik Özellikler ile Hareketli Şut (Turnike) Becerileri Arasındaki İlişki**

Dribble-shooting bu sporun temel becerilerinden biridir ve başarılı bir şekilde gerçekleştirilebilmesi için belirli fiziksel ve motorik özelliklere sahip olmak önemlidir. 9-10 yaş arası kadın basketbolcuların fiziksel gelişimleri hızla devam etmekte ve fiziksel uygunluk düzeyleri bu dönemde değişkenlik gösterebilmektedir. Bu çalışmada 9-10 yaş arası kadın basketbolcuların seçilmiş fiziksel ve motorik özellikleri ile top sürme performansları arasındaki ilişki araştırılmıştır. Çalışmaya yaş ortalaması 9.50±0.51 yıl olan 40 kadın basketbolcu katılmıştır. Çalışmada elde edilen veriler SPSS 26.00 programı kullanılarak değerlendirilmiştir. Veriler değerlendirilirken tanımlayıcı istatistikler (min., max., ortalama ve standart sapma) verilmiştir. Verilerin analizinde normallik dağılımı yapıldıktan sonra, veriler parametrik olmadığı için veriler arasındaki ilişkiler Spearman korelasyonu ile

değerlendirilmiştir. Elde edilen sonuçlar $p<0.05$ anlamlılık düzeyinde değerlendirilmiştir. Fiziksel ölçümlerin ardından denge, esneklik, sürat, el kavrama, çeviklik, sıçrama, top atma ve top sürme-şut atma performans testleri uygulanmıştır. Yaş, boy, vücut ağırlığı, esneklik, sıçrama, el kavrama, top fırlatma, çeviklik, 20 metre sprint, denge ve kol uzunluğu gibi seçilmiş fiziksel ve motorik özellikler ile 9 yaşındaki kadın basketbolcuların top sürme-şut atma performansı arasında bir ilişki bulunamamıştır. Sonuç olarak, 9-10 yaş grubu kadın basketbolcuların seçilen fiziksel ve motorik özellikleri ile hareketli şut (turnike) becerileri arasında bir ilişki yoktur.

**Anahtar Kelimeler:** Basketbol, kız, korelasyon, motorik özellik, turnike.

## INTRODUCTION

Basketball, a dynamic and complex sport that combines cyclic and acyclic movement structures, has gained worldwide popularity (10,18). The aim of the basketball game is basically to score by putting the ball into the basket as many times as possible and to prevent other teams from scoring during the given time. Therefore, players need to have 6 individual technical skills for many basketball movements with or without the ball during a match. These are dribbling, shooting, passing, rebounding, defensive and offensive skills (24). The fact that each shot to the basket in basketball brings points shows that shooting techniques are dominant for this branch and play a vital role in games. In particular, the dribble-shooting technique is a very basic technique in basketball games because the number of points scored from a dribble-shooting performance is the highest compared to other types of shots such as free throws or three-pointers (5,8,19).

The successful and efficient realization of all movements in basketball, especially the dribble-shooting performance, depends on the motor and functional skills of the players. Motor skills play an important role in the selection of young basketball players and in the progression of their game performance. This is especially true for innate abilities that are difficult to reach the high-quality level required by modern basketball through training alone (11). The necessity of physical conditioning components for each sport varies according to the characteristics or characteristics of that sport and is orientated towards the demands of the sport. The explosive power of the leg muscles is a physical conditioning component that cannot be ignored. The explosive power and take-off power of the leg muscles are needed when making a dribble-shooting or putting the ball in the opponent's basket. In addition, the strength of the arms and shoulder girdle, agility, coordination, balance, flexibility, speed of cyclic and acyclic movements, anaerobic lactate and alactate capacities, shooting accuracy and ball handling ability are other important elements in basketball (20,22,30,36). Basketball is a complex sport that requires a high level of motoric skills. The development of these skills at a young age is critical for future sporting success. The age group of 9-10 years is a period of rapid development of motoric skills and the skills acquired during this period can significantly affect the performance of athletes in later ages (37). Balance plays an important role in basketball, especially in defensive and offensive positions. Balance development in children aged 9-10 years is closely related to the development of the central nervous system and musculoskeletal system. Children in this age group show significant improvements in static balance tests such as standing on one leg (38). Studies have reported that initiating balance training at an early age can be effective in improving overall motoric performance (39). Flexibility is important for preventing injuries and increasing the range of movement. Flexibility of muscle and connective tissues develops rapidly in this age group (40). Flexibility, which is evaluated by tests such as sit-and-reach, should have an important place in the training programmes of female basketball players. In the literature, it is emphasised that regular stretching exercises are effective in the development of flexibility. Speed is associated with the ability to change direction suddenly and react quickly in basketball (41). In children aged 9-10 years, sprint development is influenced by genetic and environmental factors. Short distance sprint tests are commonly used to assess sprint performance in this age group. Muscle fibre type composition and contractile properties change rapidly in children aged 9-10 years, with a transition from slow to fast in the vastus lateralis between 6-10 years (42). In 9-year-old children, muscle differentiation develops rapidly with a higher percentage of fast-twitch muscle fibres and higher muscle activation (43). Research shows that regular speed training contributes to speed development in this age group. Hand grip strength is critical for ball control and passing ability in basketball. In this age group, hand grip strength is considered as an indicator of general muscle strength (44). Jumping plays an important role especially in offensive and defensive rebounding. Vertical jump tests are used as an indicator of explosive strength. In the 9-10 age group, jumping ability increases in parallel with neuromuscular development (45).

To date, many studies have investigated the performance parameters and physical characteristics of male and female basketball players in various age groups (2,7,28,46).

However, studies investigating the relationship between the physical and motoric characteristics and dribbling-shooting of female basketball players aged 9-10 years are limited in the literature. Therefore, the aim of this study was to investigate the relationship between selected physical and motoric characteristics and dribbling-shooting performances of 9-10 age group female basketball players. Our hypothesis is that there will be a positive and significant relationship between selected physical and motoric characteristics such as balance, flexibility, speed, handgrip strength, agility and jumping, and mobile shooting (lay-up) skills of 9-10 years old female basketball players.

## METHOD

### Participants

The participants consisted of 40 female athletes playing basketball regularly for at least 1 year. Before the study, the participants and their parents were informed about the structure of the study, possible risks, and that they could leave the study at any time, and their written consent was obtained that they voluntarily agreed to participate. Athletes who had any injury, injury or medical procedure in the last three months were excluded from the study.

### Study protocol

In the study, body composition measurement, balance test, flexibility test, handgrip strength test, sprint test, agility test, vertical jump test, and mobile throw (tourniquet) test were performed in one day respectively. In the second repetition of the same movement, 2 min rest and 10 min rest between the stations were given.

### Ethical approval and institutional permission

It was approved by the Scientific Research Ethics Committee that the research design was in compliance with the Helsinki Declaration on Ethical Principles in Medical Research on Humans (2023/06).

### Height and Body Weight Measurement

The body height, using a wall-mounted stadiometer (Holtain, UK) with an accuracy of ±0.1 mm, and the body weight, using the electronic laboratory scale (Seca, Vogel & Halke, Hamburg) with an accuracy of ±0.1 kg was measured.

### Sit and Reach Test

The athlete sat without shoes on the flexion board with the soles of both feet placed on it. With her knees tense, bending at the hip joint, she tried to take the ruler standing on the flexion board to the farthest point. He was made to wait for a few seconds at the last point he reached. After resting for 5-10 seconds, the second measurement was made and the best score was recorded.

### Arm Length

The athlete sat in a chair with the trunk and head upright and knees at 90 degrees. The telescopic meter was adjusted so that it was at the level of the athlete's shoulder head. The athlete positioned her arms parallel to the floor with the palms facing forward. The athlete's stroke length was measured by pushing the middle fingers of both hands with the telescopic meter.

### Vertical Jump

The athlete was asked to jump on a Microgate witty, wirelles trainig timer (China) jump mat with feet apart and upright to the highest point she could reach. The measurement was done 2 times and the best degree was recorded.

### Hand Grip Strength

To calculate the athlete's hand grip strength, a Baseline Smedley spring dynamometer (electronic-90 kg) was used with the clamping lever spacing adjusted to the second knuckle of the fingers of each athlete. The athlete made a trial by lightly squeezing the dynamometer once. At the end of the trial, they rested for 5-10

seconds. Then, in a standing position, he held the dynamometer downwards so that the arm was tense. He squeezed once with her left hand and once with her right hand with all her strength. The measured values were noted.

**Speed (20 m Sprint Test)**

Participants performed a maximum sprint of 20 meters starting from a stationary standing position. To avoid a premature start, they placed their forefoot on an additional line placed 20 cm behind the photocell. Sprint times were measured with an accuracy of 0.01 s using three 1.2 m high and 1.5 m wide photocells (Microgate, Bolzano, Italy).

**Pro Agility Test**

The pro agility test was marked with two guide funnels set up 4m 57cm to the left and right of the start/finish photocell. The athlete stood ready with her feet 50 cm behind the funnel. The choice of stance and direction was left to the participant's preference. When the start command was given, she touched the marked target with her hand, then ran towards the start, turned quickly and ran in the opposite direction of the second marked target, touched it with her hand, turned again and quickly crossed the starting line and finished the test. Before starting the test, the athletes were instructed to complete the set targets, run fast and maintain their speed until the finish line was crossed (21).

**Throwing the Ball Back**

The athlete's legs are shoulder-width apart, and her back is facing the throwing area. They were asked to throw the ball with both hands in front of them without falling backwards. After slightly bending their knees, they quickly straightened their bodies and threw the 1 kg ball backwards with both hands. Uncontrolled hits were not taken into account. Two throws were made. The best score was recorded.

**Star Balance Test (SEBT)**

The test was performed using a 2x2 m flat dry surface, a flat adhesive tape, and a meter. On the designated floor, 4 strips cut 2 m long were glued so as to form 45-degree angles between them. The athlete was shoeless for the test. The test was performed separately for the right and left feet. If the right foot was used, the test was performed clockwise; if the left foot was used, the test was performed anti-clockwise. The athlete's hands were on her waist throughout the test. The athlete reached the last point she could reach with her feet and lightly touched the strip with her toe tip. Then she returned to the starting position (hands on the waist, foot in the air, on one foot). A total of eight lines were completed in this way. Each time, the test administrator made a mark with a pencil at the maximum point that the test participant could reach in order to be able to measure it later. Participants were allowed to practice reaching in each of the eight directions six times to minimize the learning effect (12,16). Following a 5-min rest period, participants performed three trials in each of the eight directions. The best result was recorded. At the conclusion of all trials, the investigator measured the distances of each excursion with a standard tape measure.

**Dribble-Shoot Test**

The first funnel was placed at a distance of 6 meters from the starting line and the other 3 funnels were placed at equal intervals, 4.5 meters ahead of the first funnel. With the command, the athlete behind the starting line was asked to move between the funnels and reach the basket. On the first shot, the player was asked to shoot a right or left dribble-shooting from close range. If she was not successful, she was asked to take the ball and make a dribble-shooting from any point. The movement continued until a successful point was made. The time between starting and scoring was measured and recorded. This test is a method used to evaluate the dribble-shooting in basketball (27).

**Data Analysis**

The data obtained in the study were evaluated using SPSS 26.00 program. Descriptive statistics (min., max., mean and standard deviation) were given while evaluating the data. After the normality distribution was made in the analysis of the data, the relationships between the data were evaluated by Spearman correlation since the data were not parametric. The results obtained were evaluated at $p<0.05$ significance level.

## FINDINGS

**Table 1.** Descriptive Statistics of the Participants (Mean± SD)

| | N | Min. | Max. | Mean±SD |
|---|---|---|---|---|
| **Age(year)** | 40 | 9 | 10 | 9.50±0.51 |
| **Height (cm)** | 40 | 124 | 151 | 139.0±0.08 |
| **Body Weight (kg)** | 40 | 24 | 44.5 | 33.41±4.86 |
| **Sit and reach (cm)** | 40 | 10 | 29 | 20.85±5.46 |
| **Arm length (cm)** | 40 | 117 | 152 | 136.6±8.48 |
| **Jumping (cm)** | 40 | 10.0 | 34.0 | 21.36±6.70 |
| **Hand grip (right)** | 40 | 8.10 | 19.0 | 12.07±2.65 |
| **Hand grip (left)** | 40 | 7.20 | 16.10 | 11.30±1.94 |
| **Ball throwing (cm)** | 40 | 2.76 | 4.90 | 3.89±0.56 |
| **Agility (sec)** | 40 | 4.56 | 7.80 | 6.42±0.91 |
| **20-m sprint (sec)** | 40 | 4.10 | 6.30 | 5.16±0.54 |
| **Dribble-shooting (sec)** | 40 | 14.63 | 56.0 | 26.23±9.01 |
| **Star balance (cm)** | 40 | 57 | 90 | 70.95±8.63 |

Min: Minimum, Max: Maksimum, SD: Standart Deviation

The minimum, maximum, mean, and standard deviation of the physical and motor performance parameters of the participants are presented in Table 1.

**Table 2.** The Relationship Between the Physical and Performance Parameters of The Participants and Dribble-Shooting Value

| | Height (cm) | Body Weight (kg) | Arm length (cm) | Jumping (cm) | Hand grip (right) | Hand grip (left) | Ball throwing (cm) | Agility (sec) | 20-m sprint (sec) | Dribble-shooting (sec) | Star balance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Age (year)** | .237 | -.215 | **.446**** | **.711**** | .311 | .165 | .152 | **-.709**** | -.095 | -.085 | .284 |
| **Height (cm)** | | **.694**** | **.918**** | .286 | **.333*** | **.318*** | **.669**** | -.175 | **-.562**** | -.080 | **.950**** |
| **Body Weight (kg)** | | | **.594**** | -.073 | .278 | **.480**** | **.645**** | .201 | **-.417**** | .174 | **.606**** |
| **Sit and reach (cm)** | | | .134 | .043 | .216 | **.432**** | .114 | -.076 | -.285 | -.023 | -.065 |
| **Arm length (cm)** | | | | **.452**** | **.382*** | **.419**** | **.650**** | **-.400*** | **-.520**** | -.017 | **.860**** |
| **Jumping (cm)** | | | | | .233 | .063 | .185 | **-.877**** | -.268 | .197 | .292 |
| **Hand grip (right)** | | | | | | **.642**** | **.534**** | -.284 | -.203 | .088 | **.320*** |
| **Hand grip (left)** | | | | | | | **.570**** | -.117 | -.288 | .124 | .242 |
| **Ball throwing (cm)** | | | | | | | | -.252 | **-.572**** | .028 | **.566**** |
| **Agility (sec)** | | | | | | | | | .203 | -.100 | -.189 |
| **20-m sprint (sec)** | | | | | | | | | | .061 | **-.459**** |

***: p<0.05, **: p<0.01**

When the relationship between the physical and performance parameters of the participants and dribble-shooting values was examined, no statistically significant correlation was found between the parameters. There was a positive correlation between age and arm length and jump parameter, while there was a negative correlation between age and agility parameter. A positive correlation was found between height and body weight, arm length, hand grip (right-left), ball throwing, 20 m sprint and balance parameters. There was a positive correlation between body weight and arm length, hand grip (left), ball throwing and balance parameter, while a negative correlation was found in the 20 m sprint parameter. There was a positive

correlation between sit and reach and hand grip (left) parameter. Arm length was correlated with all parameters except dribble-shooting performance score. A negative correlation was found between jump height and agility. There was a positive correlation between hand grip strength-right and hand grip-left, ball throwing and balance. There was a positive correlation between hand grip left and ball throwing. A negative correlation was found between 20 m sprint and balance (Table 2).

## DISCUSSION AND CONCLUSION

In this study, the relationship between selected physical and motoric characteristics of 9-10 years old female basketball players and the dribble-shooting performance was investigated.

The dribble-shooting is the most frequently used scoring method in basketball games (34). The dribble-shooting consists of three stages. These are approach, jump and release phases. Therefore, for a successful dribble-shooting performance, the explosive power of the leg muscles is needed in the transition from the approach phase to the jump phase. Since the dribble-shooting is made by jumping on one foot, the balance must be developed, and the joints must have flexibility capacity. Because when sending the ball to the hoop, the feet and hands are expected to move in a flexible structure (31,35). Candra (4), in a study conducted on secondary school basketball players, shows that there is a strong relationship between flexibility and dribble-shooting performance (r=0.934). A significant relationship was found between speed endurance and height in female volleyball players aged 11-13 (47). However, unlike this study, no significant correlation was found between flexibility and dribble-shooting performance in our study ($p>0.05$). The reason for the difference in this study may be that the age scale of the population was older than our study.

Another important factor for basketball performance is dynamic balance. Studies have shown that basketball players with better dynamic balance tend to have better performance in various physical characteristics such as height, sitting height, body weight, lean body weight, upper body strength, lower body muscular endurance, lower body muscular strength, speed and agility (3,6,13,14,15). In our study, significant correlations were found between balance and height, body weight, arm length and upper extremity strength. Therefore, it can be said that the results of our study support the above study. There is a lack of studies investigating the relationship between dynamic balance and basketball performance. It is important for basketball players to have good dynamic balance because it can contribute to their overall stability, coordination and ability to maintain control during dynamic movements on the court.

In sports where the ball is played with the hand, the player needs to achieve optimum coordination to generate maximum speed in the throwing performance of the upper arm, and when performing the throw, the player must use all body parts from ankle to wrist when ready to throw. The ball throwing process starts with the movement of the legs and ends with the rapid movement of the torso and arms together and the ball leaving the throwing hand (25). When the relationship between ball throwing and hand grip strength as the throwing performance of the upper arm was examined, a significant positive correlation was found between ball throwing and hand grip strength (right/left) ($r=0.534$, $p<0.05$; $r=0.570$, $p<0.05$, respectively). Similar to our study, a high positive correlation was found between ball throwing and hand grip strength (right/left) ($r = .906$, $p<0.01$; $r= .874$, $p<0.01$, respectively) in handball players.

Finally, when sprint and agility performance were evaluated as the characteristics affecting performance in basketball, no significant relationship was found between sprint and jump performances ($r=-.268$, $p>0.05$). Studies investigating the relationship between sprint and lower extremity muscle strength performance have different limitations and have so far reported only weak or no relationship (1,29). Body size is very important for basketball players, especially for centers, and may be one of the reasons for the lack of a relationship between strength and single sprint performance. In the present study, height ($r=-.562$) and body weight ($r=-.417$) were negatively correlated with 20 m sprint performance.In contrast to this study, Taşkın et al. (32) found a significant positive correlation ($p<0.05$) between age and height of soccer players and 20 m sprint performance ($r=0.287$; $r=0.430$, respectively). Rios et al. (2023) found direct relationships between height, arm span, jumping performance and body mass index of 9-10 years old Portuguese female handball players (48).

Hoffman et al. (17) stated that "differences in power produced by simultaneous or sequential movement of the legs, or by active or passive upper body musculature, can have a profound effect on power expression". The relationship between linear sprint and agility performance has been examined by few studies (23,26,33).

Therefore, our discussion is limited. "Since sprint requires the development of muscle strength along with the development of the nervous system, it may not make a great progress until adolescence (9). Furthermore, the main energy sources used during sprint performance are ATP and PC. In children and young people, the capacity of these energy sources is generally lower than in adults. Another reason for this low capacity is the limited muscle strength of young people. Over time, as muscle strength increases with age, sprint performance usually improves." However, longitudinal and more comprehensive studies are needed.

Differences in these studies may be due to limitations such as sample size, number of trials performed, testing participants at only one level, time of year when data was collected, and age group. The fact that this age group is the period when muscle fibril types are just becoming apparent and the development of acceleration is not yet complete may also be the reason for the differences in the study.

## CONCULUSION

As a result, no correlation was found between selected physical and motor characteristics such as age, height, body weight, flexibility, jumping, hand grip, ball throwing, agility, 20-meter sprint, balance, and arm length, with the dribble-shooting performance of 9-10 years-old female basketball players.

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# Examining the Relationship Between Attitudes Toward E-Sports, Loneliness and Happines in High School Students

Kaan Doğan YAZAN [1A], Samet SAĞ [1B],

Mehmet YILDIRIM [1C], Fatih AKGÜL [1D]

[1] *Yozgat Bozok University, Faculty of Sports Sciences, Yozgat, TÜRKİYE.*
*Address Correspondence to Samet SAĞ: e-mail: samettsag@hotmail.com*

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A: Orcid ID: 0000-0002-6336-8190 B: Orcid ID: 0009-0000-2788-860X
C: Orcid ID: 0000-0002-9707-6540 D: Orcid ID: 0000-0003-2400-8683

**Abstract**

The main purpose of this study is to examine the relationships between high school students' attitudes towards e-sports and their loneliness and happiness levels. The research group consists of 360 high school students studying in high schools in Yozgat province in 2024. 175 (48.6%) of the participants were male and 185 (51.4%) were female. E-sports Attitude Scale, UCLA Loneliness Scale Short Form, Oxfort Happiness Scale Short Form were used as data collection tools. Descriptive statistics, Pearson correlation analysis and multiple linear regression analysis were used. According to the findings, a low level, positive and significant relationship was found between cognitive attitude, which is one of the attitudes towards e-sports, and loneliness and happiness. A medium level, positive and significant relationship was found between affective attitude and loneliness, and a low level, positive and significant relationship was found with happiness. There was a medium level, positive and significant relationship between behavioral attitude and loneliness and a low level, positive and significant relationship with happiness. It was concluded that affective and behavioral attitudes affect loneliness by 12%. As a result, it was observed that as high school students' attitudes towards e-sports increased, their feeling of loneliness increased and their happiness levels increased at a low level. Especially affective and behavioral attitudes were found to have an effect on loneliness by 12%. These findings suggest that e-sports may increase social isolation for some students, but it provides a low level increase in happiness levels. The findings examine the relationship between attitudes toward e-sports and psychosocial factors such as loneliness and happiness, providing significant data on high school students' experiences in this area. Additionally, it offers a new perspective to the literature on understanding the effects of e-sports on individuals' social and emotional states.

**Keywords:** Attitude, E-sport, Loneliness, Happines, High School Students.

**Özet**

**Lise Öğrencilerinde E-Spora Yönelik Tutumlar, Yalnızlık ve Mutluluk Arasındaki İlişkinin İncelenmesi**

Bu çalışmanın temel amacı lise öğrencilerinin e-spora yönelik tutumları ile yalnızlık ve mutluluk düzeyleri arasındaki ilişkiyi incelemektir. Araştırma grubunu 2024 yılında Yozgat ilindeki resmi ortaöğretim kurumlarında öğrenim gören 360 lise öğrencisi oluşturmuştur. Katılımcıların 175'i (%48,6) erkek ve 185'i (%51,4)

kadındır. Veri toplama araçları olarak, E-Spor Tutum Ölçeği, UCLA Yalnızlık Ölçeği Kısa Formu ve Oxford Mutluluk Ölçeği Kısa Formu kullanılmıştır. Verilerin analizinde tanımlayıcı istatistikler, Pearson korelasyon analizi ve çoklu doğrusal regresyon analizi kullanılmıştır. Elde edilen bulgulara göre e-spora yönelik tutumlardan biri olan bilişsel tutum ile yalnızlık ve mutluluk arasında düşük düzeyde, pozitif ve anlamlı bir ilişki bulunmuştur. Duygusal tutum ile yalnızlık arasında pozitif yönde, orta düzeyde ve anlamlı bir ilişki, mutluluk ile ise pozitif yönde, düşük düzeyde ve anlamlı bir ilişki bulunmuştur. Davranışsal tutum ile yalnızlık arasında pozitif yönde, orta düzeyde ve anlamlı bir ilişki, mutluluk ile ise pozitif yönde, düşük düzeyde ve anlamlı bir ilişki bulunmuştur. Duygusal ve davranışsal tutumların yalnızlığı %12 oranında etkilediği sonucuna varılmıştır. Sonuç olarak lise öğrencilerinin e-spora yönelik tutumları arttıkça yalnızlık duygularının arttığı ve mutluluk düzeylerinin düşük düzeyde arttığı tespit edilmiştir. Özellikle duygusal ve davranışsal tutumların yalnızlık üzerinde %12 oranında etkili olduğu bulunmuştur. Bu bulgular, e-sporun bazı öğrenciler için sosyal izolasyonu artırabildiğini ancak mutluluk düzeylerinde düşük düzeyde bir artış sağladığını düşündürmektedir. Bulgular, e-spora yönelik tutumlar ile yalnızlık ve mutluluk gibi psikososyal faktörler arasındaki ilişkiyi inceleyerek, lise öğrencilerinin bu alandaki deneyimlerine ilişkin önemli veriler sunmaktadır. Ayrıca, e-sporun bireylerin sosyal ve duygusal durumları üzerindeki etkilerini anlamaya yönelik literatüre yeni bir bakış açısı kazandırmaktadır.

**Anahtar Kelimeler:** Tutum, E-Spor, Yalnızlık, Mutluluk, Lise Öğrencileri.

## INTRODUCTION

Rapid developments in the field of technology in today's world have caused radical changes in the field of sports as in every field. One of the most important of these radical changes is thought to be the replacement of traditional games with games played in virtual environments. As a matter of fact, games played in physical environments such as streets, neighborhoods or sports fields in the past have turned into games played in virtual environments through computers, tablets or smartphones in today's world. The fact that computers, tablets, and smartphones are becoming more technologically useful every day, along with the widespread use of the internet, has led to an increasing interest in virtual games. Games played in virtual environments have paved the way for changes in the field of sports and created the concept known as e-sports in today's world.

E-sports include games that are played in online environments and can be played both individually and as a team. According to Wagner (29), e-sports is defined as a sporting activity with its own rules, played in virtual environments and involving a sense of winning and competition. Newzoo (19), on the other hand, defines it as individual or team competitions organized in a competitive environment for a specific purpose. As mentioned earlier, the rapid developments in the field of technology have increased the number of people interested in e-sports day by day and paved the way for e-sports to become a very popular sports field in today's world. Reports and studies on e-sports also support this idea.

According to the report of Statista (25), the number of e-sports viewers, which was around 435 million in 2020, reached 489 million in 2021, 532 million in 2022, and this figure is expected to reach 640 million in 2025. When we look at the report of the same institution for 2022, it is estimated that the e-sports revenue, which was 996 million dollars in 2020, was 1.13 billion dollars in 2021, 1.38 billion dollars in 2022 and will reach 1.86 billion dollars in 2025 (26). According to the report prepared by Newzoo (20), the audience of 532 million people in 2022 is expected to be over 640 million in 2025.

Looking at the reports prepared on e-sports data, it is possible to say that e-sports will be preferred by many more people in the coming years, and that both the number of players, the number of viewers and the time allocated to e-sports by individuals will increase every year. Especially as a result of the increase in the time allocated to e-sports, it is possible to see some psychological and sociological problems in individuals. Two of the most important of these psychological and sociological problems are thought to be loneliness and happiness. As a matter of fact, it can be said that individuals who spend too much time on e-sports will move away from their social circles, weaken their friendships and lead an asocial life. As a result, it will be inevitable for them to face the feeling of loneliness. It is estimated that the resulting sense of loneliness will lead individuals to a more unhappy life. For this reason, it is thought that there is a relationship between attitude towards e-sports, loneliness and happiness.

Therefore, the aim of this study is to examine the relationship between attitude towards e-sports, loneliness and happiness in high school students. Within the framework of this main purpose, the following question was sought to be answered.

1.What is the relationship between attitude towards e-sports, loneliness and happiness in high school students?

## METHOD

### Research Model

This research is based on the relational survey model. The relational survey model is a research approach that aims to determine the relationships between two or more variables. This model aims to reveal the relationships between variables as they are without any intervention (5).

### Population-Sample (Research Group)

The research group of this study consists of 360 high school students studying in various types of high schools in Yozgat province in 2024. 175 (48.6%) of the participants were male and 185 (51.4%) were female. In sample selection, the convenience sampling method was used. Convenience sampling is a sampling method in which the researcher selects the easiest and most appropriate participants from the target population (8). This method was preferred because it saves time and cost.

### Data Collection

This research was conducted in accordance with the principles of the Helsinki Declaration, and ethical approval was obtained from the Ethics Committee of Yozgat Bozok University with the decision dated 28.06.2024 and numbered 15/31. The data collection process of the study was carried out entirely online, considering the technological possibilities of today. In this context, participants were able to easily access the online data collection form created via the Google Forms platform using their personal computers or smartphones. The time required for participants to complete the scales ranged between 5 to 10 minutes on average. The primary reasons for choosing the online data collection method in the study include significant advantages such as facilitating the data processing process, enabling rapid access to a wide participant pool, minimizing the risk of data loss, ensuring a high rate of voluntary participation, and particularly providing the opportunity to conduct research on sensitive and confidential topics. These advantages make the online data collection method a prominent choice in modern research processes (Kılınç ve Fırat, 2017).

### Data Collection Tools

#### *E-Sports Attitude Scale*

The scale was developed by Savaş and Turan (23) to measure participants' attitudes towards e-sports. The scale consists of 18 items and 3 sub-dimensions (cognitive, affective and behavioral). The evaluation of the items of the scale is made with a 5-point Likert-type rating (1=Not at all; 5=Totally agree). Cognitive sub-dimension: It refers to the knowledge and thoughts that an individual has about a subject. In the context of e-sports, the individual's knowledge about e-sports and having a certain opinion on this subject are evaluated under this dimension. Example item: I have sufficient knowledge about e-sports. Affective sub-dimension: It covers an individual's emotional reactions and attitudes towards a subject. In the e-sports example, emotional responses such as a person's interest in e-sports, excitement or satisfaction towards e-sports belong to this dimension. Example item: Winning in e-sports excites me. Behavioral sub-dimension: It includes an individual's behaviors and actions towards a specific topic or situation. In the context of e-sports, activities such as participating in e-sports events, producing e-sports-related content, or watching e-sports matches reflect the behavioral dimension. Example item: I participate in e-sports every chance I get. The lowest score that participants can get from each sub-dimension of the E-sports Attitude Scale (cognitive, affective, and behavioral) is 6, and the highest score is 30. The Cronbach Alpha value in the original form of the scale was .92.

***UCLA Loneliness Scale Short Form***

In order to determine the loneliness levels of the participants, Russel, Peplau and Ferguson (22) first developed a 20-item scale. Then, Hays and DiMatteo (12) created an 8-item short form of the 20-item scale. The short form of the scale was adapted into Turkish by Doğan, Çötok, and Tekin (7). The scale consists of a total of 8 items and a single sub-dimension. The items of the scale are evaluated with a 4-point Likert-type rating (1=Never; 5=Always). Sample item: I have no friends. The lowest score that participants can get from the UCLA Loneliness Scale Short Form is 8 and the highest score is 32. High scores on the scale are interpreted as a high level of loneliness. Cronbach's Alpha value in the original form of the scale was found to be .72.

***Oxfort Happiness Scale Short Form***

It was developed by Hills and Argyle (13) to assess the happiness levels of the participants. The scale was adapted into Turkish by Doğan and Akıncı-Çötok (6). The scale consists of a total of 7 items and one sub-dimension. The items of the scale are evaluated on a 5-point Likert-type scale (1 - Strongly Disagree, 5 - Strongly Agree). Sample item: I am quite satisfied with everything in my life. The lowest score that can be obtained from the scale is 7 and the highest score is 35. Higher scores on the scale indicate higher happiness level scores. The Cronbach Alpha value in the original form of the scale was .74.

**Data Analysis**

Data analysis was performed using the IBM SPSS Statistics 24 (IBM SPSS Corp., Armonk, NY, USA) package program. After checking for missing or incorrect data entry, the kurtosis and skewness values of the data included in the analysis were examined. Skewness and kurtosis values between -1.5 and +1.5 are considered as normal distribution (27). Within the scope of this research, it was concluded that kurtosis values were between -,385-,197 and skewness values were between -,016-,209. In addition, Durbin Watson test was used to check whether there is autocorrelation among the variables. The Durbin Watson value is expected to be between 1.5 and 2.5 (15). According to the analysis, it is concluded that there is no autocorrelation between the variables. Cook distance value was used for extreme value control, which is one of the assumptions of regression analysis. In the study, Cook distance values ranged between .087 and .000. As stated by Cook and Weisberg (4), a value less than 1 indicates that there is no outlier in the data set. In addition, a correlation greater than 0.90 between independent variables in regression analysis is considered as multicollinearity. Multicollinearity is an undesirable situation in regression analysis (21). In the analyses conducted within the scope of this research, the highest correlation coefficient between independent variables was found to be 0.67. This result shows that there is no multicollinearity problem in the data set. The statistical significance level was set as 0.05 in the analyses. Descriptive statistics, Pearson correlation analysis and multiple linear regression analysis with enter method were used in the analysis of the data. For the "r" coefficient obtained in Pearson correlation analysis; 0.1-0.3=Low, 0.3-0.5=Medium, 0.5-1=High correlation (3).

## FINDINGS

This section includes the description of the data obtained and the analysis of the relationships between students' e-sports attitudes, loneliness and happiness levels.

**Table 1.** Descriptive Statistics of Variables

| | Minimum | Maksimum | Mean | SD | Cronbach Alpha |
|---|---|---|---|---|---|
| **Cognitive** | 9 | 30 | 17.99 | 4.235 | .75 |
| **Affective** | 9 | 26 | 17.67 | 3.853 | .77 |
| **Behavioral** | 6 | 30 | 17.69 | 4.407 | .81 |
| **Loneliness** | 8 | 34 | 19.42 | 5.539 | .80 |
| **Happiness** | 10 | 32 | 21.38 | 4.101 | .70 |

Table 1 presents the minimum, maximum, mean, standard deviation, and Cronbach Alpha values for the participants' attitudes towards e-sports, loneliness, and happiness scores. Based on these values, the mean scores for the sub-dimensions of attitudes towards e-sports (cognitive, affective, and behavioral), as

well as loneliness and happiness, are observed to be *slightly above the moderate level* when considering the score ranges of the respective scales.

**Table 2.** Correlation Analysis of the Relationship Between Variables

| | Loneliness | Happiness |
|---|---|---|
| **Cognitive** | .242* | .176* |
| **Affective** | .344* | .177* |
| **Behavioral** | .312* | .094* |

The positive correlational relationships between the variables are shown in Table 2. As a result of the analyses, a low level, positive and significant relationship was found between cognitive attitude, which is one of the attitudes towards e-sports, and loneliness (r= .242; p<0.05), while a low level, positive and significant relationship was also found between cognitive attitude and happiness (r= .176; p<0.05). A medium level, positive and significant relationship was found between affective attitude and loneliness (r= .344; p<0.05), whereas a low level, positive and significant relationship was found between affective attitude and happiness (r= .177; p<0.05). Similarly, a medium level, positive and significant relationship was found between behavioral attitude and loneliness (r= .312; p<0.05), while a low level, positive and significant relationship was found between behavioral attitude and happiness (r= .094; p<0.05).

**Table 3.** Regression Analysis of Students' Attitudes Towards E-Sports Predicting Loneliness and Happiness Variables

| Dependent Variable | Independent Variable | B | SH | Beta | t | p | Corrected R2 |
|---|---|---|---|---|---|---|---|
| **Loneliness** | Cognitive | -.017 | .094 | -.013 | -.184 | .854 | .12 |
| | Affective | .273 | .100 | .190 | 2.741 | .006 | |
| | Behavioral | .263 | .084 | .209 | 3.145 | .002 | |
| **Happiness** | Cognitive | .126 | .073 | .130 | 1.731 | .084 | .03 |
| | Affective | .135 | .077 | .127 | 1.752 | .081 | |
| | Behavioral | -.057 | .065 | -.061 | -.883 | .378 | |

In Table 3, regression analysis results regarding the prediction of students' attitudes towards e-sports, loneliness and happiness levels are presented. According to the findings, cognitive attitude, which is one of the attitudes towards e-sports, does not explain loneliness significantly F(3.356)=11.378, p>0.05. Affective attitude F(3.356)=36.448, p<0.05 and behavioral F(3.356)=38.654, p<0.05 explained loneliness by 12%. It is seen that attitudes towards e-sports do not significantly explain happiness F(3.356)=4.876, p>0.05.

## DISCUSSION AND CONCLUSION

In this study, the effects of high school students' attitudes towards e-sports (cognitive, affective and behavioral) on their loneliness and happiness levels were examined. The results obtained are both consistent with the findings in the literature and differ in some respects. In this section, the findings will be discussed in more detail and compared with current research in the literature.

First of all, when the effect of cognitive attitude on loneliness and happiness was examined, a low level, positive and significant relationship was found. This finding indicates that the cognitive aspect of e-sports increases students' feelings of loneliness at a low level, while increasing their happiness levels at a low level. This can be explained by the fact that the cognitive aspect of e-sports focuses more on knowledge and strategy development and emphasizes individual performance rather than social interaction (11). Moreover, the limited effect of cognitive attitude on loneliness and happiness may also be related to the fact that e-sports are generally based on individual achievement and competition (24). These findings suggest that the cognitive aspect of e-sports has a limited impact on social connections and that focusing on individual achievement may increase feelings of loneliness, but does not lead to a significant increase in happiness levels.

The effect of affective attitude on loneliness was found to be medium level, positive and significant. This finding suggests that the affective aspect of e-sports may moderately increase students' feelings of loneliness. While e-sports communities can create strong emotional bonds and a sense of belonging among players (9), it should not be ignored that these bonds can also increase social isolation in some cases. In this context, the potential of e-sports to provide social support may increase rather than decrease feelings of loneliness for some students (16). However, the effect of affective attitude on happiness was found to be low,

positive and significant. This result suggests that the affective aspect of e-sports increases the level of happiness at a low level, but is not effective enough in general. This suggests that the affective aspect of e-sports is more effective in increasing the feeling of loneliness, but it is limited in increasing the overall level of happiness. These findings call for a deeper examination of the complex effects of e-sports on social interactions and emotional bonds (2).

The effect of behavioral attitude on loneliness was also found to be medium level, positive and significant. This finding suggests that behavioral participation in e-sports may moderately increase students' feelings of loneliness. Participation in e-sports activities can reduce the feeling of loneliness by increasing students' social interactions, but in some cases it can also increase social isolation (14). While the fact that e-sports is seen as a social activity and enables the establishment of social ties between players may be effective in reducing the feeling of loneliness, the fact that these ties replace face-to-face interactions in some cases may increase the feeling of loneliness (28). However, the effect of behavioral attitude on happiness was found to be low, positive and significant. This result shows that behavioral participation in e-sports increases students' overall happiness level at a low level, but it is not effective enough. This suggests that despite the potential of e-sports to provide social interaction, it remains limited in increasing individuals' overall happiness levels (30).

According to the regression analysis results, cognitive attitude does not have a significant effect on loneliness. This shows that students' knowledge and thoughts about e-sports do not directly affect their feelings of loneliness. However, affective and behavioral attitudes had a significant effect on loneliness and explained 12% of loneliness. This finding reveals that students' emotional ties to e-sports and their level of participation in e-sports activities are important in increasing their feelings of loneliness. The effect of affective attitude on loneliness can be interpreted as the positive emotions that students feel towards e-sports may increase social isolation and therefore increase their feelings of loneliness. Since e-sports activities are usually carried out individually and concentrated online, it may lead to a decrease in face-to-face social interactions and thus increase feelings of loneliness (18). Similarly, the effect of behavioral attitude on loneliness suggests that students' active participation in e-sports activities may increase their feelings of loneliness by reducing opportunities for physical social interaction (17). The findings regarding happiness level show that attitudes towards e-sports do not explain happiness in a significant way. This result reveals that students' cognitive, affective or behavioral attitudes towards e-sports do not have a significant effect on their overall happiness levels. To further examine the impact of e-sports on individuals' overall life satisfaction and happiness levels, other variables and moderators may need to be considered (1).

In conclusion, this study shows that the emotional and behavioral aspects of e-sports are effective in increasing high school students' feelings of loneliness. However, the cognitive aspect of e-sports has no significant effect on loneliness and happiness. These findings suggest that e-sports can play an important role in increasing students' feelings of loneliness in social and emotional contexts, but it is limited in increasing the overall level of happiness.

## SUGGESTIONS

In line with the findings of this study, various suggestions can be made to better understand the effects of high school students' attitudes towards e-sports on their loneliness and happiness levels and to minimize the negative effects. First of all, e-sports clubs and activities can be organized in schools to encourage students to increase their social interactions. In this way, e-sports can be transformed from an individual activity into a social activity. In addition, guidance services and awareness-raising programs can be organized for students to engage in e-sports in a balanced way. Students can be encouraged to adopt a balanced lifestyle by suggesting them to engage in different social and physical activities in addition to e-sports. Finally, parents and teachers can closely monitor students' e-sports activities and provide support and guidance when necessary. Such approaches can help students increase their happiness levels in a healthier way while reducing feelings of loneliness.

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# Efficiency of Coach Training in Turkey and Its Assessment Specific to Shooting Sport

Mehmet ABİŞ [1A], Mehmet Yavuz TAŞKIRAN [2B]

[1] *Istanbul Gedik University, Faculty of Health Sciences, Istanbul, Türkiye.*
*Address Correspondence to Mehmet ABİŞ: e-mail: mehmetabis@hotmailcom*


*Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*
**This study was summarized from the master's thesis. It was presented as an oral presentation at the 3rd International Studies Congress (IGSCONG) between 14-17 June 2023.*

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A: Orcid ID: 0000-0002-7394-9714 B: Orcid ID: 0000-0003-2135-4185

**Abstract**

The primary aim of this study is to assess the efficiency of the coach training system in Turkey, with a specific focus on shooting coaches, and to gather the views of working, retired and volunteer coaches working in this field regarding this training. The research follows a correlational survey model and targets shooting coaches, encompassing both air and firearms disciplines, who possess coaching certificates and were actively engaged in coaching roles in Turkey during the year 2023, whether voluntarily or on a tenured or non-tenured basis. The research sample comprises 307 coaches, selected through simple random sampling from the larger population. Data for the study were collected through questionnaires. To this end, the researcher developed a questionnaire consisting of two parts, drawing on the existing literature and expert opinions. Statistical methods included descriptive statistics, Pearson correlation analysis, and regression analysis (using Hayes' PROCESS model) to evaluate relationships and potential moderating effects between variables, facilitated by the SPSS 25 program, were employed for data analysis. Results indicate that the overall sentiments of coaches in Turkey regarding the adequacy of coaching education in terms of content, duration, and facilities, as well as its impact on athletes' skills and performance, and the coaches' personal development through education, tended to be negative. Conversely, there were very strong ($0.90<r$) positive and statistically significant ($p<0.05$) correlations between participants' levels of agreement in their views on the adequacy and effectiveness of coach training and its benefit to the instructor. Furthermore, it was established that coaches' views on the benefit of coach training to the instructor did not exert a moderating influence on the relationship between their views on the adequacy and effectiveness of training ($p>0.05$).

**Keywords:** Sports Management, Coaching, Training, Shooting.

**Özet**

**Türkiye'de Antrenör Eğitiminin Yeterliliği ve Atıcılık Sporuna Özgü Değerlendirilmesi**

Bu araştırmanın temel amacı, atıcılık antrenörleri üzerinde odaklanarak Türkiye'deki antrenör eğitim sisteminin yeterliliğini değerlendirmek ve bu alanda görev yapan, emekli olan ve gönüllü antrenörlerin bu eğitime yönelik görüşlerini toplamaktır. Araştırma, ilişkisel tarama modeli çerçevesinde yürütülmüştür. Araştırmanın evrenini, bir antrenörlük belgesine sahip olarak gönüllü, kadrolu veya ücretli olarak 2023 yılı içerisinde Türkiye'de

antrenörlük yapan atıcılık (havalı ve ateşli silahlar branşı) antrenörleri oluşturmuştur. Araştırmanın örneklemi ise evren içerisinden basit rastgele örnekleme yoluyla ulaşılan toplam 307 antrenörden oluşmaktadır. Araştırmanın verileri, anket yöntemi ile toplanmıştır. Bunun için araştırmacı tarafından, literatüre ve uzman görüşlerine başvurularak iki bölümden oluşan bir anket hazırlanmıştır. Araştırmada veri analizi için nicel yöntemlere başvurulmuştur. Bu bağlamda, SPSS 25 programı kullanılarak verilerin ayrıntılı analizi gerçekleştirilmiştir. Araştırma sonucunda ilk olarak Türkiye'deki antrenörlerin, antrenörlük eğitiminin içerik, süre ve imkanlar bakımından yeterliği; antrenörlük eğitiminin sporcunun becerileri ve performansı üzerindeki etkisi ve verilen eğitimin kendilerine sağladığı katkı hakkındaki görüşlerinin genel olarak olumsuz özellikler gösterdiği bulgusuna ulaşılmıştır. Öte yandan, katılımcıların antrenörlük eğitiminin yeterliği, etkinliği ve eğitim verene yaptığı katkı ile ilgili görüşlere katılım düzeylerinin tamamı arasında çok güçlü düzeyde (0,90<r) pozitif ve anlamlı (p<0,05) ilişkiler bulunmuştur. Ayrıca antrenörlük eğitiminin eğitim verene yaptığı katkının, antrenörlerin eğitimin yeterliği ve etkinliği ile ilgili düşünceleri arasındaki ilişkide moderatör (düzenleyici) etkiye sahip olmadığı sonucuna ulaşılmıştır (p>0,05).

**Anahtar Kelimeler:** Spor Yönetimi, Antrenörlük, Eğitim, Atıcılık.

## INTRODUCTION

Sport is a discipline that contributes to individuals' mental, physical, social and emotional development. This occurs through the improvement of knowledge, skills and leadership abilities, and also allows individuals to make use of their free time and relieve stress by getting away from everyday problems (10). Athletes represent a specific demographic segment and symbolize a remarkable community in terms of their daily routines and social status. However, activities such as challenging training programs and long camp periods can negatively affect their socio-cultural lives, families, and friendships outside the team, and even their work or school lives. Moreover, athletes are individuals who have to compete against thousands of people they do not know and who are either admired or harshly criticized by these people (8). Considering all these factors, athletes must possess certain characteristics such as adaptation, motivation, communication, and leadership (11).

A critical factor in achieving success is that in team sports, different individuals coordinate and work in harmony, create a team spirit and focus on a common goal. This process takes place through the dedicated efforts of the coach, whose ability to manage the team, maintain the team's performance with interventions at the right time and place, and act by considering future and expected events with his/her own skills and unique working philosophy, reveals his/her command of the team. Individual sports, on the other hand, require more agility and athleticism, and in these sports, personal responsibility is more evident. This situation tends to create more stress and anxiety for athletes. In this context, unlike team sports, the coach has to prepare and plan individual training programs by understanding all the characteristics of athletes (13).

Individuals' ability to acquire certain characteristics is largely influenced by sports instructors, and the first group that comes to mind among sports instructors is usually coaches. Coaches are regarded as practitioners of continuous and collective activities that aim in the initial stage to bring out and develop the individual's characteristic features and to strengthen their natural dynamism. In the second stage, they are defined as people who facilitate group members to jointly accomplish tasks that they cannot achieve individually, and who assume management responsibility. As can be understood from these definitions, coaches can be considered as the cornerstone of sports. Therefore, increasing the opportunities offered to coaches and giving them a good education will directly affect the performance of the individuals they are to train. This will be made possible with a well-prepared and implemented coach training program (10).

Furthermore, a coach is a person who can effectively and efficiently use the technical and tactical knowledge required for the athlete to be successful in his/her discipline, and who can develop different strategies and solutions for the problems he/she encounters and implement them successfully on the field. In this regard, the coach focuses on the skills of influencing, effective communication and correct guidance in coaching practice, which guides athletes correctly and is considered a leadership art (6).

The term "coach" originally referred to a superior type of carriage first built in the 15th century in the small town of Kocs in Hungary and is still used to describe a type of transport today. The term was first used in the sense of "trainer" in the field of education in 18th century England, when it referred to a tutor who "carried" students through their exams. The word was first used for athletic coaches in the 1880s. A coach is a person who uses all their capacity for a single purpose, whether it be in team or individual sports. This involves aiming for the athlete to maximize their performance and to reach peak levels both mentally and physically. The coach's probability of success depends on how much motivation, empathy and sports knowledge he or she has. As well as knowledge of the techniques and tactics related to the sports discipline, the coach's knowledge of psychological and physiological needs and his/her efforts focusing on deficient areas increase the success rate. Similarly, the coach's understanding of athletes' individual needs, feelings, thoughts and wishes, and acting by considering their psychological states enable the coach to play a critical role in individual and team sports by increasing athletes' self-confidence and motivation (7).

It has been observed that countries that have achieved sporting success around the world are rich in terms of the courses they offer and the materials and methods they use in their sports departments, and that they especially attach great importance to coach training (9). However, it is known that the current coaching and coach training in Turkey has been criticized due to the disjointedness it contains, and that serious concerns have arisen in this regard. Lack of standardization, lack of appropriate examination mechanisms, and exemptions in licensing regulations constitute the main concerns in the field of coach training (14). These problems lead to a weaker coach training and to a decrease in the quality of sporting activities across the country, since coaches play a critical role in the planning, presentation and quality of these activities (5). Considering Turkey's high overall participation in sports and its high targets for international success, it is very important that the coaching system operates correctly and effectively in the country (4).

The main aim of this study is to assess the efficiency of the coach training system in Turkey by focusing on shooting coaches and to gather the views of working, retired and volunteer coaches in this field regarding this training. By identifying the deficiencies in the field of coach training in Turkey and benefiting from the coaches' knowledge and experience, recommendations are made for providing a better-quality training.

The importance of this study lies in its potential to address critical gaps in the existing coaching system and to enhance the quality of training programs for coaches. By identifying deficiencies and offering practical recommendations, this study aims to contribute to the development of a more standardized, effective, and high-quality coaching framework that aligns with Turkey's aspirations for international sporting success.

## METHOD

### Research model

This study was conducted according to a correlational survey model. Our study is based on this conceptual framework, and the general structure of the model is presented in Figure 1.

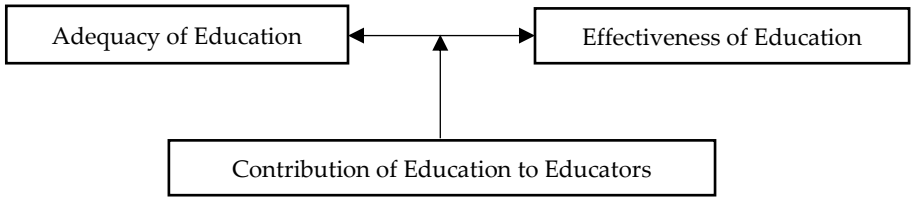


**Figure 1.** Research Model

### Population and sample

The population of the study consists of shooting (air guns and firearms disciplines) coaches who have a coaching certificate and worked as volunteer, tenured or non-tenured staff in Turkey in 2023. According to the official information obtained from the Turkish Shooting and Hunting Federation, as of June 12, 2023, there were a total of 892 shooting coaches in Turkey, 634 at level 1, 180 at level 2, 75 at level 3 and 3 at level 5. The sample of the study consists of a total of 307 coaches selected from the population through simple random sampling. The researcher chose the participants randomly using online and face-to-face methods. For

determining the sample size, the formula $n = \frac{Nt^2pq}{d^2(N-1)+t^2pq}$, which is one of the frequently used calculations (12), was used. When this calculation was performed for our study with a 95% confidence interval and 5% sampling error, the result was 269 people. In our study, this number was exceeded, and a total of 307 people were enrolled.

The participants were predominantly male (59.9%), with a significant proportion under the age of 40 (61.9%). Regarding educational levels, the majority held a bachelor's degree (61.9%), followed by high school graduates (16.6%), master's degree holders (17.6%), and a smaller number with a doctorate (3.9%).

In terms of marital status, 54.4% of the participants were single, 38.4% were married, and 7.2% were divorced. Professionally, most participants (75.2%) were volunteer coaches, while the remaining 24.8% were either tenured or non-tenured staff. Coaching certificates were predominantly obtained through federation courses (77.2%), with a smaller percentage acquired via university programs (22.8%).

The majority of participants had more than five years of coaching experience (65.5%), and 18.6% had served as national team coaches. Additionally, 65.5% of participants were shooting athletes themselves, while 34.5% were not.

**Data collection tools**

The study data were collected by the researcher himself, via online and face-to-face survey methods, in June, July and August 2023. For this purpose, a questionnaire consisting of two parts was prepared by the researcher, by making assessments based on the literature and expert opinions. The first part of the questionnaire included a total of 9 multiple-choice questions aimed at identifying the participants' demographic and professional characteristics. In the second part of the questionnaire, there were a total of 35 items of the 5-point Likert type, aimed at determining the participants' assessments of the adequacy of coach training in Turkey and specific to shooting sports. Participants were asked to respond to these items on a scale ranging from "strongly disagree" to "strongly agree". The items in the second part of the questionnaire were also grouped into four groups (subscales) based on expert opinions. These were named adequacy of training (12 items: items 1, 2, 3, 4, 8, 12, 19, 21, 22, 23, 27 and 35), effectiveness of training (11 items: items 5, 6, 7, 9, 11, 14, 15, 16, 25, 28 and 31), benefit to the instructor (9 items: items 10, 17, 18, 26, 29, 30, 32, 33 and 34), and importance and success of training (3 items: 13, 20 and 24). In the study, the mean scores of the first three of these subscales were also calculated, and these scores were used in different analyses. An increase in the mean score obtained from these subscales indicates that the participants' positive views about the adequacy and effectiveness of coach training and its benefit to the instructor have increased. However, during the scoring phase, reverse scoring is required for a total of 6 negatively worded items (items 4, 19, 25, 27, 28 and 31).

**Data analysis**

Quantitative methods were used for data analysis in the study. In this context, detailed analysis of the data was carried out using the SPSS 25 program. The correlations between the adequacy and effectiveness of coach training and its benefit to the instructor were found using Pearson correlation analysis. To determine the moderating role of the benefit to the instructor in the relationship between the adequacy and effectiveness of coach training, regression analysis was conducted using Hayes' (3) PROCESS approach and in accordance with the Baron and Kenny (1) model. All analyses were evaluated within a 95% confidence interval and were concluded according to a $p<0.05$ significance level.

It was decided whether normal distribution, which is a prerequisite for using parametric analyses, was present or not by evaluating the skewness and kurtosis coefficients of the subscale scores used in parametric analyses (Table 1).

**Table 1.** Skewness and kurtosis coefficients of subscale scores

| Score | n | Skewness | | Kurtosis | |
|---|---|---|---|---|---|
| | | Statistic | Std. Error | Statistic | Std. Error |
| **Adequacy of Training** | 307 | 0.902 | 0.139 | -0.167 | 0.277 |
| **Effectiveness of Training** | 307 | 0.332 | 0.139 | -0.539 | 0.277 |
| **Benefit to the Instructor** | 307 | 0.451 | 0.139 | -0.811 | 0.277 |

As can be seen in Table 1, the skewness and kurtosis values of all examined scores are within the range of ±1.00. According to Büyüköztürk (2), the fact that these values are within the range of ±1.00 shows that normal distribution is achieved. Therefore, it was decided that normal distribution was achieved.

## FINDINGS

### Descriptive information about the participants

The study was conducted with the participation of a total of 307 shooting coaches (Table 2).

**Table 2.** Distribution of athletes based on demographic and professional characteristics

| Variable | n | % | Variable | n | % |
|---|---|---|---|---|---|
| Gender | | | Coaching Status | | |
| Male | 184 | 59.9 | Voluntary | 231 | 75.2 |
| Female | 123 | 40.1 | Tenured/non-tenured | 76 | 24.8 |
| Age | | | Source of Coaching Certificate | | |
| Under 40 | 190 | 61.9 | Federation course | 237 | 77.2 |
| 40 or over | 117 | 38.1 | University | 70 | 22.8 |
| Education Level | | | Length of Coaching Experience | | |
| High school | 51 | 16.6 | Less than 5 years | 106 | 34.5 |
| Bachelor's | 190 | 61.9 | 5 years or more | 201 | 65.5 |
| Master's | 54 | 17.6 | Serving as a National Team Coach | | |
| Doctorate | 12 | 3.9 | Yes | 57 | 18.6 |
| Marital Status | | | No | 250 | 81.4 |
| Single | 167 | 54.4 | Is Participant a Shooting Athlete? | | |
| Married | 118 | 38.4 | Yes | 201 | 65.5 |
| Divorced | 22 | 7.2 | No | 106 | 34.5 |
| | | | **Total** | **307** | **100** |

When the distribution of the participants according to their demographic characteristics is examined, it can be said that coaches with different characteristics were enrolled in the study, but that the participants were mostly single men under the age of 40 with bachelor's degrees. Moreover, when the distribution of the participants according to their professional characteristics is evaluated, there is still a lot of diversity, as in the demographic characteristics, but it can be said that most of the participants were volunteer individuals who had been coaching for 5 years or more, with a document obtained through the federation course. In addition, the majority of the participants were shooting athletes and were not national team coaches.

### Participants' views on coach training

Within the scope of the findings regarding the participants' views on coach training, the descriptive statistics determined in the subscale scores for adequacy of training, effectiveness of training and benefit to the instructor were evaluated (Table 3).

**Table 3.** Descriptive findings for evaluation scores

| Score | n | Min | Max | $\bar{x}$ | SD |
|---|---|---|---|---|---|
| **Adequacy of Training** | 307 | 1.33 | 4.00 | 2.42 | 0.73 |
| **Effectiveness of Training** | 307 | 1.00 | 3.91 | 2.30 | 0.79 |
| **Benefit to the Instructor** | 307 | 1.00 | 4.22 | 2.26 | 0.89 |

Accordingly, the participants' scores indicating the adequacy of training ranged between 1.33 and 4.00 and the mean score was found to be 2.42±0.73. When evaluated according to the minimum and maximum scores (1 and 5 points) that can be obtained from this subscale, the mean score of the participants corresponds to 35.5%. Therefore, it can be said that the participants' views on the adequacy of coach training were at a low level. The participants' scores indicating the effectiveness of training ranged between 1.00 and 3.91, and the mean score was determined as 2.30±0.79. When compared to the lowest (1 point) and highest (5 points) scores that can be obtained from this subscale, the participants' mean score was determined as 32.5%. Therefore, it can be said that the participants' views on the effectiveness of coach training were again at a low level. Finally, the participants' scores indicating the benefit of training to the instructor ranged between 1.00 and 4.22 and the mean score was found to be 2.26±0.89. When evaluated according to the minimum and maximum scores

(1 and 5 points) that can be obtained from this subscale, the participants' mean score was calculated as 31.5%. Therefore, it can be said that the participants' opinions about the benefit of coach training to the instructor were again at a low level.

Correlations between the adequacy and effectiveness of coach training and its benefit to the instructor

Pearson correlation analysis was performed to determine whether there was a significant relationship between the levels of agreement in the views of coaches in Turkey regarding the adequacy and effectiveness of coach training and its benefit to the instructor, and the findings are presented in Table 4.

**Table 4.** Correlations between the adequacy and effectiveness of coach training and its benefit to the instructor

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| **(1) Adequacy of Training** | Pearson r | 1 | 0.909 | 0.904 |
| | p | | **0.000*** | **0.000*** |
| **(2) Effectiveness of Training** | Pearson r | | 1 | 0.952 |
| | p | | | **0.000*** |
| **(3) Benefit to the Instructor** | Pearson r | | | 1 |
| | p | | | |

*** p<0.05.**

Accordingly, very strong (0.90<r) positive and significant (p<0.05) correlations were found between the participants' levels of agreement in their views regarding the adequacy and effectiveness of coach training and its benefit to the instructor. The strength of the correlation between the adequacy and effectiveness of coach training is r = 0.909. As the belief that the training is adequate increases, the belief that it is effective also increases with a very strong correlation. The variance explained by the variables on each other was found to be 82.6% ($r^2$ = 0.826). The strength of the correlation between the adequacy of coach training and its benefit to the instructor is r = 0.904. As the belief that the training is adequate increases, the belief that it benefits the instructor also increases with a very strong correlation. The variance explained by the variables on each other was found to be 81.7% ($r^2$ = 0.817). The strength of the correlation between the effectiveness of coach training and its benefit to the instructor is r = 0.952. As the belief that the training is effective increases, the belief that it benefits the educator also increases with a very strong correlation. The variance explained by the variables on each other was found to be 90.6% ($r^2$ = 0.906).

**The moderating role of the benefit to the instructor in the relationship between the adequacy and effectiveness of coach training**

To answer the question, "Does the benefit of coach training to the instructor have a moderating effect on the relationship between coaches' views about the adequacy and effectiveness of the training?" regression analysis was performed using Hayes' (2) PROCESS approach, and the findings are presented in Table 5.

**Table 5.** The moderating role of the benefit to the instructor in the relationship between the adequacy and effectiveness of coach training

| Dependent Variable | Independent Variables | b | Std. Error | t | p | 95% CA | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Limit | Upper Limit |
| **Effectiveness of Training** | (Constant) | 0.010 | 0.154 | 0.063 | 0.950 | -0.293 | 0.312 |
| | Adequacy of Training | 0.374 | 0.084 | 4.474 | **0.000** | 0.210 | 0.539 |
| | Benefit to the Instructor | 0.689 | 0.058 | 11.870 | **0.000** | 0.574 | 0.803 |
| | Interaction Term | -0.028 | 0.023 | -1.251 | 0.212 | -0.073 | 0.016 |

***F value for the model (3-303)=1151.936; p=0.000; $R^2$=0.919.**

As shown in Table 5, it can be seen that the benefit of coach training to the instructor does not have a moderating effect on the relationship between the coaches' views about the adequacy and effectiveness of training (p>0.05). For a variable (M) to be a moderating variable, the interaction term (XM) generated by multiplying it with the independent variable (X) must significantly predict the dependent variable and alter

its strength or direction (1). Therefore, it was decided that there was no moderating effect here. This finding can also be clearly seen in Figure 2.

Figure 2 shows the regression lines of the relationship between the coaches' views on the adequacy and effectiveness of coach training in cases where the scores for the benefit of coach training to the instructor are mean, one standard deviation above the mean, and one standard deviation below the mean. It can be seen that the regression lines have very similar slopes to each other. This shows that the benefit of coach training to the instructor does not affect the strength of the relationship, and that therefore, it does not have a moderating role.

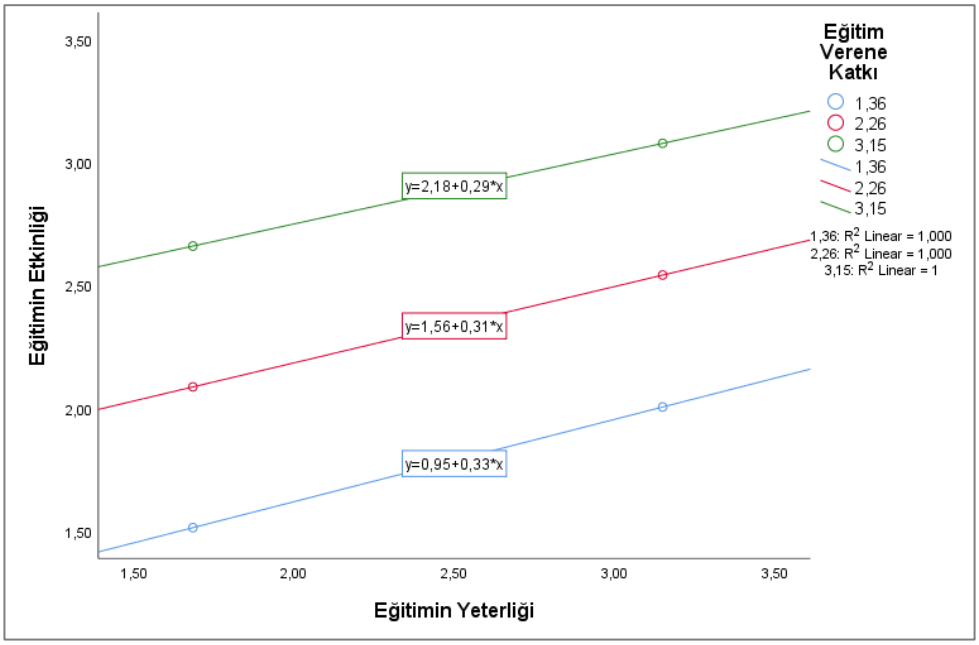


**Figure 2.** The Moderating Role of The Benefit to The Instructor in The Relationship Between The Adequacy And Effectiveness of Coach Training

## DISCUSSION AND CONCLUSION

This study, which was conducted to assess the adequacy of coach training specific to shooting sports in Turkey, provides a very strong example of research. The research has a number of strong features in terms of participant characteristics, data collection methods, and analysis strategies. First, the characteristics of the study participants vary widely. The participants belong to different age groups and have different education levels and marital statuses. The study was conducted with the participation of a total of 307 male and female, married and single shooting coaches of different age groups, with different levels of education ranging from high school to doctoral level. This wide range increased the generalizability of the research results and allowed for the representation of different experiences and perspectives on shooting coaching. Furthermore, the study includes the participation of volunteer, tenured or non-tenured coaches who have a coaching certificate obtained from either federation courses or universities. This both increased the representativeness of the study population and enabled more comprehensive results to be obtained by considering the views of professionals with different coach training backgrounds.

As a result of the study, it was first found that coaches in Turkey generally held negative views about the adequacy of coach training in terms of content, duration and opportunities, the effect of coach training on the athlete's skills and performance, and the benefit provided by the training to themselves. The obtained mean scores showed that positive views on the above issues were at a low level.

The findings of this study align with previous research highlighting significant challenges in coach training systems, particularly in Turkey. Studies have consistently pointed to issues such as lack of standardization, inadequate duration, and insufficient technical and tactical content in coach education

programs. For example, Işık and Moustakas (2022) emphasized the fragmented structure of Turkey's coach education and the need for reforms to meet international standards

Similarly, Sunay (1997) noted deficiencies in the resources and infrastructure supporting coach training, which mirror the concerns raised by participants in this study regarding equipment and facilities for shooting coaches. These parallels underscore the systemic nature of the problem and suggest that addressing these issues requires a nationwide, strategic overhaul of coach training curricula and delivery.

Globally, research on coach education frameworks in successful sporting nations offers valuable insights for improving Turkey's system. Studies have shown that countries like Germany, the USA, and Australia prioritize standardized training, strong collaboration with national federations, and a focus on the psychological and physiological needs of athletes. For instance, comprehensive training programs that integrate theoretical knowledge with practical application have been highlighted as critical for producing high-performing coaches (Koçak, 2019). By adopting similar approaches, Turkey can enhance its coach education system to align with international best practices. This study contributes to the existing literature by focusing specifically on shooting sports and providing actionable recommendations for addressing gaps in coach training within this unique context.

The examinations regarding the adequacy of the training revealed that the majority of coaches in Turkey believed that the technical and tactical information provided in coach training was insufficient, that coach training was better implemented in other countries, that the equipment and shooting ranges used in coach training were insufficient, that coaches working in the field were not adequately utilized, and that the duration of the courses given in coach training was insufficient. These findings highlight the general dissatisfaction of coaches in Turkey with the adequacy of coach training and indicate the need to review and improve coach education programs.

Furthermore, very strong ($0.90<r$) positive and significant ($p<0.05$) correlations were found between the participants' levels of agreement in their views on the adequacy and effectiveness of coach training and its benefit to the instructor. When participants had more positive views about the adequacy of coach training, their positive thoughts about the quality and impact of the training and its benefit to the instructor also increased.

However, it was observed that coaches' views on the benefit of coach training to the instructor did not have a moderating effect on the relationship between their views on the adequacy and effectiveness of the training ($p>0.05$). In other words, coaches' views on the benefit of coach training to the instructor did not affect the strength of the relationship between their views on the adequacy and effectiveness of the training.

Based on these results, the following recommendations can be offered to improve and develop coach training programs in Turkey:

1. The content and quality of training should be improved: The majority of participants thought that the content and quality of the courses were inadequate. Therefore, the content of coach training programs should be reviewed and updated. More technical and tactical information should be provided, and greater emphasis should be placed on issues such as communication skills, athlete development and psychological preparation.

2. The duration of training should be extended: Participants believed that the duration of coach training was insufficient. Training programs should be extended for longer periods and more in-depth training opportunities should be provided.

3. Customized training approaches should be developed for different groups: Research shows that different demographic groups may require different approaches to coach training. Therefore, training programs should be customized according to factors such as gender, age, and education level.

4. Collaborations with federations should be strengthened: Federations can contribute more to coach training programs. These collaborations can increase access to educational materials and resources and improve the quality of training.

5. The quality of training providers should be improved: The qualifications and experience of instructors are important. Instructors should be made more competent and should be provided with access to up-to-date information.

6. International collaborations should be encouraged: Participants thought that coach training did not comply with international standards. Therefore, international coach training programs and collaborations should be encouraged.

7. In conclusion, this study emphasizes the need to improve coach education programs in Turkey. These recommendations may be an important step in making coach training more effective and enabling Turkish athletes to achieve greater success.

While this study offers valuable insights into the adequacy and effectiveness of coach training in Turkey, it is not without limitations. First, the sample focuses specifically on shooting coaches, which may limit the generalizability of the findings to coaches in other sports disciplines. Second, the study relies on self-reported data through questionnaires, which may introduce biases such as social desirability or subjective interpretations. Lastly, the cross-sectional design of the study does not allow for examining changes over time, which could be addressed in future longitudinal research.

The obtained findings can be an important starting point for better understanding and improvement of the coach training system and the development of shooting sports in Turkey. It may be important for future studies to examine issues such as the reasons for the negative views, how coach training programs can be improved, and how more effective training strategies can be created to increase athletes' performance.

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# The Effect of 3 Breathing Techniques on 25 m Freestyle Swimming Performance Level in Swimming Branch

Ebru CEVİZ [1A]

[1] *Bingöl University, Sport Science Faculty, Coaching Training department, Bingöl, TÜRKİYE*

*Address Correspondence to Ebru CEVİZ: e-mail: eceviz@bingol.edu.tr*


*Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.*

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A: Orcid ID: 0000-0002-8515-0803

**Abstract**

The purpose of the study; It is aimed to evaluate different breathing techniques such as mouth-to-mouth exhale, mouth-to-nose exhale and mouth-to-mouth and nose exhale to determine which one may have more effect on swimming performance. 16 female participants who joined swimming training for 1 year were determined as the study group. This group was called (age 24.44±1.09 years, height 166.06±5.85cm, weight 58.19±3.22 body). The exercise program applied for 120 minutes, for 2 days a week and lasted 8 weeks. There were 4 techniques (freestyle, backstroke, breaststroke, butterfly) with varying movements of each technique, with different breathing methods within each training unit. These breathing methods were mouth-to-mouth exhale (*MM*), mouth-to-nose exhale (*MN*) and mouth-to-mouth and nose exhale (*MMN*). These breathing methods were planned and practiced. Windows Excel and SPSS (Statistical Package for the Social Sciences) 25.0 computer programs were used to analyze the data from the research. Numerical variables are expressed as percentages and mean ± standard deviation. Skewness and kurtosis values were examined to determine whether the data obtained showed a normal distribution or not. In this context, the -2, +2 skewness and kurtosis values determined by George and Mallery (10) were taken into account and it was determined that the distribution was normal. Since the data showed normal distribution, Paired-Sample T test, which is one of the parametric tests, was used to compare dependent variables within groups. One Way Anova test was used for intergroup comparison. The significance level was accepted as ($p<0.05$). When intergroup comparisons before and after training were examined, no statistically significant difference was found between pre-test and post-test values in the MM group regarding possible effects on 25-meter freestyle swimming performances ($p>0.05$). On the other hand, in the intergroup comparisons made in the MN and MMN groups, an improvement of 1.01% and. 99%, respectively, was observed and the differences were found to be statistically significant ($p<0.05$). In the intergroup comparison between the pre-test and post-test values of MM, MN and MMN groups, no statistically significant difference was found ($p>0.05$).

In conclusion; No statistically significant difference was found between 3 different breathing techniques within the training group. In order to reveal this difference, it is recommended to increase and expand the intensity and scope of training time in different studies. Statistically significant differences were found between the pre-and post-test breathing types of inhaling through the mouth (IM), exhaling through the nose (EN), and inhaling through the mouth (IM) and exhaling through both mouth and nose (EMN), thus revealing that they could significantly affect performance.

**Keywords:** Inhaling and exhaling, diaphragm, stroke, Leg stroke.

**Özet**

**Yüzme Branşında 3 Nefes Tekniğinin 25 m Serbest Teknik Yüzme Performansı Düzeyine Etkisi**

Çalışmanın amacı; farklı nefes tekniklerinin ağızdan al ağızdan ver, ağızdan al burundan ver, ağızdan al ağız-burun birlikte ver, hangisinin yüzme performansı üzerine daha etki olabileceğinin tespiti yönünde değerlendirilmesi amaçlanmıştır. Araştırmaya 1 yıldır yüzme antrenmanlarına katılan 16 kadın katılımcı çalışma grubu olarak belirlenmiştir. Bu grup (yaş 24,44±1,09yıl, boy 166,06±5,85cm kilo 58,19±3,22 vücut) olarak adlandırıldı. Uygulanacak olan egzersiz programında 8 hafta boyunca, haftada 2 gün 120 dk. 4 teknik olan (serbest, sırt üstü, kurbağalama, kelebek) her tekniğin değişen diriller içeriğinde hazırlanan programlar, her antrenman birimi içerisinde farklı nefes yöntemleri olan; Ağızdan al Ağızdan ver (AA), Ağızdan al Burundan ver (AB), Ağızdan al Ağız-Burun birlikte ver (AAB) bu nefes yöntemleri planlanarak antrenmanlar uygulatılmıştır. Yapılan araştırmadan elde edilen verilerin istatistiksel analizi için Windows Excel ve SPSS (Statistical Package for the Social Sciences) 25.0 bilgisayar programları kullanılmıştır. Sayısal değişkenler, yüzde ve ortalama ± standart sapma olarak ifade edilmiştir. Elde edilen verilerin normal dağılım gösterip göstermediğini belirlemek için çarpıklık basıklık değerleri incelenmiştir. Bu kapsamda George ve Mallery (10) tarafından belirlen -2, +2 çarpıklık basıklık değerleri dikkate alınmış ve dağılımın normal olduğu tespit edilmiştir. Veriler normal dağılım gösterdiği için, grup içi bağımlı değişkenlerin karşılaştırılmasında parametrik testlerden Paired-Sample T testi, gruplar arası karşılaştırmada ise One Way Anova testi kullanılmıştır. Anlamlılık düzeyi $p$<0,05 olarak kabul edilmiştir. Antrenman öncesi ve sonrası grup içi karşılaştırmalar incelendiğinde, 25 metre serbest yüzme performansları üzerindeki olası etkiler üzere AA grubunda ön-test ve son-test değerleri arasında istatistiksel olarak anlamlı bir farklılık tespit edilmemiştir ($p$>0,05). Buna karşın AB ve AAB gruplarında yapılan grup içi karşılaştırmalarda sırasıyla %1.01 ve %.99 gelişme gözlemlenmiş ve elde edilen farklar istatistiksel olarak anlamlı tespit edilmiştir ($p$<0,05). AA, AB ve AAB gruplarının ön-test ve son-test değerleri arasında yapılan gruplar arası karşılaştırmada ise istatistiksel olarak anlamlı bir farklılık tespit edilmemiştir ($p$>0,05).
Sonuç olarak; Antrenman grubu içerisinde 3 farklı nefes tekniği arasında istatistiksel olarak anlamlı bir fark bulunamadı. Bu farklılığı ortaya koyabilmek için antrenman süresi şiddeti ve kapsamının farklı çalışmalarda arttırılması ve genişletilmesi önerilmektedir. Nefesi ağızdan al burundan ver ve ağızdan al ağız burun birlikte nefes ver nefes tipinin ön ve son test arasında istatistiksel olarak anlamlı farklılıklar bulunmuştur böylelikle de performansı önemli ölçüde etkileyebileceği ortaya koyulmuştur.

**Anahtar Kelimeler:** Nefes alıp verme, diyafram, kulaç, bacak vuruşu.

## INTRODUCTION

Swimming is a versatile sport that requires a unique blend of strength, endurance and technical abilities. Optimum performance depends on the harmony and systematic functioning of these functions, like musculoskeletal, cardiovascular and respiratory systems. A delicate balance between aerobic and anaerobic energy production requires the ability to maintain effective and efficient striking mechanics under conditions of fatigue and environmental stress (35). Swimming is one of the best exercises to maintain physical fitness. It has a profound effect on the individual's lung function (29), and it is thought that emotional and mental factors also play a major role and can positively affect the performance of individuals at a significant level (37, 26). Since swimming is a sport performed intermittently, both breathing pattern and breathing frequency are important. Swimming exercises make almost all muscle groups work. Therefore, the usage of $O_2$ for muscle is higher in swimmers. Water pressure applied to the chest makes breathing difficult. The amount of breathing a swimmer does during different strokes varies from stroke to stroke. Lung function status plays an essential role in swimming performances (15), and is considered a sports branch in which physiological requirements can lead to lung adaptations (4). In general, swimming coaches recommend 'hypoxic exercises' which involve holding the breath for approximately 7-10 footstrokes of the individual's total lung capacity (TLC) and then holding the breath for a prolonged period before breathing in again. Such controlled frequency breathing during swim training can cause more hypercapnic than hypoxic effects (42). It is generally accepted that these trainings can increase the fatigue resistance of respiratory muscles over time, which can lead to improved swimming duration (4). The traditional method used in performance swimming is to take the head out of the water while underwater and breathe in through the mouth and exhale through

the nose in a short time. Thus decreasing the resistance emerged by turning the head but because of the increase in exhalation, helping to overcome the resistance of the water, there is a rise in fatigue of the respiratory muscles. Moreover, there is a decrease in blood flow and oxygen supply to other exercising muscles (12). Swimming at a competitive level requires a serious and purposeful organization of the breathing technique in order to achieve maximum oxygen utilization levels in a relatively short period of time. Techniques developed to improve performance and overcome swimming-related complications focus on keeping the lungs in good condition, increasing vital capacity, regulating respiratory functions and strengthening the respiratory musculature (12). The respiratory function plays a fundamental physiological role in human physiology by providing and its relationship with athletic performance, especially in swimming, has received relatively little attention in performance studies (43). Given the mountainous activity performance, methods that include cyclic hypoxia, time loading, stroke technique, patterns dictated by the position of the body in the water are important (7, 1). Specifically, the muscles involved in respiratory mechanics, particularly those associated with inhalation, such as the intercostal muscles and diaphragm muscle, may have an influential role in athletic performance, given their role in exercise tolerance (22).

Correct breathing during swimming provides the speed of movement in the distance the swimmer will swim and expresses the distance the swimmer must complete. The individual's general condition and fatigue level are important when breathing during swimming. Wrong breathing during trainings can cause a serious problem that leads to disabilities. When an athlete starts training in water, it depends on his ability to control his breathing while swimming and to perform the movements he needs to display with the correct technique. Correct breathing technique in swimming is an important process during the swimmer's training period. In order to make athletes successful in teaching swimming, the compatibility of correct breathing technique and swimming techniques is important. If an individual wants to learn swimming, s/he must first learn to breathe correctly. A swimmer that has learned how to breathe in the right way can master every kind of swimming techniques (39). When swimming is performed at a competitive level, increased breathing causes fatigue in the muscles that contribute to respiration, reducing breathing frequency, endurance and performance during swimming (20). Studies have reported that serum lactate during swimming causes muscle pain and stiffness as a metabolic byproduct of the glycolytic pathway (12). The traditional method of competitive swimming performance is to breathe in through the mouth and out through the nose as quickly as possible while moving through the water, and to reduce the resistance that occurs when turning the head to the right and left. Thus, depending on the increase in exhalation, which helps to cope with water resistance that will affect performance; Respiratory muscle fatigue may decrease oxygen transport and blood flow to other muscle groups, which contribute to swimming performance. During high-level swimming, the breathing technique must be well regulated in order to provide maximum oxygen demand in a short period of time. (12). Techniques developed to have the best performance and avoid swimming-related complications focus on keeping the lungs in good condition, increasing vital capacity, regulating respiratory activity, and strengthening the respiratory musculature (20). The breathing technique used during exercise is also very substantial within the scope of the exercise. Here, changes in blood pressure are also seen when the athlete inhales, exhales or holds his breath. During exhalation or breath holding, the load on the heart and blood pressure increases. On the other hand, breathing may also reduce intrathoracic pressure during resistance exercise and contribute to reducing the increase in blood pressure (21). Correct breathing helps carry enough oxygen to the tissues and enable better activity (27). The main purpose of breathing exercises is; to increase relaxation and respiratory efficiency (3). Breath is necessary for life, as well as for protection from diseases, improvement of quality of life, and health and energy balance. Additionally, with the correct breathing technique, oxygen consumption can increase by 20% during exercise or sports activities (6).

People generally change their breathing from nose to mouth as the *'amount of air inhaled per minute'* increases above 40 L/min (30). The breathing cycle rises from approximately 40% of maximum intensity resting values (E being slightly longer than I) to 50% *'equal inhalation and exhalation*' or higher (26, 18, 32). Shorter *'exhalation time'* and *'breathing time'* mean that the the mean inspiratory flow rate (air flow rate during the breathing phase) to maintain a constant *'lung function volume* (%)'. Exercise-related *'amount of air breathed per minute*' and energy increases trigger changing respiratory pump muscular system activity and coordination. From rest to 70% of maximum workload, diaphragmatic pressure doubles or even more and is accompanied by increased shortening rate, contributing 70%-80% of the total inspiratory force (40). As fatigue increases

during swimming, the active exhalation (expiratory muscle activation) reduces the lung volume at the end of expiration (exhalation) and decreases the inspiratory workload (inhalation). Reach voluntary contraction at 50% of their maximally intense contraction level (2,13). Intercostal muscles, parasternal muscles, scalene muscles and neck muscles measure *'lung volume after-inspiratory'* and raspiratory diameter, e.g. it contributes to ventilation at high intensities by regulating dilation and inflammation. In general, the ventilation pump and diaphragm muscle involved work systemically very efficiently In total, the diaphragm and associated ventilation pump musculature is highly efficient [~3%-5% total O2 consumption ($VO_2max$)] and Resistant to fatigue factor at swimming intensities below submaximal fatigue resistant at densities below the maximum (41, 33). The arm and leg muscles; respiratory frequency, as well as respiration being coordinated with stroke rate (5). Furthermore, effective stroke mechanics require minimizing the duration of inspiration. Tidal volume increases proportionally with respiratory frequency restriction (36). For this reason, inspiration must be rapid in order to maintain ventilation per minute at a level that meets metabolic demand (14). Swimming requires a sequential breathing system as well as stroke efficiency and buoyancy. During swimming, the respiratory system is synchronized with the movement system of the limbs, requiring a demanding breathing phase within the biomechanical constraint of the foot stroke cycle. Sequential breathing can have a significant effect on tidal volume and respiratory frequency, which can lead to varying degrees of hypercapnia and hypoxemia (19). During the stroke phase while swimming, exhaling is done when the face is under water and therefore the breathing technique must be consciously controlled. Buildup in the expiratory muscles. Additionally, prone body position can cause changes in blood perfusion, capillary recruitment, and respiratory function that also affect lung function (18). The aquatic environment has been found to pose ventilation, including frequent breath holding, ribcage submergence, and prone body positioning. Lung volume and other factors such as the impact of stroke efficiency on metabolic work. Considering these difficulties, it can be assumed that the work of breathing will be higher during swimming compared to land exercises, thus increasing the for working respiratory muscles (19). It can also be said that water has a compelling and powerful effect on breathing and that 'the energy used to cover a targeted distance is equivalent to 4 times the energy to run the same distance' (32). Considering the challenging effect of the amount of oxygen required for muscle movements during exercise on the breathing mechanism on performance, it can affect the speed of both training and competitive level. The aim of the present study is to evaluate different breathing techniques (such as both MM, MN and MMN) to determine which one may have more effect on swimming performance.

## METHOD

### Research Group

16 female participants with an average age of 24.44±1.09, who have been participating in swimming training for 1 year, were determined as the study group. All participants completed and approved the voluntary consent form declaring that they were volunteers for the research. The purpose and importance of the study was explained to the participants, and their motivation and desire levels were increased. The 25 m free technical distance to be swam was practiced two days a week before the experiment at the Bingöl Youth and Sports Provincial Directorate Indoor Swimming Pool. Demographic information of the participants is presented in Table 1.

**Table 1.** Demographic characteristics of the research group

| Variables | n | $\bar{X}$ | Ss |
|---|---|---|---|
| Age (years) | 16 | 24,44 | 1,09 |
| Height (cm) | 16 | 166,06 | 5,85 |
| Weight (kg) | 16 | 58,19 | 3,22 |

### Data collection tools

***Height:*** The subjects held their breath, without shoes, heels and big toes of both feet together, standing upright on a flat surface, the degree of precision was measured with a 0.01 m. stadiometer (SECA, Germany).

***Weight:*** Subjects were measured with an electronic scale (SECA, Germany) with a precision of 0.1kg, wearing sportswear (T-shirt, tracksuit) and without shoes.

***25 m Freestyle Technical Swimming Times:*** The participants' 25 m freestyle technical swimming times were determined using the "Selex Slx 508 chronometer (30 Lap)" brand chronometer.

***Inhaling and exhaling through mouth (MM) Swimming Degrees:*** Starting from free technical swimming in the water, the breathing cycle by breathing in through the mouth outside the water and exhaling through the mouth in the water was completed for 25 m.

***Inhaling through mouth and exhaling through nose (MN) Swimming Degrees:*** Starting from free technical swimming in the water, the breathing cycle of inhaling through the mouth outside the water and exhaling through the nose in the water was completed for 25 m.

***Inhaling through mouth and exhaling through both mouth and nose (MMN) Swimming Degrees:*** The breathing cycle is completed by starting free technical swimming in the water, breathing in through M outside the water, and exhaling through MN in the water was completed for 25 m.

**Training protocol**

Three different breathing techniques were explained to the 16 female participants. They continued their swimming training for 1 year. One week before the first training unit, the types of breathing techniques added to the exercise content that they will practice for 8 weeks were shown one by one, mistakes were corrected and opportunities were provided for them to practice the breathing techniques as desired. In the exercise program to be applied, 120 minutes, 2 days a week for 8 weeks. The programs, which are prepared with 4 techniques (freestyle, backstroke, breaststroke, butterfly) with varying movements of each technique, are given to the participants at the beginning of each training unit for the first 15 minutes to increase body temperature and blood circulation. Training started with warming up in water and lasted 95 minutes. The training content continued as the main phase, with breathing techniques changing within the specified technical movements within the specified distances, 10 minutes and completed it with cooling exercises. There are different breathing methods within each training unit. These breathing methods: Inhaling and exhaling through mouth (MM), Inhaling through mouth and exhaling through nose (MN), Inhaling through mouth and exhaling through both mouth and nose (MMN). They were planned and practiced. Five minutes of passive rest was provided between each phase. The intensity in the 25 m free technique swimming test that the subjects swam for each breathing method was determined by the target heart rate according to the heart rate reserve (Karvonen) method. As a result of a 10-second heart rate count from the carotid artery in the neck immediately after the end of the exercise (9).

*Karvonen Method*; HRmax=220-Age, HRR=HR max-HR rest, 60% THR=(0.60xHRR)+HR rest (9).

**Statistical analysis**

Windows Excel and SPSS (Statistical Package for the Social Sciences) 25.0 computer programs were used for statistical analysis of the data obtained from the research. In the research, firstly, the blank space was evaluated to check the suitability of the analyzes and the assumptions. As a result of this process, the data of three participants who were filled in incorrectly and incompletely were excluded from the analysis and analyzes were made on the data of the remaining 16 participants. Numerical variables are expressed as percentages and mean ± standard deviation. Skewness and kurtosis values were examined to determine whether the data obtained showed a normal distribution. In this context, the -2, +2 skewness and kurtosis values determined by George and Mallery (10) were taken into account and it was determined that the distribution was normal. Since the data showed normal distribution, Paired-Sample T test, one of the parametric tests, was used to compare dependent variables within groups, and One Way Anova test was used to compare between groups. The significance level was accepted as $p<0.05$.

**Ethical approval and institutional permission**

This research was found ethically appropriate by the Bingöl University Health Sciences Scientific Research and Publication Ethics Committee 'Decision:2) dated 07.05.2024, numbered 24/10'.

## FINDINGS

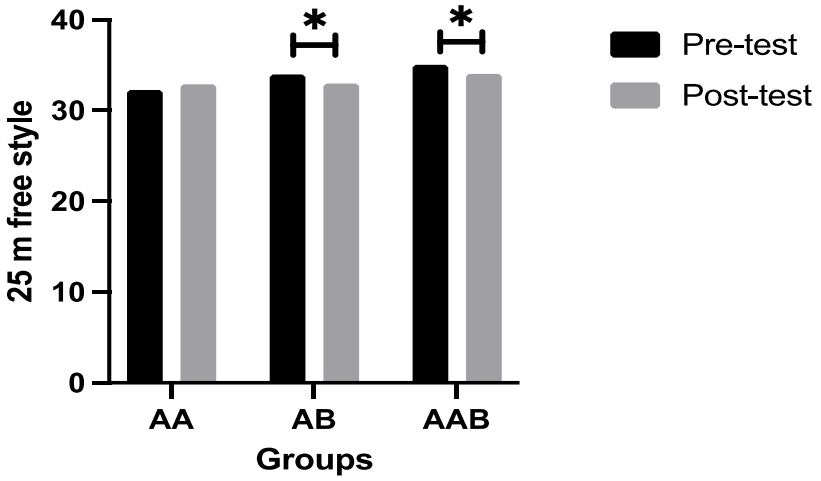
The research was conducted to evaluate the possible effects of three different breathing techniques for eight weeks on the 25-meter free swimming performance of subjects who participated in swimming training for a year.

As seen in Table 2, there was not any statistically significant difference between the pre-test and post-test values in the MM group (p>0.05). On the other hand, in the intragroup comparisons made in the MN and MMN groups, an improvement of 1.01% and .99%, respectively, was observed and the differences were found to be statistically significant (p<0.05). In the intergroup comparison between the pre-test and post-test values of MM, MN and MMN groups, no statistically significant difference was detected (p>0.05).

**Table 2.** Comparison of participants' 25 m freestyle swimming degrees within and among the groups

| Variables | Groups | n | Within Groups | | | Among Groups | |
|---|---|---|---|---|---|---|---|
| | | | Pre-test X±Ss | Post-test X±Ss | *p* | *F* | *p* |
| 25 m Free Style Technique | MM | 16 | 32,30±6,10 | 31,92±5,89 | ,122 | 1,076 | ,350 |
| | MN | 16 | 33,98±6,59 | 32,97±6,68 | **,027*** | | |
| | MMN | 16 | 35,04±6,99 | 34,04±6,67 | **,016*** | | |

*$p<0.05$. MM: Inhale through mouth and exhale through mouth, MN: Inhale through mouth and exhale through nose, MMN: Inhale through mouth and exhale through mouth and nose.




**Graph 1:** Effect of participants' MM, MN and MMN breathing techniques on their 25 m free swimming degrees *$p<0.05$.

## DISCUSSION AND CONCLUSION

This study was carried out to determine which of the different breathing techniques such as MM, MN and MMN techniques would be more effective on swimming performance. 16 female participants, with an average age of 24.44±1.09, trained for 120 minutes, 2 days a week and lasted for 8 weeks. There are 4 techniques in swimming training (freestyle, backstroke, breaststroke, butterfly) and the programs are prepared with the changing movements of each technique, with different breathing methods within each training unit. The breathing methods are as follows MM, MN and MMN. These breathing methods were planned and practiced.

Murlasits et al. (24) conducted a study to determine the responses of young competitive swimmers to the 200 m swimming test, which increased with different breathing patterns. 8 male swimmers with an average age of 15±2 underwent a 7x200 meter progressive swimming test performed with two different breathing rates. 1; breathing every third beat (BR3) 2; the test was performed twice, 14 days apart, with two different respiratory rates in random order, breathing every five beats. When the performance values are examined, *stroke speed* increased gradually from the first to the seventh series, in agreement with the swimming speed

showing the main effect in terms of time (p=0.000). However, the time-dependent condition interaction was not found to be statistically significant (p=0.701). In another study that Lavin et al. (18) conducted to examine the effects of controlled frequency breathing (CFB) swimming on respiratory function with 18 male swimmers between the ages of 18-45, who completed each distance of 16x25 meters within 45 seconds, 3 times a week for 4 weeks, and completed each distance within 45 seconds in the first 8 of 16 swimming strokes. 1 of them were made in a controlled frequency style and the last 8 were made in a beat harmonic style. For the controlled-frequency breathing condition, they were instructed to inhale nearly maximally, hold their breath for approximately two-thirds of the distance, and slowly release air through their nostrils for successful completion of the distance. After 2 weeks of training, the time interval was reduced to 40 seconds. 12 training distances were completed in which controlled frequency breathing (CFB) subjects took 2 breaths per length and beat matched (SM) subjects took 7 breaths per length (18). Increases in the exhalation rate are observed in swimming training performed in a controlled breathing and stroke-synchronous manner. Controlled and harmonious breathing exercises can also increase performance in the swimming distance, which is parallel to the results of our study. Turning the head to breathe can potentially affect hydrodynamic resistance and therefore affect performance. Respiratory restriction can contribute to fatigue. It is more important to breathe adequately for a long time. Since there are distances where aerobic demand is greater, restricting oxygen delivery is expected to alter performance (24).

Hakked et al. (12) conducted a study to examine the effects of yoga breathing practices on swimmers' lung functions and included 27 participants between the ages of 13-20, with 8.29±2.9 in individuals who have been swimming, who did 9.58±1.81 km swimming training every day. Competitive swimmers (13 men and 14 women) participated. Yoga bellow breathing Hole Breathing exercises were applied. Significant improvement in maximum voluntary ventilation (p1⁄4 0.038), forced vital capacity (p1⁄4 0.026) and number of beats per breath (p1⁄4 0.001) in the YBP group compared to the control group. They suggested that YBP helps increase respiratory endurance in competitive swimmers. In the present study, an improvement of 1.01% and .99% was observed in the intra-group comparisons made in the MN and MMN groups, respectively, and the differences were found to be statistically significant *(p<0.05).* It is parallel to the results of the study that MN and MMN simultaneously, with a longer nasal exhalation time, positively affects performance.

Jakovljevic and McConnell (14) examined the prescan swimming in the first 4 months of the year in 10 college swimmers with an average age of 21.2±1.9 years who had been swimming for 8.2±2.1 years. In their study to evaluate the swimmers, the swimmers performed a 200 m pre-scan swim with reported breathing rates at 90% of race speed: 1; 1 breath (B2) and 2 on every second stroke; 1 breath on every fourth stroke (B4). Maximum inspiratory pressure (PImax) decreased by 21% after B4 and 11% after B2 compared to baseline (p<0.05). 1⁄2La was 15% lower after B4 than after B2 *(p<0.05).* There was no significant difference between HR, B2 and B4. In another breathing cycle study, Key et al. (16) conducted 22 female swimmers aged (19.0±1.1), performing a maximum effort 100 m swimming test, one with a normal breathing (NB) pattern (1 breath every 2-3 strokes) and the second with controlled frequency breathing (Using the CFB) model (1 breath every 7 beats), post-exercise heart rate increased significantly (p=0.02) higher in the NB trial (184.9±12.0 bpm) than in the CFB trial (174.8±14.8 bpm). NB 100 m swimming average was 60.23±0.53 sec and CFB trial average was 61.36±0.62 sec (p>0.05). In the study of Burtch et al. (4), 25 male and female swimmers aged 18-22 were divided into 2 experimental (CFB) and control groups (stroke compatible), training lasted approximately 35 minutes, 4 days a week, for 4 weeks, and the swimmers breathed every 7-10 strokes. Controlled frequency breathing (CFB)) and one breathing every 3-4 strokes (control group) were allocated and the training content was 8-10 breaths at 50 m (control group) and 2-3 breaths at 50 m (control group). CFB group and 12x50 m were recreated for 5-6 weeks (16 sessions). The CFB group limited their breathing to 2 breaths per round, approximately 24 breaths per workout. The control group was asked to breathe in rhythm with the beat, breathing every 2-3 beats and reaching 10-12 breaths per round. Swimming performance, aerobic capacity, pulmonary diffusion capacity and running economy did not improve after training in both groups (p<0.05). In conclusion, CFB exercise appears to prevent inspiratory muscle fatigue; however, no difference was found in performance results. Jakovljevic and McConnell (14) reported that there was a significant level of inspiratory muscle fatigue after high-intensity swimming. However, inspiratory muscle fatigue is further increased when respiratory frequency decreases during high-intensity front crawl swimming. It has been suggested that respiratory muscle training should be used to enhance its strength in swimmers (14).

In the study of Stavrou et al. (34), the aerobic training period of 10 fin swimmers with an average age of 15.8±0.5 was 8 hours a week, including 8x25 m freestyle leg strokes, and their training age was 7.8±1.8 years, using three different breathing techniques. As a result of the study carried out on the effect of submaximal freestyle leg kick (normal breathing (NB), breath holding (BH) and intermittent breath holding (IBH)), respiratory showed lower $SpO_2$ values immediately after the end of the IBH technique in relation to the IBH techniques (IBH: 88%±0.9%; BD: 93.3%±0.7%; NB: 98.3%±0.3%; p<0.001). In a similar study that McCabe et al (23) conducted with 10 male competitive swimmers with an average age of 18±2.6 swam two 25 m sprints. When the breathing (Br) group that breathed towards their preferred side compared to the nonbreathing (NBr) group, the swimming speed was found to be substantial higher. When compared to other breathing techniques, HR was higher after IBH (IBH: 177±4.2 bpm-1; BH: 165.7±7.9 bpm-1; NB: 158.3±2.2 bpm-1, p<0.001) and higher PImax after IBH compared to the other two techniques (IBH:168.3±5.3 $cmH_2O$; BH:166±11 $cmH_2O$; NB:161.7±11.4 $cmH_2O$; p<0.05) result was reached. Formosa et al. (8) studied 20 elite swimmers, 10 males, 21.3±3.1 years old, and 10 females, 21.3±3.1 years old. Similarly, in the non-breathing condition, there was a significant difference between breathing and non-breathing values in the footstroke cycle when the symmetry index of net propulsion force was used for the minimum (P=0.035) and maximum (P=0.011) net propulsion force (P=0.011). Using the symmetry timing index within the conditions of not breathing (P<0.001) and breathing (P=0.002), significant differences were detected between not breathing and breathing in the foot strike cycle. Psycharakis and McCabe (28) conducted two maximum 25 m preliminary survey trials with 12 professional male swimmers, with an average age of 18.9±2.4, one without breathing and the other breathing towards the preferred side. In the breathing trial, swimming speed was observed to be significantly slower (p<0.01). Swimmers rotated their hips and shoulders more towards the inhaled side during breathing compared to the uninhaled side during the trial (SR: p<0.01; HR: p=0.03). However, no significant difference was found between these studies in terms of SR and HR. In the breathing trial, SR was significantly higher on the breathing side than on the non-breathing side (p<0.01), but there was no significant difference in HR (p=0.07). There was no evidence that temporal characteristics of HR or SR were related to performance levels in swimming. When the studies are examined, a higher performance on the breathing side compared to non-breathing side and an increase in heart rate were observed in breath holding and intermittent breath holding groups compared to normal breathing. The study of Stavrou et al. (34) supports that it increases acutely. They reported that in these athletes, and in this study, the results were parallel to the studies in which three different breathing exercises positively affected the performance.

Gray et al. (11) carried out a study with 7 female swimmers to examine the effects of 30 sec and 2 min deep breathing exercises on 50 m and 100 m freestyle performance. After deep breathing for 30 seconds (DB30) and 2 minutes (DB2), swimmers performed 50 m and 100 m freestyle sprint swimming under normal conditions (DBNO). However, both in the 50 m freestyle (50 freestyle: DBNO 28.45±1.90 sec vs DB30 28.18±1.59 sec, (p>0.23)) and 100 freestyle (100 freestyle Faster swimming times were observed: DBNO 61.73±4.33 sec versus DBNO 61.73±4.33 sec. DB30 61.54±5.11 sec p=0.79) After DB30, DB2 resulted in slower swim periods in both 50 and 100 m swims compared to DBNO (respectively, DBNO 28.45±1.90 sec, DB2 28 .85±2.21 sec P=0.29; DBNO 61.73±4.33 sec, DB2 62.15±5.52 sec P=0.58). An optional 30-second deep breathing procedure prior to the race resulted in a slight improvement in the time of the 50m and 100m freestyle race, which could potentially turn into a competitive advantage.

Vezos et al. (38) included 10 female freestyle swimmers with an average age of 15±1.2 years and a swimming age of 8.0±1.5 years. In the study, which aimed to determine the effects of breathing on stroke and fathom kinematics in a three-dimensional underwater environment. Each subject performed a series of 25 m prescan trials equal to approximately 80% of their performance under breathing and breath-holding conditions, with a period of 3 min between rests. They reported that breathing during the stroke (t9=2,764; p<0,05) caused significant velocity increases in the displacement of the hand when moving backwards (t9=2,471; p<0,05) and the displacement of the hand towards the side of the body according to the density of the water. In contrast to the X-axis (t9=2,638; p<0,05) during the downward sweep of the arm (t9=2,638; p<0,05), the highest speed of the hand going backward during the sweep of the arm inward (t9=2,368; p<0,05) and the displacement of the hand during the push phase (t9=-2,297; p<0,05), significant decreases were found when breathing was needed. From this point of view, it was concluded that the breathing method during swimming

caused significant changes in both basic stroke parameters and general motor trait models due to the coordinated forward progression of the body during breathing.

When the literature was examined, it was seen that there were no detailed studies examining the effects of exercises using different breathing techniques in terms of performance levels. The different breathing techniques in this study were affecting the stroke coordination of the arms and legs in terms of the distance covered by swimmers. It is important to ensure that the *AA, AB* and *AAB breathing techniques* is well understood by the athlete. It affects the performance positively in order to minimize the friction effect while progressing on the horizontal plane in the water and to prevent the body from swaying left and right and restricting the forward movement in order to show superiority over its competitors.

No statistically significant difference was found between 3 different breathing techniques within the training group. The aim was to reach a conclusion on which breathing technique can affect performance more significantly. In order to reveal this difference, it is recommended to increase and expand the intensity and scope of training time in different studies. Statistically significant differences were found between the pre- and post-test breathing types, thus revealing that they could significantly affect performance. In most sports branches, the breathing pattern (mouth breathing, rib cage breathing, diaphragm breathing) and the amount of breathing are carried out during technical skill learning to ensure that the learning in breathing techniques is appropriate for the purpose and that the performance development can be demonstrated more healthily. In order to make athletes successful in swimming teaching, the combination of correct breathing coordination and swimming movements must be in harmony. In terms of performance development, it is very important for the athlete and his/her performance to carry the oxygen taken to the relevant muscles to display skill movements for sports branches and control breathing for the respiratory mechanism, cordovascular system and metabolic developments.

**Suggestions**

The same studies can be done on male athletes. Similar studies can be conducted in different age groups. Underwater cameras can be used to check that the breathing technique is used correctly. In training for coaches and athletes, exercises such as breathing through the mouth and exhaling through the nose and breathing through the mouth and exhaling through both the mouth and nose may be recommended.

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