

IJSHER

Uluslararası Spor, Saęlık, Egzersiz ve Rekreasyon Arařtırmaları Dergisi
International Journal of Sport, Health, Exercise and Recreation Research

Volume 2, Issue 1, April, 2026

Chief Editor
Dr. Mevlüt GÖNEN

<http://www.ijsher.com>

Editorial Board

Yayıncı / Publisher

Dr. Mevlüt GÖNEN

Bayburt University, FACULTY OF SPORTS SCIENCE – Türkiye
mevlutgonen[et] bayburt.edu.tr

Baş Editör/ Chief Editor

Doç. Dr. Mevlüt GÖNEN

Bayburt University, FACULTY OF SPORTS SCIENCE – Türkiye

Yardımcı Editör / Deputy Chief Editor

Dr. Mehmet Ali CEYHAN

Bayburt University, Faculty of Sports Sciences – Türkiye *mehmetaliceyhan[et] bayburt.edu.tr*

Danışma Yayın Kurulu / Editorial Advisory Board

Prof. Dr. Fatih ÇATIKKAŞ, Manisa Celal Bayar University, Faculty of Sport Science -Türkiye, Prof. Dr.

Prof. Dr. Mutlu TÜRKMEN, Bayburt Üniv. Türkiye *mutluturkmen [et] bayburt.edu.tr*

Prof. Dr. Metin YAMAN

Prof. Dr. Erdal ZORBA

Sistem ve Teknik Editörler / System and Technical Editors

Sezai ÇAKIR, THY, Türkiye, *sezaicakir [et] gmail.com*

Kader YEL, Bayburt University., Türkiye, *yelkader [et] yandex.com*

Sema GÜZEL, Bayburt University., Türkiye, *semaguzel2019 [et] gmail.com*

Engin SARIKAYA, Bayburt Univ., Türkiye, *sarikayaengin44 [et] yandex.com*

İngilizce Dil Editorleri / English Language Editors

Dr. Mehmet Ali CEYHAN

Bayburt University, Türkiye, *mehmetaliceyhan [et] bayburt.edu.tr*

BİLİM KURULU / SCIENCE BOARD

Dr. Alper Hamdi GÜNGÖRMÜŞ, Alanya Alaattin Keykubat Univ., *hamdi.gungormus [et] alanya.edu.tr*

Dr. Andriy Vovkanych, Lviv State University, Ukrainian, *avovkinfiz [et] i.ua*

Dr. Ali Ozan ERKILIÇ, Bayburt Univ, Türkiye , *aliozan32 [et] gmail.com*

Dr. Ahmed Yousif Miteb , Iraq, *ahmed1968yousif [et] gmail.com*

Dr. Ahmet YIKILMAZ, Iğdır Univ., Türkiye, *ahmetyikilmaz84[at]gmail.com*

Dr. Ahmet DİNÇ , Iğdır Univ., Türkiye, *tffadinc[at]hotmail.com*

Dr. Ayşe OYA ERKUT, Türkiye, *oerkut [et] marmara.edu.tr*

Dr. Antonio Robustelli, India, *antonio.robustelli [et] omni-athlete.com*

Dr. Barış BAYDEMİR, Türkiye, *barisbaydemir [et] hotmail.com*

Dr. Bilal Demirhan, KYRGYZ – Turkish Manas University,

Dr. Bülent AĞBUBA, Pamukkale Univ., Türkiye, *bakboga[at]pau.edu.tr*

Dr. Çetin YAMAN, Marmara Univ., Türkiye, *cetin.yaman [et] marmara.edu.tr*

Dr. Döndü **UĞURLU**, Marmara Univ., Türkiye, [dondusimsek\[et\] kku.edu.tr](mailto:dondusimsek@kku.edu.tr)

Dr. Eda **ADATEPE**, Bayburt Univ., Türkiye, [edaadatepe \[et\] bayburt.edu.tr](mailto:edaadatepe@bayburt.edu.tr)

Dr. Emre **BOZ**, Bayburt Univ., Türkiye, [emreboz \[et\] bayburt.edu.tr](mailto:emreboz@bayburt.edu.tr)

Dr. Engin **GEZER**, Kafkas Üniv.(Sarıkaş), Türkiye, [gezerengin\[at\]gmail.com](mailto:gezerengin@gmail.com)

Dr. Esqane **BABAYEVA**, Azerbaycan, [eshqane \[et\] mail.ru](mailto:eshqane@mail.ru)

Dr. Erkan **YARIMKAYA**, Bayburt Univ., Türkiye, [erkanyarimkaya \[et\] bayburt.edu.tr](mailto:erkanyarimkaya@bayburt.edu.tr)

Dr. Ertuğrul **GELEN**, Sakarya University of Applied Sciences, Türkiye, [gelen\[at\]subu.edu.tr](mailto:gelen@subu.edu.tr)

Dr. Fatih **YAŞARTÜRK**, Bartın University, Türkiye, [fatihyasarturk \[et\] gmail.com](mailto:fatihyasarturk@gmail.com)

Dr. Hamid **ABDULSADA**, Iraq

Dr. Gülten **HERGÜNER**, Sakarya University of Applied Sciences, Türkiye, [herguner\[at\]subu.edu.tr](mailto:herguner@subu.edu.tr)

Dr. Halil İbrahim **CİCİOĞLU**, Gazi University, Türkiye, [cicioglu\[at\]gazi.edu.tr](mailto:cicioglu@gazi.edu.tr)

Dr. Hayri **AKYÜZ**, Bayburt Univ., Türkiye, [hayriakyuz \[et\] bayburt.edu.tr](mailto:hayriakyuz@bayburt.edu.tr)

Dr. İsmail **KARATAŞ**, Türkiye, [ismail.karatas \[et\] karabuk.edu.tr](mailto:ismail.karatas@karabuk.edu.tr)

Dr. İlker **ERCAN**, Bursa Uludağ University, Türkiye, ercan@uludag.edu.tr

Dr. Jewelson M. **Santos**, Philippines, [jewel.lee.00.27 \[et\] gmail.com](mailto:jewel.lee.00.27@gmail.com)

Dr. Kemal **GÖRAL**, Muğla Sıtkı Koçman University, Türkiye, [kgoral\[at\]mu.edu.tr](mailto:kgoral@mu.edu.tr)

Dr. Mehmet Ali **CEYHAN**, Bayburt Univ, Türkiye, [mehmetaliceyhan \[et\] bayburt.edu.tr](mailto:mehmetaliceyhan@bayburt.edu.tr)

Dr. Meltem Işık **AFACAN**, Aydın Adnan Menderes Univ., Türkiye, [isik.meltem \[et\] adu.edu.tr](mailto:isik.meltem@adu.edu.tr)

Dr. Murat **TAŞ**, Manisa Celal Bayar Univ, [murattas25 \[et\] gmail.com](mailto:murattas25@gmail.com)

Dr. Murat **AKYÜZ**, Manisa Celal Bayar Univ, Türkiye, [murat.akyuz \[et\] cbu.edu.tr](mailto:murat.akyuz@cbu.edu.tr)

Dr. Murat **KUL**, Bayburt Univ, Türkiye, [muratkul \[et\] cbu.edu.tr](mailto:muratkul@cbu.edu.tr)

Dr. Oleh **Olkhovyi**-Vice-rector for scientific and pedagogical work
Ukraine, Kharkiv State Academy of Physical Culture тел. [olkhovoleh \[et\] gmail.com](mailto:olkhovoleh@gmail.com)

Dr. Öznur **AKPINAR**, Türkiye, Karamanoğlu Mehmet Mey Univ., [oznurakpinar \[et\] kmu.edu.tr](mailto:oznurakpinar@kmu.edu.tr)

Dr. Onur **AKYÜZ**, Dicle Univ., Türkiye, [onurakyuz1986 \[et\] gmail.com](mailto:onurakyuz1986@gmail.com)

Dr. Pınar **GÜZEL GÜRBÜZ**, Manisa Celal Bayar Univ, Türkiye, [pinarguzel.gurbuz \[et\]cbu.edu.tr](mailto:pinarguzel.gurbuz@cbu.edu.tr)

Dr. Recep **CENGİZ**, Manisa Celal Bayar Univ, Türkiye, [rcengiz1965 \[et\] gmail.com](mailto:rcengiz1965@gmail.com)

Dr. Refik **ÇABUK**, Ondokuz Mayıs Univ., Türkiye, [refik.cabuk \[et\] omu.edu.tr](mailto:refik.cabuk@omu.edu.tr)

Dr. Saadet Rana **VAROL**, Ege Univ., Türkiye,

Dr. Sara **ALİZADEH**, Iran, [s.alizadeh.psy \[et\] gmail.com](mailto:s.alizadeh.psy@gmail.com)

Dr. Selahattin **AKPINAR**, Düzce Üniv. / Turkey, [selahattinakpinar \[et\] duzce.edu.tr](mailto:selahattinakpinar@duzce.edu.tr)

Dr. Serdar **USLU**, Gazi Univ., Türkiye, [usluserdar77 \[et\] gmail.com](mailto:usluserdar77@gmail.com)

Dr. Serdar **ELER**, Gazi Univ, Türkiye, [seler\[at\]gazi.edu.tr](mailto:seler@gazi.edu.tr)

Dr. Selim **ASAN**, Erzurum Teknik Univ, Türkiye, selim.asan@erzurum.edu.tr

Dr. Şebnem **ŞARVAN CENGİZ**, Manisa Celal Bayar Univ, Türkiye, [csebnem \[et\] gmail.com](mailto:csebnem@gmail.com)

Dr. Sevinç **NAMLI**, Erzurum Technical Univ, Türkiye, [sevinc.namli\[at\]erzurum.edu.tr](mailto:sevinc.namli@erzurum.edu.tr)

Dr. Süleyman **GÖNÜLATES**, Pamukkale Univ., Türkiye, [sgonulates \[et\] hotmail.com](mailto:sgonulates@hotmail.com)

Dr. Taner **BOZKUŞ**, Gazi Univ.,Türkiye, [tanerbozkus \[et\] yahoo.com](mailto:tanerbozkus@yahoo.com)

Dr. Tolga **ŞAHİN**, Dokuz Eylül Univ, Türkiye, [tolga.sahin \[et\] deu.edu.tr](mailto:tolga.sahin@deu.edu.tr)

Dr. Tuncay **ÖKTEM**, Bayburt Univ, Türkiye, [tuncayoktem \[et\] bayburt.edu.tr](mailto:tuncayoktem@bayburt.edu.tr)

Dr. Tuğçe Orkun **ERKİLİÇ**, Bayburt Univ,Türkiye, [ozanerkilic \[et\] bayburt.edu.tr](mailto:ozanerkilic@bayburt.edu.tr)

Dr. Ülfet **ERBAŞ**, Şırnak Univ., Türkiye, [ulfeterbas \[et\] sirnak.edu.tr](mailto:ulfeterbas@sirnak.edu.tr)

Dr. Yunus Emre **ÇİNGÖZ**, Bayburt Univ, Türkiye, [yunusemrecingoz \[et\] bayburt.edu.tr](mailto:yunusemrecingoz@bayburt.edu.tr)

Dr. Yunus **YILDIRIM**, Mersin Univ., Türkiye, [ynsyldrm69\[at\]mersin.edu.tr](mailto:ynsyldrm69@mersin.edu.tr)

İÇİNDEKİLER

Araştırma Makalesi

The Relationship Between Anthropometric Characteristics and Tapping Dynamic Strength, Balance, and Force Velocity in Elite Handball Players /
Elit Hentbolcularda Antropometrik Özellikler ile Vurma Dinamik Kuvveti, Denge ve Kuvvet-Hız İlişkisi

***Derya Çetin SARIŞIK**

1-14

Araştırma Makalesi

Sporcularda Kafein Tüketiminin Bazı Değişkenlere Göre İncelenmesi
/ An Examination of Caffeine Consumption in Athletes According to Some Variables

*** Ezgi SAMAR , Okan KARTAL , Cansu YILMAZ**

15-23

Araştırma Makalesi

Effects of an Eight-Week Basic Swimming Training Program on Kinanthropometric Characteristics, Flexibility, and Muscular Strength in Girls and Boys Aged 6–13 Years /
Haftalık Temel Yüzme Eğitiminin 6–13 Yaş Kız ve Erkek Çocuklarda Kinantropometrik Özellikler, Esneklik ve Kas Kuvveti Üzerine Etkileri

*** Kübra Gül Kaplan, Zekai ÇAKIR**

24-36

The Relationship Between Anthropometric Characteristics and Tapping Dynamic Strength, Balance, and Force Velocity in Elite Handball Players

Elit Hentbolcularda Antropometrik Özellikler ile Vurma Dinamik Kuvveti, Denge ve Kuvvet-Hız İlişkisi

Derya Çetin SARIŞIK^{1*}

^{1*} Department of Physical Education and Sports Education, Faculty of Sports Sciences, Bayburt University, Bayburt, Turkey
Orcid:0000-0003-4659-0803, Eposta: deryacetin@bayburt.edu.tr

*Corresponding author: Derya Çetin Sarışık

Araştırma Makalesi / Research Article Doi: <https://doi.org/10.5281/zenodo.19882790>

Gönderi T. / Received : 15.11.2025

Kabul T. / Accepted : 30.03.2026

Online Yayın T. / Published : 29.04.2026

Abstract

The aim of this study was to examine the relationships between anthropometric characteristics and dynamic strength, balance, and force–velocity parameters following taping application in elite handball players. Fourteen elite male athletes competing in the Turkish Men’s Handball Super League participated in the study (age: 22.85 ± 2.87 years; height: 169.71 ± 5.22 cm; body weight: 65.78 ± 6.65 kg). Anthropometric data such as height, weight, body mass index, and leg length were measured using standard methods. Dynamic strength, balance, and force–velocity tests were conducted before and after taping application. Spearman’s correlation coefficient was used for data analysis. The analyses revealed significant positive correlations between height and body weight ($r = .742, p < .01$), height and Vmax ($r = .663, p < .05$), height and the Dynamic High Jump test ($r = .697, p < .05$), leg length and the Dynamic High Jump test ($r = .797, p < .01$), and BMI and Pmax ($r = .693, p < .05$). The findings demonstrate that anthropometric characteristics play a determining role in strength and velocity parameters in handball players. In particular, the significant associations of height, leg length, and BMI with performance outcomes highlight the importance of considering anthropometric data in player selection and training planning.

Keywords: Handball, anthropometric characteristics, strength, balance

Öz

Bu araştırmanın amacı, elit düzeyde hentbolcuların antropometrik özellikleri ile taping uygulaması sonrası dinamik kuvvet, denge ve force–velocity parametreleri arasındaki ilişkileri incelemektir. Literatürde hentbol gibi yüksek şiddetli, çok yönlü performans gerektiren branşlarda antropometrik özelliklerin performans belirleyicisi olduğu vurgulanmaktadır. Çalışmaya Türkiye Erkek Hentbol Süper Ligi’nde yer alan 14 elit erkek sporcu katılmıştır (yaş: $22,85 \pm 2,87$ yıl; boy: $169,71 \pm 5,22$ cm; vücut ağırlığı: $65,78 \pm 6,65$ kg). Katılımcıların boy, kilo, vücut kitle indeksi ve bacak uzunluğu gibi antropometrik verileri standart yöntemlerle ölçülmüştür (Çalışkan & Zeki, 2017). Dinamik kuvvet, denge ve force–velocity testleri taping uygulaması öncesi ve sonrası gerçekleştirilmiştir. Verilerin analizinde Spearman korelasyon katsayısı kullanılmıştır. Analizler sonucunda; boy ile vücut ağırlığı ($r = ,742; p < 0,01$), boy ile Vmax ($r = ,663; p < 0,05$) ve Dinamik Yüksek Çıkış testi ($r = ,697; p < 0,05$), bacak uzunluğu ile DYK ($r = ,797; p < 0,01$) ve VKİ ile Pmax ($r = ,693; p < 0,05$) arasında anlamlı pozitif ilişkiler saptanmıştır. **Sonuç:** Elde edilen bulgular, antropometrik özelliklerin hentbolcularda kuvvet ve velocity parametreleri üzerinde belirleyici rol oynadığını göstermektedir. Özellikle boy, bacak uzunluğu ve VKİ’nin performans çıktılarıyla olan anlamlı ilişkisi, oyuncu seçimi ve antrenman planlamasında antropometrik verilerin dikkate alınmasının önemini ortaya koymaktadır.

Anahtar Kelimeler; Hentbol, Antropometrik özellikler, Kuvvet, Denge

**This study was presented as an abstract at the 8th International Eurasian Conference on Sports, Education and Society*

Introduction

Athletes involved in sports must possess superior characteristics in terms of speed, strength, skill, coordination, anthropometry, and physiology. It is necessary to proceed based on scientific research to develop the skills and abilities that athletes possess. In order to achieve the goals set in sport, examining the athlete's anthropometric and physiological characteristics, applying the correct training model, and working at the right place and time will greatly contribute to the athlete reaching the desired goal (Ersöz, Özkara, & Karakaya, 1996; Duyul Albay, Zorba, & Saygın, 2008).

Considering the fast and accurate playing characteristics of handball, handball players must possess a high level of basic motor skills such as strength, speed, agility, balance, jumping ability, and coordination (Eler & Bereket, 2001). In handball, the ability to generate quick strength and maintain strength plays a significant role in the athlete's ability to score. In handball, the ability of players to jump

and shoot, their hang time in the air, and their ability to block shots are almost entirely based on jumping power, which forms the foundation of these techniques (Koç & Aslan, 2010). At the same time, the high anaerobic capacity of handball players, particularly for high-intensity contact and mobility with short breaks during the game, is among the main factors affecting performance (Rannou, Ben Abderrahman, Bishop, & Chamari, 2001).

In addition to the parameters mentioned above, tactical skills and game strategies play an important role in handball players (Tsunawake, Tahara, Moji, Muraki, Minowa, & Yukawa, 2003). The athlete's ability to make quick decisions, gain time for the next move, and provide the correct movement components varies depending on the motor responses to signals from the peripheral nervous system.

As in many sports, the balance parameter holds an important place in handball. Athletes need to have good balance parameters for both the development of their sporting skills and the prevention of injuries (Haksever, Ersöz, & Bayraktar, 2023). In a sport such as handball, which involves direct contact, protection from injuries will greatly positively affect the athlete's performance. Therefore, in handball, balance is fundamental to jumps and falls. A high balance protects the athlete both against opponents and in terms of preventing injuries.

The aim of this study is to examine the effects of taping on dynamic strength, balance, and force-velocity profile in elite handball players based on their anthropometric characteristics; to reveal the relationship between these variables, and to contribute scientifically to performance-oriented evaluations. Within this scope, the relationship between the athletes' physical characteristics (height, weight, body composition, etc.) and performance parameters was evaluated, and the potential supportive or limiting effects of taping on these performance components were analysed.

METHOD

Study Group

Our research group consists of 15 athletes from the Spor Toto Handball Team competing in the Super League. Prior to the research, participants were provided with detailed information about the study and read the World Medical Association's Declaration of Helsinki. They signed a "Voluntary Consent Form" confirming their voluntary participation in the research.

Data Collection Tools

The participants' body composition, anthropometric measurements, balance, dynamic strength, force velocity, and jumping performance were assessed at the TOHM sports performance laboratory. Each athlete participating in the study was provided with detailed information about the study and the protocols of the tests performed.

Participants' body composition, anthropometric measurements, and balance measurements were taken on the morning of Day 1. On Day 2, strength and jumping performance measurements were taken. Participants underwent a 15-minute warm-up exercise protocol before the measurements.

Body Composition Measurements

Participants in the study underwent body composition measurements wearing shorts and a T-shirt, barefoot. Height, body weight, body fat percentage, and BMI scores were measured using the Tanita BC418 Segmental Body Composition Scale (TANITA BC-418, Tanita, Tokyo, Japan) (Güder, Yılmaz & Karakaya, 2022).

Anthropometric measurements

Skinfold Measurements: All measurements were taken twice on the right side of the athletes, and the average value was recorded. **Triceps Skinfold Thickness:** Measured vertically on the skin fold over

the muscle, at the midpoint between the "acromion" of the scapula and the "olecranon" process of the ulna, on the back-midline of the upper arm (over the triceps muscle). Subscapular Skinfold Thickness: With the arm hanging down and the body relaxed, the skin fold was pinched diagonally across the body, just below the scapula and parallel to the edge of the bone. Suprailiac 2 Skin Fold Thickness: Measured by pinching the skin fold slightly diagonally (semi-horizontally) just above the ilium on the midline of the body. Calf Skinfold Thickness: The measurement was taken by grasping the skin and fat tissue on the medial side of the widest part of the right calf. (Pazarözyurt & İnce, 2009)

Balance Test Protocol

A dynamic balance device was used to measure balance ability. Postural control was assessed using the body's centre of gravity/pressure. Three different indices are formed according to the direction of deviations from the horizontal plane: total stability, anterior-posterior, and medial-lateral. These indices are calculated according to the region corresponding to the letters in the balance results. Three tasks were defined and performed sequentially in the test. These tasks were maintaining postural control on both feet, on the right foot, and on the left foot. Participants were instructed to stand as still as possible on a force platform for 10 seconds, minimising sway by maintaining the body's centre of gravity. The test was initiated by the examiner when the participant stepped onto the platform. Participants were asked to remain as stable as possible for up to 10 seconds for each test measurement position. The test was terminated when subjects could no longer maintain the test position requirements. Test measurements were performed once in each test position, with a 10-second rest period between positions. When subjects completely lost their balance (fell off the force platform or, in single-leg stance, supported themselves with their foot on the force plate or the ground for more than 1 second), the test was terminated, and the subject repeated the test. Before the test, measurements were taken, and subjects performed 1 ± 2 trials of each test position.

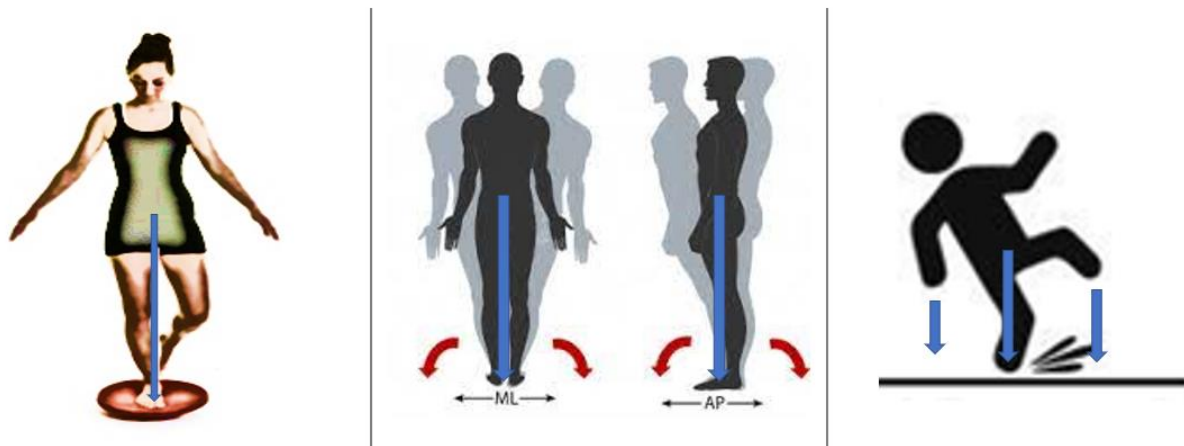


Figure 1. When postural sway increases, the body cannot maintain its centre of gravity.

SQUAT JUMP AND COUNTERMOVEMENT JUMP TEST.

The Optojump device was used in the jump test. The athletes' values were recorded in the Optojump programme.

Squat Jump: In the squat jump test, which measures the explosive strength characteristic exhibited by the leg muscles based on maximum strength, a full upward jump is performed with the knees flexed at 90 degrees in the squat position and the hands on the waist.

Active Jump: In this test, in addition to measuring the explosive strength of the leg muscles, the elastic force property that affects explosive strength in jumping also comes into play. The active jump

test is performed by quickly squatting down with the knees fully extended and upright, and then performing a full upward jump.

Evaluation

- Athletes with a high squat value but a low active jump value may be interpreted as having a deficiency in "jump-specific coordination."
- Athletes with a high active jump value but a low squat value may be interpreted as having insufficient explosive strength abilities.
- However, in some athletes, if the active jump value is high but the squat is below average, this should be interpreted as a deficiency in leg strength.
- Coaches can compare athletes based on the relative strength values for each jump.

DYNAMIC STRENGTH INDEX (DSI) TEST

Data Collection Tools

Jump height, ground contact time, and flight time were recorded using the Microgate Opto Jump device. The isometric mid-thigh pull (IMTP) test was measured using the Kistler brand – MVC measurement system.

Data Collection

Prior to the test, the athlete's body weight (kg), the distance between the SIA (spina iliaca anterior superior) and the fingertips (cm), and the distance from the SIA projection to the ground while the athlete was in a 90-degree squat position were measured and recorded. The athletes were warmed up for 15 minutes. The athletes were placed on the Optojump device, and three CMJ jumps were performed and recorded, with one minute of rest in between. The athletes rested for 3 minutes. The athletes were then placed on the Kistler device, and three IMTP pulls were performed and recorded, with each pull lasting 5-10 seconds and one minute of rest in between. The data were processed using Excel software, and the results were evaluated.

DSI was calculated using formulas based on the ratio of ballistic peak force to isometric peak force. The DSI values identified in the athletes were evaluated according to Table 1.

Table 1. Percentage values used in interpreting DSI

DSI PUANI	Proposed Training Program	Proposed Training Programı
<%60	Low	Ballistic strength training
%60 - %80	Moderate	Concurrent strength training
>%80	High	Strength training

The dynamic strength index provides information about athletes' capacity to generate ballistic force using explosive power and maximal strength, as well as any deficiencies in the performance components that constitute this performance. Coaches can reorganise training programmes based on this information. It is recommended that measurements be repeated at specific times of the year to regularly monitor the performance components that athletes aim to develop.

Data Analysis and Interpretation

The statistical analysis of the data obtained within the scope of the research was performed using Microsoft Excel and SPSS 22.0 computer software. First, a missing data assessment was conducted in the research. As a result of this process, no missing data was detected. Measurements were taken once for the anthropometric characteristics taken as independent variables and the jump, tapping, strength, velocity, and balance parameters taken as dependent variables from the 14 athletes participating in the study. First, the normality assumptions for the obtained data were checked with the Shapiro-Willk test, and it was determined that the data did not meet the normality assumptions. The relevant literature indicates that skewness and kurtosis values are also prominent for normality assumptions. For these values, the -1.5 +1.5 range suggested by Tabachnick and Fidell (2013) was considered, and it was determined that the values did not fall within the specified limits. Accordingly, Spearman's correlation analysis was used to determine the relationships between the parameters. The coefficients obtained from this analysis were evaluated according to Schober et al. (2018) (.00-.10: insignificant, .10-.39: weak, .40-.69: moderate, .70-.89: strong, .90-1: very strong).

FINDINGS

Table 1. Spearman Correlation Analysis Results Regarding the Relationship Between Anthropometric Characteristics and Jumping Parameters

Variables		Time in the air	Contac t	Height	Powe r	Pace Step	Walking pointx	Walking Point gapx	Step with
Fat Mass	r	,095	,149	,108	,147	-,090	,437	,420	,433
	p	,747	,612	,714	,615	,759	,118	,135	,122
	n	14	14	14	14	14	14	14	14
Lean Mass	r	,218	,126	,204	,108	-,231	,231	,196	,437
	p	,454	,667	,483	,714	,427	,427	,503	,118
	n	14	14	14	14	14	14	14	14
Triceps	r	,040	,557*	,038	-,113	-,148	,413	,444	,470
	p	,892	,039	,899	,702	,614	,142	,112	,090
	n	14	14	14	14	14	14	14	14
Subscapular	r	-,044	,007	-,055	-,002	,077	,135	,183	-,051
	p	,881	,982	,851	,994	,793	,646	,531	,863
	n	14	14	14	14	14	14	14	14
Midaxillar	r	,265	,281	,270	,162	-,281	,334	,385	,369
	p	,360	,330	,351	,581	,331	,243	,174	,194
	n	14	14	14	14	14	14	14	14
Chest	r	-,177	,058	-,185	-,062	,145	,029	,084	-,154
	p	,546	,845	,527	,834	,620	,923	,776	,599
	n	14	14	14	14	14	14	14	14
Abdomen	r	,031	,063	,029	,068	-,011	,231	,209	,187
	p	,917	,830	,923	,817	,970	,427	,474	,523
	n	14	14	14	14	14	14	14	14
Subrallak	r	-,075	,003	-,059	-,031	,101	,541*	,484	,249
	p	,799	,991	,840	,917	,731	,046	,079	,391
	n	14	14	14	14	14	14	14	14

Thigh	r	-,013	-,032	-,040	-,097	,086	-,068	-,042	,183
	p	,964	,915	,893	,742	,770	,817	,887	,532
	n	14	14	14	14	14	14	14	14

Upon examination of Table 1, no statistically significant relationship was found between anthropometric variables such as fat mass, lean mass, triceps, subscapular, midaxillary, chest, abdomen, and thigh circumference and jump parameters. However, while no significant relationship was found between the subrallak parameter and jumping parameters, a moderately positive ($r=0.541$; $p=0.046$) significant relationship was found between walking pointx and subrallak.

Table 2. Spearman Correlation Analysis Results Regarding the Relationship Between Anthropometric Characteristics and Taping Left Foot Parameters

Variables		Time on				
		Time in the Air	Ground	Pace StepS	Pace StepM	Stride Time Cycle
Fat Mass	r	,079	,054	-,268	-,268	,058
	p	,787	,854	,355	,354	,843
	n	14	14	14	14	14
Lean Mass	r	-,069	,115	,184	,184	,025
	p	,814	,696	,529	,528	,933
	n	14	14	14	14	14
Triceps	r	,528	,669**	-,641*	-,642*	,612*
	p	,052	,009	,013	,013	,020
	n	14	14	14	14	14
Subscapular	r	,163	,047	-,401	-,401	,099
	p	,577	,874	,155	,155	,737
	n	14	14	14	14	14
Midaxillar	r	,285	,316	-,398	-,397	,294
	p	,323	,270	,159	,160	,307
	n	14	14	14	14	14
Chest	r	-,157	-,236	-,072	-,073	-,208
	p	,593	,417	,806	,803	,476
	n	14	14	14	14	14
Abdomen	r	,312	,250	-,570*	-,570*	,280
	p	,277	,389	,033	,033	,332
	n	14	14	14	14	14
Subrallak	r	,447	,343	-,609*	-,609*	,413
	p	,109	,230	,021	,021	,143
	n	14	14	14	14	14
Thigh	r	,548*	,627*	-,473	-,472	,582*
	p	,043	,016	,088	,088	,029
	n	14	14	14	14	14

Table 2 shows that there is no statistically significant relationship between fat mass, lean mass, subscapular, midaxillary, and chest anthropometric variables and taping parameters for the left foot. However, while no significant relationship was found between the triceps and the airborne taping parameter included in the study, a moderate positive relationship was found between the ground contact time and the triceps parameter ($p=,669$; $r=,009$), a moderate negative relationship between pace stepS ($p=,641$; $r=0.013$), a moderate negative relationship was found between pace stepM ($p=-0.642$; $r=0.013$), and finally, a moderate positive relationship was found between stride time cycle ($p=0.612$; $r=0.020$). These relationships were statistically significant.

When examining the results related to the abdomen parameter, no statistically significant relationship was found between the airborne time, ground contact time, and stride time cycle parameters, while a moderately negative relationship was found between pace stepS ($p=0.033$; $r = -0.570$) and pace stepM ($p = -0.570$; $r = 0.033$), and this relationship was found to be statistically significant.

When examining the results related to the subrallak parameter, no statistically significant relationship was found between the airborne time, ground contact time, and stride time cycle parameters. However, a moderately negative relationship was found between pace steps ($p=-,609$; $r=0.021$) and pace ptepm ($p=-0.609$; $r=0.021$), and this relationship is statistically significant.

Finally, when examining the results related to the Thigh parameter, no statistically significant relationship was found between the pace stepS and pace stepM parameters. However, a moderately positive relationship was found between hang time ($p=0.043$; $r=0.548$), and a moderately positive relationship was found between stride time cycle ($p=0.029$; $r=-0.627$). $r=-0.627$, and stride time cycle ($p=0.029$; $r=0.582$), and that this relationship is statistically significant.

Table 3. Spearman Correlation Analysis Results Regarding the Relationship Between Anthropometric Characteristics and Taping Right Foot Parameters

Variables		Ground				
		Time in the Air	Contact Time	Pace StepS	Pace StepM	Stride Time Cycle
Fat Mass	r	,669**	,027	-,128	-,160	,061
	p	,009	,927	,663	,585	,835
	n	14	14	14	14	14
Lean Mass	r	-,251	,078	,197	,206	,031
	p	,387	,792	,500	,479	,916
	n	14	14	14	14	14
Triceps	r	,355	,598*	-,695**	-,691**	,625*
	p	,213	,024	,006	,006	,017
	n	14	14	14	14	14
Subscapular	r	,514	,025	-,317	-,335	,096
	p	,060	,933	,270	,242	,744
	n	14	14	14	14	14
Midaxillar	r	,485	,258	-,306	-,314	,290
	p	,079	,374	,287	,274	,314
	n	14	14	14	14	14
Chest	r	,511	-,238	,023	-,005	-,205

	p	,062	,412	,937	,985	,483
	n	14	14	14	14	14
Abdomen	r	,423	,202	-,407	-,447	,288
	p	,131	,488	,149	,109	,318
	n	14	14	14	14	14
Subrallak	r	,534*	,331	-,416	-,456	,420
	p	,049	,247	,139	,102	,135
	n	14	14	14	14	14
Thigh	r	,241	,574*	-,544*	-,508	,568*
	p	,407	,032	,044	,063	,034
	n	14	14	14	14	14

Table 3 shows that there is no statistically significant relationship between lean mass, subscapular, midaxillary, chest, and abdominal anthropometric variables and taping right foot parameters. However, while no significant relationship was found between the triceps and the parameters of time spent in the study area, pace steps, pace step M, and stride time cycle, a moderate positive relationship ($p=0.009$; $r=0.669$) was observed between time spent in the air and the fat mass parameter, and this relationship was found to be statistically significant.

When examining the results related to the triceps parameter, no statistically significant relationship was found between the hang time parameters. However, a moderately positive relationship was found between hang time and time spent on the ground ($p=0.024$; $r=0.598$), a moderately negative relationship between pace stepS and hang time ($p=0.006$; $r=-,695$) a moderate negative relationship, between pace stepM ($p=.006$; $r=-,691$) a moderate negative relationship, and between stride time cycle ($p=.017$; $r=.625$) a moderate positive relationship, and that this relationship is statistically significant.

When examining the results related to the subrallak parameter, no significant relationship was found between ground contact time, pace steps, pace step M, and stride time cycle parameters. However, a moderately positive relationship was observed between airborne time and the subrallak parameter ($p=0.049$; $r=0.534$), and this relationship was statistically significant.

Finally, when examining the results related to the Thigh parameter, no statistically significant relationship was found between the airborne time and pace stepM parameters, while a moderately positive relationship was found between ground contact time ($p=0.032$; $r=0.574$), a moderately positive relationship between pace stepS ($p=0.044$; $r = -0.544$), and stride time cycle ($p = 0.034$; $r = 0.568$), and this relationship is statistically significant.

Table 4. Spearman Correlation Analysis Results Regarding the Relationship Between Anthropometric Characteristics and Dynamic Force Parameters

Variables		Force JH	Force JF	Force IMTP	Force IMTP	Force DSI
				PeakKG	PeakfN	
Fat Mass	r	-,315	,530	,306	,306	,433
	p	,273	,051	,287	,287	,122
	n	14	14	14	14	14
Lean Mass	r	,548*	,013	-,084	-,084	,114
	p	,042	,964	,776	,776	,697
	n	14	14	14	14	14
Triceps	r	-,104	,013	-,272	-,272	,239
	p	,724	,964	,347	,347	,411
	n	14	14	14	14	14
Subscapular	r	-,460	,517	,414	,414	,362
	p	,098	,058	,141	,141	,203
	n	14	14	14	14	14
Midaxillar	r	-,118	,334	,134	,134	,315
	p	,689	,243	,648	,648	,273
	n	14	14	14	14	14
Chest	r	-,308	,600*	,317	,317	,368
	p	,284	,023	,270	,270	,195
	n	14	14	14	14	14
Abdomen	r	-,247	,552*	,604*	,604*	,323
	p	,395	,041	,022	,022	,259
	n	14	14	14	14	14
Subrallak	r	-,390	,291	,168	,168	,412
	p	,168	,313	,567	,567	,143
	n	14	14	14	14	14
Thigh	r	-,050	-,280	-,073	-,073	-,126
	p	,866	,332	,805	,805	,669
	n	14	14	14	14	14

Table 4 shows that there is no statistically significant relationship between fat mass, triceps subscapular, midaxillary, chest, subrallak, and thigh anthropometric variables and dynamic force parameters. However, while no significant relationship was found between lean mass and the force JF, force imtp peakKG, force imtp peakfN, and force DSI parameters included in the study, a moderate positive relationship was found between force JH and the lean mass parameter ($p=.042$; $r=0.548$), and this relationship was found to be statistically significant.

When examining the results related to the abdominal parameter, no statistically significant relationship was found between the force JH and force DSI parameters, while a moderately positive relationship was found between force JF ($p=.041$; $r=.552$) and force imtp peakKG ($p=.022$; $r=0.604$), and strength imtp peakfN ($p=0.022$; $r=0.604$), and that this relationship is statistically significant.

Table 5. Spearman Correlation Analysis Results Regarding the Relationship Between Anthropometric Characteristics and Balance Parameters

Variables		Balance Density	Balance Amplitude
Fat Mass	r	-,327	,424
	p	,253	,131
	n	14	14
Lean Mass	r	-,626*	,468
	p	,017	,091
	n	14	14
Triceps	r	-,536*	,594*
	p	,048	,025
	n	14	14
Subscapular	r	,095	,086
	p	,747	,770
	n	14	14
Midaxillar	r	-,378	,524
	p	,182	,054
	n	14	14
Chest	r	,073	,075
	p	,805	,799
	n	14	14
Abdomen	r	,015	,112
	p	,958	,703
	n	14	14
Subrallak	r	-,070	,200
	p	,811	,493
	n	14	14
Thigh	r	-,458	,421
	p	,099	,134
	n	14	14

Table 5 shows that there is no statistically significant relationship between fat mass, subscapular, midaxillary, chest, abdomen, subrallak, and thigh anthropometric variables and balance parameters. However, while no significant relationship was found between lean mass and the balance amplitude parameter included in the study, a moderate negative relationship ($p=.017$; $r=-.626$) was observed between balance intensity and lean mass parameter, and this relationship was found to be statistically significant.

When examining the results related to the abdomen parameter, a moderately negative relationship was found between balance density and triceps ($p=.048$; $r=-.536$), and a moderately positive relationship was found between balance amplitude ($p=.025$; $r=.594$), and this relationship was found to be statistically significant.

Table 6. Spearman Correlation Analysis Results Regarding the Relationship Between Anthropometric Characteristics and Velocity Parameters

Variables		Velocity FOKG	Velocity VOM	Velocity Max
Fat Mass	r	-,101	-,128	-,274
	p	,731	,664	,343
	n	14	14	14
Lean Mass	r	-,053	,431	,234
	p	,858	,124	,420
	n	14	14	14
Triceps	r	-,075	,102	-,191
	p	,798	,729	,513
	n	14	14	14
Subscapular	r	-,049	-,325	-,315
	p	,869	,257	,272
	n	14	14	14
Midaxillar	r	-,128	-,024	-,133
	p	,662	,934	,649
	n	14	14	14
Chest	r	,021	-,247	-,103
	p	,943	,395	,726
	n	14	14	14
Abdomen	r	-,156	-,101	-,183
	p	,594	,731	,530
	n	14	14	14
Subrallak	r	-,370	,116	-,478
	p	,193	,694	,084
	n	14	14	14
Thigh	r	,141	-,221	-,172
	p	,630	,449	,557
	n	14	14	14

Table 6 shows that there is no statistically significant relationship between fat mass, subscapular, midaxillary, chest, abdomen, subrallak, and thigh anthropometric variables and balance parameters.

DISCUSSION

This study examined the effects of various anthropometric characteristics on strength, balance, and taping performance in elite handball players. The findings indicate that body composition variables, particularly muscle circumference and lean mass, are decisive in performance tests.

Firstly, the positive correlation found between lean mass and circumference measurements and isometric strength tests (IMTP) supports previous studies. Maughan, Watson, and Weir (1983) noted a strong relationship between muscle mass and maximal force production. Similarly, Abe, Kearns, and Fukunaga (2000) emphasised that upper and lower extremity circumferences can be used to predict

strength capacity. The relationship between abdominal circumference and IMTP in the current study supports the view that core muscles play a fundamental role in force production (Kibler, Press & Sciascia, 2006).

The fact that variables such as stride time cycle, ground contact time, and step frequency in the taping test show significant relationships with triceps and thigh circumference reveals that lower extremity muscle mass is particularly effective on agility and mobility. This parallels findings reported by Reilly, Williams, Nevill, and Franks (2000), indicating that lower body strength influences agility and change-of-direction performance. Furthermore, Gabbett, Kelly, and Sheppard (2008) confirmed the direct relationship between strength development and agility, particularly in contact team sports.

The observed relationships between balance parameters and triceps circumference and lean mass point to indirect effects of the upper extremity on postural control. Winter (1995) noted that the interaction between the central nervous system, proprioceptive feedback, and muscle mass is important for postural balance. The findings of the present study are consistent with previous studies on the effect of muscle mass on balance strategies (Gribble, Hertel & Plisky, 2004; Paillard, Noé, Rivière, Marion & Montoya, 2006). Particularly in sports such as handball, which heavily utilise the upper extremities, the effect of the shoulder girdle and upper arm muscle structure on stability may be even more pronounced.

The study found no significant relationship between jump tests and anthropometric variables. This result supports studies suggesting that jump performance is determined not only by muscle mass but also by neuromuscular factors such as motor unit activation, tendon stiffness, and movement technique (Cormie, McGuigan & Newton, 2011; Markovic & Mikulic, 2010). In this context, better motor coordination and muscle-fascia chain interaction may play a role in individuals who can demonstrate high jumping performance (Bobbert & van Ingen Schenau, 1988).

Furthermore, some studies conducted on handball players in the literature have also indicated that anthropometric characteristics differ according to position and that their effect on performance varies (Bayios, Anastasopoulou, Sioudris & Boudolos, 2006). It has been shown that elite handball players have different body compositions according to their positions and that these differences have significant effects on performance. Therefore, evaluating the current findings with position-based differences in mind may provide a more comprehensive interpretation.

In conclusion, this study demonstrates that anthropometric characteristics are related to performance components such as strength, balance, and taping in a sport like handball, which requires versatile physical capacity. These findings should be taken into account in individualised performance assessments and the structuring of training programmes for athletes. Future studies could enhance the generalisability of these findings by conducting longitudinal analyses, gender-based comparisons, and position-based evaluations.

CONCLUSION

This study was conducted to examine the relationship between anthropometric characteristics and taping, dynamic strength, balance, and strength-velocity relationships in elite handball players. The findings revealed that certain anthropometric measurements are significantly related to performance parameters, particularly strength and balance.

In general, variables such as lean mass, triceps, and thigh circumference were observed to play a decisive role in taping, strength, and balance performance. In particular, the fact that triceps circumference and thigh circumference were significantly related to stride time, cycle, ground contact time, and step parameters in taping tests suggests that lower limb anthropometry has important effects on athletic mobility and balance. The presence of positive, significant relationships between dynamic strength parameters and lean mass and abdominal circumference supports the interaction between strength development and body composition.

In terms of balance parameters, the relationship between triceps and lean mass density and amplitude variables suggests that muscle mass distribution may affect postural control. However, the absence of a significant relationship between jumping performance and anthropometric variables indicates that this ability may be more dependent on neuromuscular coordination and technical factors.

References

- Abe, T., Kearns, C. F., & Fukunaga, T. (2000). Muscle volume and strength of the lower extremities. *International Journal of Sports Medicine*, 21(4), 245–250.
- Bayios, I. A., Anastasopoulou, E. M., Sioudris, D. S., & Boudolos, K. D. (2006). Relationship between anthropometric and performance parameters in young female volleyball players. *Journal of Sports Medicine and Physical Fitness*, 46(2), 271–277.*
- Bobbert, M. F., & van Ingen Schenau, G. J. (1988). Coordination in vertical jumping. *Journal of Biomechanics*, 21(3), 249–262.*
- Cormie, P., McGuigan, M. R., & Newton, R. U. (2011). Developing maximal neuromuscular power. *Sports Medicine*, 41(1), 17–38.*
- Duyul Albay, M., Tutkun, E., Ağaoğlu, Y. S., & Canikli, A. (2008). Hentbol, voleybol ve futbol üniversite takımlarının bazı motorik ve antropometrik özelliklerinin incelenmesi. *Sportmetre Beden Eğitimi ve Spor Bilimleri Dergisi*, 6(1), 13–20. https://doi.org/10.1501/Sporm_0000000129
- Eler, S., & Bereket, S. (2001). Elit Türk ve yabancı hentbolcuların motorik ve fizyolojik parametrelerinin karşılaştırılması. *Gazi Beden Eğitimi ve Spor Bilimleri Dergisi*, 6(4), 46–48.*
- Ersöz, G., Koz, M., Sunay, H., & Gündüz, N. (1996). Erkek voleybol oyuncularının sezon öncesi, sezon ortası ve sezon sonu fiziksel uygunluk düzeyi parametrelerindeki değişimler. *Gazi Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi*, 1(4), 1–7.*
- Gabbett, T. J., Kelly, J. N., & Sheppard, J. M. (2008). Speed, change of direction speed, and reactive agility of rugby league players. *Journal of Strength and Conditioning Research*, 22(1), 174–181.*
- Gribble, P. A., Hertel, J., & Plisky, P. (2004). Using the star excursion balance test to assess dynamic postural-control deficits and outcomes in lower extremity injury: A literature and systematic review. *Journal of Athletic Training*, 39(3), 287–295.*
- Güder, F., & Canbolat, B., & Günay, M. (2022). 12–14 yaş taekwondocularda vücut kompozisyonu, kuvvet ve esneklik ilişkisinin incelenmesi. *Akdeniz Spor Bilimleri Dergisi*, 5(1), 166–175.*
- Güder, F., & Eyuboğlu, E. (2023). Ünilig ragbi sporcularının fiziksel ve fizyolojik özelliklerinin mevkilerine göre incelenmesi. *Akdeniz Spor Bilimleri Dergisi*, 6(1), 238–250. <https://doi.org/10.38021/asbid.1251999>*
- Haksever, B., Summakoğulları, S., Soylu, Ç., & Demir, P. (2023). Elit erkek futbol, basketbol ve hentbol oyuncularının denge ve fonksiyonellik performanslarının karşılaştırılması: Kesitsel bir çalışma. *CBÜ Beden Eğitimi ve Spor Bilimleri Dergisi*, 18(1), 95–110. <https://doi.org/10.33459/cbubesbd.1195278>*
- Kibler, W. B., Press, J., & Sciascia, A. (2006). The role of core stability in athletic function. *Sports Medicine*, 36(3), 189–198.*
- Koç, H., & Aslan, C. S. (2010). Hentbolcularda bazı fiziksel ve fizyolojik özelliklerin incelenmesi. *Uluslararası İnsan Bilimleri Dergisi*, 7(1), 193–206.
- Markovic, G., & Mikulic, P. (2010). Neuro-musculoskeletal and performance adaptations to lower-extremity plyometric training. *Sports Medicine*, 40(10), 859–895.*
- Maughan, R. J., Watson, J. S., & Weir, J. (1983). Strength and cross-sectional area of human skeletal muscle. *Journal of Physiology*, 338(1), 37–49.*
- Paillard, T., Noé, F., Riviere, T., Marion, V., Montoya, R., & Dupui, P. (2006). Postural performance and strategy in the unipedal stance of soccer players at different levels of competition. *Journal of Athletic Training*, 41(2), 172–176.*
- Pazarözyurt, İ. ve İnce, G. (2009). Elit Bayan Basketbolcularda Antropometrik Özellikler, Dikey Sıçrama ve Omurga Esnekliğinin Mevkilere Göre İncelenmesi. *SPORMETRE Beden Eğitimi Ve Spor Bilimleri Dergisi*, 7(1), 9-18. https://doi.org/10.1501/Sporm_0000000144
- Rannou, F., Prioux, J., Zouhal, H., Gratas-Delamarche, A., & Delamarche, P. (2001). Physiological profile of handball players. *Journal of Sports Medicine and Physical Fitness*, 41(3), 349–353.*

-
- Reilly, T., Bangsbo, J., & Franks, A. (2000). Anthropometric and physiological predispositions for elite soccer. *Journal of Sports Sciences, 18*(9), 669–683.*
- Schober, P., Boer, C., & Schwarte, L. A. (2018). Correlation coefficients: Appropriate use and interpretation. *Anesthesia & Analgesia, 126*(5), 1763–1768. <https://doi.org/10.1213/ANE.0000000000002864>
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston, MA: Pearson Education.
- Tsunawake, N., Tahara, Y., Moji, K., Muraki, S., Minowa, K., & Yukawa, K. (2003). Body composition and physical fitness of female volleyball and basketball players of the Japan inter-high school championship teams. *Journal of Physiological Anthropology and Applied Human Science, 22*(4), 195–201. <https://doi.org/10.2114/jpa.22.195>*
- Winter, D. A. (1995). Human balance and posture control during standing and walking. *Gait & Posture, 3*(4), 193–214.*

Sporcularda Kafein Tüketiminin Bazı Değişkenlere Göre İncelenmesi

An Examination of Caffeine Consumption in Athletes According to Some Variables

Ezgi SAMAR¹, Okan KARTAL², Cansu YILMAZ³

¹Artvin Çoruh Üniversitesi Spor Bilimleri Fakültesi, email: ezgi@artvin.edu.tr 0000-0002-9376-9307

²Artvin Çoruh Üniversitesi Lisansüstü Eğitimi Enstitüsü Beden Eğitimi ve Spor, email: okan_kartal08@hotmail.com Orcid Id: 0000-0002-7028-4892

³Artvin Çoruh Üniversitesi Lisansüstü Eğitimi Enstitüsü Beden Eğitimi ve Spor email: cnsyll0@gmail.com Orcid Id: 0009-0002-6583-4674

*Corresponding author: Ezgi SAMAR

Araştırma Makalesi / Research Article

Doi : <https://doi.org/10.5281/zenodo.19885095>

Gönderi T. / Received : 10.01.2025

Kabul T. / Accepted : 30.03.2026

Online Yayın T. / Published : 29.04.2026

ÖZ

Amaç: Çalışmada sporcularda kafein tüketiminin bazı değişkenlere göre incelenmesi amaçlanmıştır. Yöntem: Çalışmaya 341 gönüllü sporcu katılmıştır. Araştırmada, katılımcıların demografik özelliklerini belirlemek amacıyla “Kişisel Bilgi Formu” ile birlikte, “Kısa Kafein Beklenti Ölçeği (B-CaffeQ)” kullanılmıştır. Katılımcılardan elde edilen veriler istatistiksel analizler için normallik analizine tabi tutulmuş ve burada değişkenlere ilişkin çarpıklık ve basıklık değerleri kontrol edilmiştir. Normal dağılıma uygun veriler bağımsız gruplar t-testi, tek yönlü varyans (ANOVA) analizi ve Pearson korelasyon analizi kullanılarak analiz edilmiş olup, anlamlılık düzeyi $p < 0,5$ olarak kabul edilmiştir. **Bulgular:** Araştırmada sporcuların kafein beklentileri çeşitli değişkenlere göre incelenmiştir. Cinsiyete göre yalnızca anksiyete/negatif fiziksel etkiler boyutunda anlamlı fark bulunmuş ve erkeklerin puanları daha yüksek çıkmıştır. Spor kategorileri arasında hiçbir boyutta anlamlı farklılık saptanmamıştır. BKİ açısından fiziksel performans artırma, enerji/iş gücü artırma ve sosyal/duygudurum artırma boyutlarında anlamlı fark görülmüş; normal kiloluların puanları kilolulardan yüksek bulunmuştur. Yaş değişkeni yoksunluk/bağımlılık, anksiyete ve sosyal/duygudurum artırma boyutlarıyla düşük düzeyde pozitif ilişkiler göstermiştir. Spor yılı ise hiçbir boyutta anlamlı ilişki vermemiştir. **Sonuç:** Kafein beklentilerinin demografik ve sportif değişkenlerden büyük ölçüde bağımsız olduğu; ancak özellikle cinsiyet, BKİ ve yaş değişkenlerinin bazı boyutlarda sınırlı fakat anlamlı farklılıklar oluşturduğu görülmektedir. Bu sonuçlar, sporcularda kafein kullanımının beklentisel boyutunun oldukça bireysel bir yapı taşıdığını ve fizyolojik/performans kategorileri yerine kişisel değişkenlerle daha fazla ilişkili olabileceğini düşündürmektedir.

Anahtar Kelimeler: Sporcu, Kafein, Sporcu performansı

Abstract

Aim: This study aimed to examine caffeine consumption among athletes according to some variables. **Method:** A total of 341 volunteer athletes participated in the study. The Brief Caffeine Expectancy Questionnaire (B-CaffeQ) was used alongside a Personal Information Form to determine the demographic characteristics of the participants. The data obtained from the participants were subjected to normality analysis for statistical analysis, and the skewness and kurtosis values of the variables were controlled. Data suitable for normal distribution were analysed using the independent groups t-test, one-way analysis of variance (ANOVA) and Pearson correlation analysis, with a significance level of $p < 0.05$. **Results:** The study examined athletes' caffeine expectancies according to various variables. Significant differences were found only in the anxiety/negative physical effects dimension based on gender, with males scoring higher. No significant differences were found in any dimension between sports categories. In terms of BMI, significant differences were observed in the dimensions of physical performance enhancement, energy/work capacity enhancement, and social/mood enhancement; those of normal weight scored higher than those who were overweight. The age variable showed low-level positive correlations with the deprivation/dependence, anxiety, and social/mood enhancement dimensions. Sport experience, however, did not show any significant correlation with any dimension. **Conclusion:** Caffeine expectancies were largely independent of demographic and sporting variables; however, gender, BMI and age variables were found to produce limited but significant differences in certain dimensions. These results suggest that the expectational dimension of caffeine use in athletes was highly individualised and may be more closely related to personal variables than to physiological/performance categories.

Keywords: Athlete, Caffeine, Athlete performance

Giriş

Modern spor bilimlerinde, atletik performansı maksimize etmek amacıyla kullanılan ergojenik desteklerin kullanımında belirgin bir artış gözlemlenmektedir. Bu destekler içerisinde kafein; hem sinir sistemi üzerindeki modülatör etkileri hem de fiziksel kapasitenin farklı parametrelerine sağladığı katkılar nedeniyle literatürde en sık incelenen bileşenlerden biri konumundadır.

Genellikle kahve tüketimi ile özdeşleştirilen kafein, doğada çok sayıda bitki türünün tohum, yaprak ve meyve kısımlarında (çay, kakao vb.) çeşitli konsantrasyonlarda sentezlenen doğal bir alkaloiddir (Wikoff vd., 2017). Doğal kaynakların yanı sıra, farmakolojik ürünlere ve nutrasötiklere (sporcu içecekleri, çikolata vb.) ilave edilmektedir. Kullanım sıklığı giderek artan bu bileşik, günlük beslenme rutininin bir parçası haline gelmiştir. Fizyolojik açıdan ele alındığında ise kafein; uygun dozlarda alımıyla dolaşım ve solunum sistemlerini regüle etme, dayanıklılık seviyesini yükseltme ve yorgunluk algısını baskılama gibi potansiyel yararlar sunmaktadır (Nehlig, 2016).

Sporcuların bu tür ergojenik desteklere yönelimi, sporun bireysel ve toplumsal düzlemdeki hayati rolü ile yakından ilişkilidir. Tarihsel süreçte hayatta kalma güdüsü ve savaş hazırlığı gibi temel ihtiyaçlardan doğan spor, günümüzde sosyalleşme, stres yönetimi, kişisel gelişim ve fiziksel bütünlüğün korunması gibi çok boyutlu işlevler üstlenmektedir (Dindar, 2019). Rekabet ve başarı odaklı bir disiplin olmasının ötesinde spor; belirli kurallar çerçevesinde icra edilen, zihinsel ve bedensel süreçleri kapsayan bütüncül bir aktivite olarak tanımlanabilir. Sporun sağladığı kazanımlar sadece bireysel sağlıkla sınırlı kalmayıp, toplum sağlığı açısından da stratejik bir öneme sahiptir (Zengin, 2010; Çakır ve ark., 2025a; 2025b). Sportif performans ise biyomekanik, fizyolojik ve psikolojik faktörlerin karmaşık bir etkileşimi sonucunda ortaya çıkan, belirli bir hedefe yönelik ölçülebilir eylemler bütünü olarak tanımlanmaktadır. Bir sporcunun potansiyelini en üst düzeye çıkarabilmesi, sadece genetik mirasa veya antrenman sıklığına değil, aynı zamanda nöromüsküler koordinasyon, motivasyonel süreçler ve beslenme durumu gibi çok sayıda iç ve dış değişkenin optimizasyonuna bağlıdır. Günümüz modern spor anlayışında, saniyelerin hatta saliselerin belirleyici olduğu rekabet ortamı, sporcuları ve antrenörleri performansı etkileyen tüm bileşenleri mikroskobik düzeyde incelemeye yöneltmiştir. Bu bağlamda, antrenman bilimi ve psikolojinin yanı sıra, yorgunluğu geciktirmek ve enerji üretim süreçlerini desteklemek amacıyla uygulanan beslenme stratejileri, performansın sürdürülebilirliği açısından kritik bir rol oynamaktadır.

Bu bilgiler doğrultusunda, sporcularda kafein tüketiminin farklı sosyodemografik ve sportif değişkenlere göre değişebileceği düşünülmektedir. Bu değişkenler; cinsiyet, yaş, boy, kilo, spor branşı, spor kategorisi (yıldızlar, gençler, ümitler, büyükler) ve spor yapma süresi gibi faktörleri içermektedir. Bu nedenle sporcularda kafein tüketim düzeylerinin bu değişkenlere göre incelenmesi hem mevcut tüketim alışkanlıklarını anlamak hem de sporcu sağlığı ve performansı açısından önemli sonuçlar ortaya koymak amacıyla gereklidir. Çalışmanın daha geniş bir örneklem grubuyla ve deneysel yöntemle de yapılması önerilmektedir.

YÖNTEM

Araştırmanın Modeli

Bu araştırma, voleybolcularda bazı demografik özellikler ile ağırlık yönetimi beslenme bilgi düzeyleri arasındaki ilişki betimlenmeye çalışılmıştır. İlişkisel tarama modeli, birden fazla değişken arasındaki ilişkilerin ve etkilerin incelenmesinde yaygın olarak kullanılmaktadır (Karasar, 2011).

Araştırma Grubu

Çalışmanın evrenini Türkiye genelindeki kulüplerde oynayan sporcular oluştururken örneklemini Artvin il ve ilçe merkezlerindeki 341 sporcu oluşturmaktadır. Örneklem yöntemi olarak kolayda örnekleme yöntemi seçilmiştir. Araştırmanın sınırlılıkları sadece Artvin ilinde yapılmış olmasıdır. Çalışma anket formu kullanılarak yapılmış olup veri toplama süresi 15 gün olmuştur. Sporculardan saklanacak herhangi bir bilgi yoktur.

Tablo 1. Katılımcılara ilişkin demografik özellikler

Cinsiyet	N	%
Kadın	194	56,9
Erkek	147	43,1
Kategori	N	%
Yıldızlar	4	1,2
Gençler	93	27,3
Ümitler	171	50,1
Büyükler	73	21,4
BKI	N	%
Zayıf	19	5,6
Normal Kilolu	277	81,2
Kilolu	45	13,2
Yaş	X	Ss
	21,88	2,99
Spor yılı	X	Ss
	5,59	2,92
Toplam	341	100,0

Tablo 1 incelendiğinde, araştırmaya toplam 341 katılımcı dâhil edilmiştir. Katılımcıların %56,9'unu kadınlar (n=194), %43,1'ini erkekler (n=147) oluşturmaktadır. Kategori dağılımı incelendiğinde, katılımcıların %1,2'si yıldızlar (n=4), %27,3'ü gençler (n=93), %50,1'i ümitler (n=171) ve %21,4'ü büyükler (n=73) kategorisinde yer almaktadır. Beden kütle indeksi (BKİ) sınıflandırmasına göre katılımcıların %5,6'sı zayıf (n=19), %81,2'si normal kilolu (n=277) ve %13,2'si kilolu (n=45) olarak belirlenmiştir. Sürekli değişkenler incelendiğinde; katılımcıların yaş ortalaması $21,88 \pm 2,99$ yıl, spor deneyimi (spor yılı) ortalaması ise $5,59 \pm 2,92$ yıl olarak bulunmuştur.

Araştırma yayın etiği

Araştırmanın etik onayı Artvin Çoruh Üniversitesi Bilimsel Araştırma ve Yayın Etik Kurulu tarafından alınmıştır (belge no: E-18457941-050.99-212807).

Veri Toplama Araçları

Çalışmada voleybolcuların demografik özelliklerini saptamak amacıyla "Kişisel Bilgi Formu" ile birlikte, "Kısa Kafein Beklenti Ölçeği (B-CaffeQ)" kullanılmıştır.

Kişisel Bilgi Formu

Araştırmacılar tarafından geliştirilmiş olup, toplam altı sorudan oluşmaktadır. Bu form aracılığıyla katılımcıların cinsiyetleri, yaşları, spor yılları, beden kütle indeksleri ve kategorilerine ilişkin veriler elde edilmiştir

Kısa Kafein Beklenti Ölçeği (B-CaffeQ)

'Kısa Kafein Beklenti Ölçeği (B-CaffeQ)' Kearns ve arkadaşları (2018) tarafından geçerlik ve güvenilirlik çalışmaları yapılarak basitleştirilen 20 maddeden oluşan 7 faktörlü bir yapıya sahiptir. Anketin Türkçe geçerlilik ve güvenilirlik çalışması Mercanoğlu ve ark., tarafından 2024 yılında yapılmıştır. Altı Likert tipinde oluşturulan bu anketin puanlaması, "1 = Kesinlikle Katılmıyorum" ile "6 = Kesinlikle Katılıyorum" arasında belirlenmiştir.

Tablo 2. Ölçme araçlarına ilişkin sonuçlar

Faktörler	Çarpıklık	Basıklık	Cronbach Alpha
Fiziksel Performans Artırma	-,390	-,734	,601
Enerji/İş Gücü Artırma	-,691	-,171	,735
Yoksunluk/Bağımlılık	-,168	-1,223	,839
İştah Baskılama	-,256	-,952	,742
Anksiyete/ Negatif Fiziksel Etkiler	,046	-1,190	,818
Sosyal/Duygudurum Artırma	-,363	-,858	,778
Uyku Bozukluğu	-,391	-,998	,739

Tablo 2’deki sonuçlara göre ölçme aracına ilişkin çarpıklık ve basıklık değerlerinin ± 2 aralığında değiştiği, söz konusu değerlerin normal dağılım içerisinde olduğu (George ve Mallery, 2019, ss. 114-115) söylenebilir. Ayrıca ölçme araçlarının Cronbach Alpha güvenilirlik katsayısının literatürde kabul gören (Karagöz, 2017, s.26) güvenilir değerleri karşıladığı bulunmuştur.

Verilerin Analizi

Katılımcılardan elde edilen veriler, istatistiksel analizlere geçilmeden önce normallik açısından değerlendirilmiştir. Bu doğrultuda, ilgili değişkenlerin çarpıklık (skewness) ve basıklık (kurtosis) değerleri incelenmiştir. Normallik varsayımını karşılayan veriler üzerinde bağımsız örneklem t-testi, tek yönlü varyans analizi (ANOVA) ve Pearson korelasyon analizleri uygulanmıştır. Tüm istatistiksel testlerde anlamlılık düzeyi $p < .05$ olarak kabul edilmiştir.

BULGULAR

Tablo 3. Kafein beklentilerinin cinsiyete göre karşılaştırma sonuçları

Faktörler	Cinsiyet	n	X	Ss.	t	P
Fiziksel Performans Artırma	Kadın	194	3,54	1,34	-1,281	,201
	Erkek	147	3,73	1,29		
Enerji/İş Gücü Artırma	Kadın	194	3,81	1,31	-1,267	,206
	Erkek	147	3,98	1,14		
Yoksunluk/Bağımlılık	Kadın	194	3,44	1,55	,458	,647
	Erkek	147	3,36	1,55		
İştah Baskılama	Kadın	194	3,58	1,41	,867	,386
	Erkek	147	3,45	1,29		
Anksiyete/ Negatif Fiziksel Etkiler	Kadın	194	2,98	1,40	-2,194	,029
	Erkek	147	3,32	1,48		
Sosyal/Duygudurum Artırma	Kadın	194	3,59	1,42	-,256	,798
	Erkek	147	3,62	1,29		
Uyku Bozukluğu	Kadın	194	3,85	1,53	,100	,921
	Erkek	147	3,84	1,46		

Tablo 3’teki “bağımsız gruplar t-testi” sonuçları incelendiğinde katılımcıların anksiyete/ negatif fiziksel etkiler ($t=-2,194$; $p=,029$) ortalama puanlarında cinsiyete göre istatistiksel olarak anlamlı farklılık tespit edilmiştir. Buna göre erkeklerin puanlarının kadınların puanlarından anlamlı derecede yüksek olduğu tespit edilmiştir. Öte yandan fiziksel performans artırma ($t=-1,281$; $p=,201$), enerji/iş gücü artırma ($t=-1,267$; $p=,206$), yoksunluk/bağımlılık ($t=,458$; $p=,647$), iştah baskılama ($t=,867$; $p=,386$), sosyal/duygudurum artırma ($t=-,256$; $p=,798$) ve uyku bozukluğu ($t=,100$; $p=,921$) ortalamalarında ise cinsiyete göre istatistiksel olarak anlamlı farklılıklar tespit edilmemiştir.

Tablo 4. Kafein beklentilerinin kategoriye göre karşılaştırma sonuçları

Faktörler	Kategori	n	X	Ss.	F	P
Fiziksel Performans Artırma	Yıldızlar	4	2,25	1,00	1,484	,219
	Gençler	93	3,64	1,29		
	Ümitler	171	3,65	1,34		
	Büyükler	73	3,61	1,30		
Enerji/İş Gücü Artırma	Yıldızlar	4	3,92	,79	,096	,962
	Gençler	93	3,82	1,28		
	Ümitler	171	3,90	1,20		
	Büyükler	73	3,92	1,29		
Yoksunluk/Bağımlılık	Yıldızlar	4	2,83	1,64	1,094	,352
	Gençler	93	3,20	1,61		
	Ümitler	171	3,45	1,51		
	Büyükler	73	3,59	1,54		
İştah Baskılama	Yıldızlar	4	2,75	1,50	1,274	,283
	Gençler	93	3,45	1,48		
	Ümitler	171	3,65	1,30		
	Büyükler	73	3,38	1,33		
Anksiyete/ Negatif Fiziksel Etkiler	Yıldızlar	4	1,92	1,20	2,213	,086
	Gençler	93	2,91	1,42		
	Ümitler	171	3,27	1,44		
	Büyükler	73	3,13	1,47		
Sosyal/Duygudurum Artırma	Yıldızlar	4	3,33	1,66	,423	,737
	Gençler	93	3,49	1,37		
	Ümitler	171	3,63	1,35		
	Büyükler	73	3,70	1,38		
Uyku Bozukluğu	Yıldızlar	4	3,00	2,45	2,326	,075
	Gençler	93	3,77	1,55		
	Ümitler	171	4,03	1,39		
	Büyükler	73	3,55	1,60		

Tablo 4’ teki “tek yönlü varyans (ANOVA)” analizi sonuçları incelendiğinde katılımcıların fiziksel performans artırma (F=1,484; p=,219), enerji/iş gücü artırma (F=,096; p=,962), yoksunluk/bağımlılık (F=1,094; p=,352), iştah baskılama (F=1,274; p=,283), anksiyete/ negatif fiziksel etkiler (F=2,213; p=,086), sosyal/duygudurum artırma (F=,423; p=,737) ve uyku bozukluğu (F=2,326; p=,075) ortalamalarında spor kategorisine göre istatistiksel olarak anlamlı farklılıklar tespit edilmemiştir.

Tablo 5. Kafein beklentilerinin kategoriye göre karşılaştırma sonuçları

Faktörler	BKI	n	X	Ss.	F	p	Fark
Fiziksel Performans Artırma	Zayıf ^a	19	3,32	1,63	3,801	,023	b-c
	Normal Kilolu ^b	277	3,71	1,27			
	Kilolu ^c	45	3,18	1,38			
Enerji/İş Gücü Artırma	Zayıf ^a	19	3,40	1,51	5,338	,005	b-c
	Normal Kilolu ^b	277	3,99	1,15			
	Kilolu ^c	45	3,44	1,51			
Yoksunluk/Bağımlılık	Zayıf ^a	19	2,88	1,62	2,236	,108	
	Normal Kilolu ^b	277	3,49	1,53			
	Kilolu ^c	45	3,13	1,58			
İştah Baskılama	Zayıf ^a	19	3,75	1,23	2,186	,114	
	Normal Kilolu ^b	277	3,57	1,35			
	Kilolu ^c	45	3,15	1,43			
Anksiyete/ Negatif Fiziksel Etkiler	Zayıf ^a	19	3,05	1,54	1,478	,230	
	Normal Kilolu ^b	277	3,19	1,43			
	Kilolu ^c	45	2,79	1,48			
Sosyal/Duygudurum Artırma	Zayıf ^a	19	3,37	1,61	4,523	,012	b-c
	Normal Kilolu ^b	277	3,70	1,33			
	Kilolu ^c	45	3,07	1,34			
Uyku Bozukluğu	Zayıf ^a	19	4,05	1,68	,825	,439	
	Normal Kilolu ^b	277	3,87	1,48			
	Kilolu ^c	45	3,60	1,55			

Tablo 5’ teki “tek yönlü varyans (ANOVA)” analizi sonuçları incelendiğinde katılımcıların fiziksel performans artırma (F=3,801; p=,023), enerji/iş gücü artırma (F=5,338; p=,005) ve sosyal/duygudurum artırma (F=4,523; p=,012) ortalamalarında BKI’ye göre istatistiksel olarak anlamlı farklılıklar tespit

edilmiştir. Farklılığın kaynağını belirlemek için yapılan Post Hoc (Scheffe) sonuçları üç faktörde de normal kiloluların puanlarının kiloluların puanlarından anlamlı derecede yüksek olduğunu göstermiştir. Öte yandan yoksunluk/bağımlılık ($F=2,236$; $p=,108$), iştah baskılama ($F=2,186$; $p=,114$), anksiyete/negatif fiziksel etkiler ($F=1,478$; $p=,230$) ve uyku bozukluğu ($F=,825$; $p=,439$) ortalamalarında BKİ'ye göre istatistiksel olarak anlamlı farklılıklar tespit edilmemiştir.

Tablo 6. Kafein beklentileri ile yaş arasındaki ilişki sonuçları

	Yaş	
Fiziksel Performans Artırma	r	,077
	p	,156
Enerji/İş Gücü Artırma	r	,095
	p	,079
Yoksunluk/Bağımlılık	r	,193**
	p	,000
İştah Baskılama	r	,048
	p	,377
Anksiyete/ Negatif Fiziksel Etkiler	r	,170**
	p	,002
Sosyal/Duygudurum Artırma	r	,107*
	p	,048
Uyku Bozukluğu	r	,044
	p	,418

Tablo 6' daki "Pearson korelasyon" analizi sonuçları incelendiğinde yaş ile yoksunluk/bağımlılık ($r=,193$; $p=,000$), anksiyete/ negatif fiziksel etkiler ($r=,170$; $p=,002$), sosyal/duygudurum artırma ($r=,107$; $p=,048$) arasında pozitif yönde düşük düzeyde anlamlı ilişkiler olduğu tespit edilmiştir. Öte yandan yaş ile fiziksel performans artırma ($r=,077$; $p=,156$), enerji/iş gücü artırma ($r=,095$; $p=,079$), iştah baskılama ($r=,048$; $p=,377$) ve uyku bozukluğu ($r=,44$; $p=,418$) arasında anlamlı ilişkiler olmadığı tespit edilmiştir.

Tablo 7. Kafein beklentileri ile spor yılı arasındaki ilişki sonuçları

	Spor Yılı	
Fiziksel Performans Artırma	r	,053
	p	,333
Enerji/İş Gücü Artırma	r	,058
	p	,289
Yoksunluk/Bağımlılık	r	,034
	p	,533
İştah Baskılama	r	-,025
	p	,642
Anksiyete/ Negatif Fiziksel Etkiler	r	-,025
	p	,651
Sosyal/Duygudurum Artırma	r	,095
	p	,080
Uyku Bozukluğu	r	-,088
	p	,105

Tablo 7' deki "Pearson korelasyon" analizi sonuçları incelendiğinde spor yılı ile fiziksel performans artırma ($r=,053$; $p=,333$), enerji/iş gücü artırma ($r=,058$; $p=,289$), yoksunluk/bağımlılık ($r=,034$; $p=,533$), iştah baskılama ($r=-,025$; $p=,642$), anksiyete/ negatif fiziksel etkiler ($r=-,025$; $p=,651$), sosyal/duygudurum artırma ($r=,095$; $p=,080$) ve uyku bozukluğu ($r=-,088$; $p=,105$) arasında anlamlı ilişkiler olmadığı tespit edilmiştir.

TARTIŞMA VE SONUÇ

Literatüre bakıldığında kafein ile ilgili yapılan çalışmalar genelde merkezi sinir sistemi, kardiyovasküler sistem, dolaşım sistemi, solunum sistemi ve endokrin sistemi üzerindeki etkileri incelenmiştir. Kafein her gün milyarlarca insan tarafından tüketilmektedir. Sporculara açısından incelendiğinde ise sporcuların daha uyanık ve zinde kalarak fiziksel uygunlukları ve hazırbulunuşlukları

üzerine olumlu etkisi ve kalp atışlarını hızlandırarak ve kan damarlarını genişlettiği (vazodilatasyon) bilinmektedir (Kara, 2019). Bu açıdan değerlendirildiğinde çalışmada sporcuların kafein tüketiminin bazı değişkenlere göre incelenmesi amaçlanmıştır.

Sporcularda kafein beklentileri cinsiyete göre incelenmiş ve anksiyete/negatif fiziksel etkiler puanlarında anlamlı bir farklılık tespit edilmiştir. Erkeklerin kafein beklentisinin kadınlarda yüksek olduğu bulunmuştur. Literatürdeki bazı çalışmalar incelenmiştir. Damar'ın (2024) çalışmasında kadın ve erkeklerin kafein kullanımı bozukluğu puanlarına bakıldığında anlamlı bir farklılık olduğu tespit edilmiştir. Erkeklerin kafein kullanım bozuklukları kadınlara kıyasla daha yüksek olduğu görülmüştür. Keskin'e (2024) göre cinsiyet ve kafein içeren içecekleri arasında anlamlı bir ilişki tespit edilememiştir. Kafein kullanım bozukluğu ölçeği ile cinsiyet arasında da anlamlı bir fark bulunmamıştır. Kuran (2024) cinsiyet ve kafein kullanım düzeyi ilişkisi arasında anlamlı bir fark olmadığını tespit etmiştir. Yapılan başka bir çalışmada kafein tüketim miktarının kadınlarda erkeklere kıyasla daha yüksek olduğu tespit edilmiştir (Ágoston et al., 2018). (Jahrami et al., 2020) tarafından yapılan başka bir çalışmada erkeklerin kafein tüketim düzeyinin kadınlara göre yüksek olduğu bulunmuştur. Sağlam (2023) yapmış olduğu çalışmada kafein kullanım bozukluğu ve cinsiyet arasında anlamlı bir fark bulunmamıştır. Adölesanlar üzerinde yapılan bir çalışmada cinsiyet ve kafein kullanım düzeyi arasında ilişkiye bakıldığında kız öğrencilerin erkek öğrencilere kıyasla daha çok kafein tükettiği tespit edilmiştir Turunç (2022). Adölesanlar üzerinde yapılan başka bir çalışmada ise Küçükkömürler ve Kurt ve ark. (2018) kafein tüketiminin kız öğrencilere göre erkek öğrencilerde daha yüksek olduğunu bulmuştur. Korkmaz (2022) çalışmasında cinsiyet ve kafein kullanım bozukluğu puanları arasında anlamlı bir farklılık olmadığı tespit edilmiştir. Mahoney ve ark. (2019) yaptığı çalışmada kadınlar ve erkekler arasında kafein kafein alımı oranında bir farklılık olmadığı tespit edilmiştir. Cinsiyet değişkeninin etkili olmadığı diğer bir çalışma ise Norton ve ark. (2011) ait olan çalışmadır. Toplu-Atakan'ın (2022) adölesanlarla yapmış olduğu çalışmada cinsiyet ve kafein tüketim arasında anlamlı bir ilişki bulunmuştur. Kafein tüketiminin kadınlarda daha fazla olduğu tespit edilmiştir. Göktepe (2020) fitness yapan yetişkinler üzerinde yaptığı çalışmada cinsiyete göre kafein tüketimi miktarında oran erkeklerde yüksek olsa da anlamlı bir farklılık olmadığı tespit edilmiştir. Aydın'ın (2019) yapmış olduğu "Üniversite Öğrencilerinde Riskli Kafein Tüketimi" adlı çalışmasında kafein tüketimi ve cinsiyet arasında anlamlı bir fark olmadığı tespit edilmiştir.

Çalışmada kafein beklentileri ile spor kategorisine göre anlamlı bir farklılık tespit edilmemiştir. Literatürde ise çalışmamızla alakalı spor kategorisi ve kafein beklentisi ile ilgili bir çalışmaya rastlanmamıştır.

Çalışmada sporcularda kafein beklentisi ve BKİ'ye göre istatistiksel olarak anlamlı bir farklılık tespit edilmiştir. Normal kilolu olan sporcuların puanlarının kilolu olan sporculara göre yüksek olduğu bulunmuştur. Damar'a (2024) ait çalışmada BKİ değerleri ile kafein kullanım bozukluğu arasında anlamlı bir ilişki olduğu görülmüştür. Kafein kullanım bozukluğu arttıkça BKİ değerleri de artmakta olduğu tespit edilmiştir. Öğrencilerle yapılan çalışmada BKİ sınıflaması ile kafein kullanım bozukluğu arasında anlamlı bir ilişki tespit edilmemiştir Keskin (2024). Kafein alım miktarı sınıflarına göre BKİ değerleri açısından istatistiksel olarak anlamlı farklılık tespit edilmiştir Doğanay (2024). Elit basketbolcular üzerinde yapılan bir çalışmada ise antropometrik ölçümler ile kafein kullanım düzeyi arasında anlamlı bir fark bulunmamıştır Fırincioğulları (2023). Göktepe'nin (2020) çalışmasında da BKİ ile kafein tüketimi arasında anlamlı bir fark bulunmamıştır.

Çalışmada kafein beklentisi ve yaşa göre düşük düzeyde ama pozitif yönde anlamlı bir ilişki tespit edilmiştir. Sporcuların yaşı arttıkça kafein kullanım beklentilerinin de arttığı görülmüştür. Damar (2024) Genç Yetişkinlerde Kafein Kullanım Bozukluğunun Sirkadiyen Ritim Ve Depresyon İle İlişkisi adlı çalışmada yaş ile kafein kullanımı ilişkisine bakıldığında anlamlı bir ilişki tespit edilmiştir. Katılımcıların yaşları arttıkça kafein kullanım bozuklukları da arttığı görülmüştür. Kuran (2024)

katılımcıların yaş ve kafein tüketim düzeyi arasında anlamlı bir fark olmadığını bulmuştur. Fırıncioğulları (2023) yapmış olduğu Elit basketbolcularda kafein takviyesinin kan laktat seviyesi, performans ve antrenman sonrası yorgunluk üzerine etkisi adlı çalışmada yaş ve kafein tüketim değerleri arasında anlamlı bir fark tespit edilmemiştir. Genç erişkinlerde kafein kullanımıyla ilgili yapılan bir çalışmada yaş ve kafein kullanım bozukluğu arasında anlamlı bir farklılık olmadığı görülmüştür Korkmaz (2022). Tot Acar ve ark. (2011) tarafından yapılan bir çalışmada yaş arttıkça kafein tüketiminin de arttığı görülmüştür. Adölesanlarda yapılmış bir çalışmada yaş ve kafein tüketimi miktarı arasında anlamlı bir fark bulunmuştur Toplu-Atakan (2022). Göktepe 'nin (2020) fitness yapan yetişkinler üzerinde yaptığı araştırmada yaşa göre kafein tüketimi arasında anlamlı bir fark bulunmuştur. Yaşı büyük olan katılımcıların yaşı küçük olan katılımcılara kıyasla kafein tüketimi daha yüksektir. Aydın (2019) üniversite öğrencileri üzerinde yapmış olduğu çalışmada normal ve riskli kafein tüketenlerin yaş ortalaması arasında anlamlı bir fark saptanmamıştır.

Çalışmada sporcuların kafein kullanım beklentileri ile spor yılına göre anlamlı bir farklılık tespit edilmemiştir.

Cinsiyete göre yapılan karşılaştırmada yalnızca anksiyete/negatif fiziksel etkiler boyutunda anlamlı bir farklılık saptanmış; erkeklerin puanlarının kadınlardan daha yüksek olduğu görülmüştür. Bu sonuç, erkek sporcuların kafeinin olası olumsuz etkilerine ilişkin beklentilerinin kadınlara kıyasla daha güçlü olabileceğini düşündürmektedir. Diğer tüm faktörlerde cinsiyete bağlı anlamlı bir farklılık bulunmamıştır. Spor kategorilerine göre yapılan değerlendirmede hiçbir faktörde anlamlı bir farklılık ortaya çıkmamıştır. Bu durum, sporcuların yer aldıkları kategori ne olursa olsun kafeine yönelik beklentilerinin benzer bir yapıda olduğunu göstermektedir. BKİ değişkeni açısından ise fiziksel performans artırma, enerji/iş gücü artırma ve sosyal/duygudurum artırma boyutlarında anlamlı farklılık tespit edilmiş; normal kilolu sporcuların, kilolu sporculara göre daha yüksek beklenti düzeyine sahip olduğu belirlenmiştir. Bu üç boyutta farkın normal kilolular lehine olması, kilolu sporcuların kafeinin olumlu etkilerine yönelik daha düşük bir beklenti geliştirdiğini düşündürmektedir. Diğer faktörlerde BKİ'ye bağlı anlamlı bir farklılık görülmemiştir. Yaş değişkeni incelendiğinde yoksunluk/bağımlılık, anksiyete/negatif fiziksel etkiler ve sosyal/duygudurum artırma boyutlarında düşük düzeyde fakat anlamlı pozitif ilişkiler saptanmıştır. Buna göre yaş arttıkça sporcuların kafein kullanımına ilişkin hem olumsuz beklentilerinin (yoksunluk, anksiyete vb.) hem de sosyal/duygusal etkilerle ilgili beklentilerinin bir miktar arttığı söylenebilir. Diğer faktörlerde yaş ile anlamlı ilişki bulunmamıştır. Spor yılı değişkeni açısından yapılan korelasyon analizlerinde ise hiçbir kafein beklentisi boyutunda anlamlı ilişki belirlenmemiştir. Bu bulgu, sporculuk deneyiminin kafeine yönelik algı ve beklentiler üzerinde belirleyici olmadığını göstermektedir.

Genel olarak bulgular değerlendirildiğinde, kafein beklentilerinin demografik ve sportif değişkenlerden büyük ölçüde bağımsız olduğu; ancak özellikle cinsiyet, BKİ ve yaş değişkenlerinin bazı boyutlarda sınırlı fakat anlamlı farklılıklar oluşturduğu görülmektedir. Bu sonuçlar, sporcularda kafein kullanımının beklentisel boyutunun oldukça bireysel bir yapı taşıdığını ve fizyolojik/performans kategorileri yerine kişisel değişkenlerle daha fazla ilişkili olabileceğini düşündürmektedir.

Kaynakça

- Ágoston, C., Urbán, R., Király, O., Griffiths, M. D., Rogers, P. J., & Demetrovics, Z. (2018). Why do you drink caffeine? The development of the motives for caffeine consumption questionnaire (MCCQ) and its relationship with gender, age and the types of caffeinated beverages. *International Journal of Mental Health and Addiction*, 16(4), 981–999.
- Aydın, B. (2019). *Üniversite öğrencilerinde riskli kafein tüketimi* (Yüksek lisans tezi). Üsküdar Üniversitesi.
- Chambers, K. P. (2009). *Caffeine and health research*. Nova Science.
- Çakır, Z., Çatikkâş, F., Türkmen, M., Şengönül, A., Yaman, M., Öktem, T., Gönen, M., Güzel, S., & Yel, K. (2025a). Preservice teachers' attitudes toward pedagogical humour: The role of physical activity, sociodemographic factors, and academic discipline. *BMC Psychology*, 13, 1423. <https://doi.org/10.1186/s40359-025-03751-4>

- Çakır, Z., Erbaş, Ü., Gönen, M. A., Ceyhan, M., Öktem, T., Kul, M., Dilek, A. N., & Güzel, S. (2025b). Examination of trauma levels and earthquake stress coping strategies of university students who exercise and do not exercise after an earthquake. *BMC Psychology*, 13, 867. <https://doi.org/10.1186/s40359-025-03108-x>
- Damar, Z. M. (2024). *Genç yetişkinlerde kafein kullanım bozukluğunun sirkadiyen ritim ve depresyon ile ilişkisi* (Yüksek lisans tezi). Haliç Üniversitesi, Lisansüstü Eğitim Enstitüsü.
- Dindar, İ., & Güler, M. L. (2019). Spor ve medya ilişkisinin spor bilimleri öğrencileri üzerindeki etkileri. *The Journal of Academic Social Science*, 7(95), 440–456.
- Doğanay, T. N. (2024). *Sağlık çalışanlarında beslenme durumu, kafein alımı ve sirkadiyen ritmin premenstrual sendrom (PMS) ile ilişkisinin incelenmesi* (Yüksek lisans tezi). Ankara Medipol Üniversitesi, Sağlık Bilimleri Enstitüsü.
- Fırıncioğulları, K. (2023). *Elit basketbolcularda kafein takviyesinin kan laktat seviyesi, performans ve antrenman sonrası yorgunluk üzerine etkisi* (Yüksek lisans tezi). Uluslararası Kıbrıs Üniversitesi.
- George, D., & Mallery, P. (2019). *IBM SPSS statistics 26 step by step: A simple guide and reference*. Routledge.
- Göktepe, N. (2020). *Fitness yapan yetişkin bireylerde kafein tüketim zamanı ve miktarının değerlendirilmesi* (Yüksek lisans tezi). İstanbul Okan Üniversitesi.
- Jahrami, H., Al-Mutarid, M., Penson, P. E., Al-Islam Faris, M., Saif, Z., & Hammad, L. (2020). Intake of caffeine and its association with physical and mental health status among university students in Bahrain. *Foods*, 9(4), 473.
- Kara, Z., Taşkın, H., Erkmen, N., & Baştürk, D. (2019). Effects of caffeine intake on short-term high-intensity exercise: Caffeine intake time. *Spor ve Performans Araştırmaları Dergisi*.
- Karagöz, Y. (2017). *SPSS ve AMOS uygulamalı nitel-nicel-karma bilimsel araştırma yöntemleri ve yayın etiği* (1. baskı). Nobel.
- Karasar, N. (2011). *Bilimsel araştırma yöntemi* (11. baskı). Nobel.
- Kearns, N. T., Blumenthal, H., Natesan, P., Zamboanga, B. L., Ham, L. S., & Cloutier, R. M. (2018). Development and initial psychometric validation of the brief-caffeine expectancy questionnaire (B-CaffEQ). *Psychological Assessment*, 30(12), 1597–1611.
- Keskin, D. (2024). *Sağlık bilimleri fakültesi öğrencilerinde kafein kullanım bozukluğu, uyku durumu ve duygusal iştah arasındaki ilişkinin değerlendirilmesi* (Yüksek lisans tezi). Aydın Adnan Menderes Üniversitesi, Sağlık Bilimleri Enstitüsü.
- Korkmaz, F. (2022). *Genç erişkinlerde kafein kullanım özelliklerinin internet bağımlılığı ve uyku kalitesi ile ilişkisinin incelenmesi* (Uzmanlık tezi). Sağlık Bilimleri Üniversitesi.
- Kuran, Ö. (2024). *Yetişkin bireylerde genel beslenme durumu ve diyetin kafein içeriğinin anksiyete ve uyku kalitesi ile ilişkisinin değerlendirilmesi* (Yüksek lisans tezi). Haliç Üniversitesi, Lisansüstü Eğitim Enstitüsü.
- Küçükkömürlü S., & Kurt N. (2018). Adolesanlarda Kafein Tüketimi (Caffeine Consumption in Adolescents), 111-114.
- Mahoney, C. R., Giles, G. E., Marriott, B. P., Judelson, D. A., Glickman, E. L., & Geiselman, P. J. (2019). Intake of caffeine from all sources and reasons for use by college students. *Clinical Nutrition*, 38(2), 668–675.
- Nehlig, A. (2016). Effects of coffee/caffeine on brain health and disease: What should I tell my patients? *Practical Neurology*, 16(2), 89–95. <https://doi.org/10.1136/practneurol-2015-001162>
- Norton, T. R., Lazev, A. B., & Sullivan, M. J. (2011). The “buzz” on caffeine: Patterns of caffeine use in a convenience sample of college students. *Journal of Caffeine Research*, 1(1), 35–40.
- Sağlam, B. (2023). *Hekimlerin kafein kullanım bozuklukları ile uyku kalitesi ve mesleki tükenmişlikleri arasındaki ilişkinin değerlendirilmesi* (Tıpta uzmanlık tezi). Sağlık Bilimleri Üniversitesi.
- Toplu-Atakan, S. (2022). *Adölesanlarda kafein tüketiminin algılanan stres ve depresyon üzerine etkisi* (Yüksek lisans tezi). Yozgat Bozok Üniversitesi.
- Tot Acar, Ş., Yazıcı, Ş., Köksal, K., Sanberk, R., & Yazıcı, S. (2011). Hocam, bir kahve daha alır mıydınız? *New/Yeni Symposium Journal*, 49(2), 121–124.
- Turunç, P. (2022). *Lise öğrencilerinin sınav kaygısı, kafein tüketimi ve uyku kalitelerinin değerlendirilmesi* (Yüksek lisans tezi). Başkent Üniversitesi.
- Wikoff, D., Welsh, B. T., Henderson, R., Brorby, G. P., Britt, J., Myers, E., Goldberger, J., Lieberman, H. R., O'Brien, C., & Nehlig, A. (2016). Effects of coffee/caffeine on brain health and disease: What should I tell my patients? *Practical Neurology*, 16(2), 89–95.
- Yel, K., Şencan, D., Güzel, S., & Erkılıç, A. O. (2024). Physical activity, nutrition, and healthy living. *International Journal of Health, Exercise, and Sport Sciences (IJOSS)*, 1(3), 15-28. <https://www.ijoss.org/Archive/ijoss-Volume1-issue3-02.pdf>
- Zengin, E., & Öztaş, C. (2010). Yerel yönetimler ve spor. *Sosyal Siyaset Konferansları Dergisi*, 55, 49–78.

Effects of an Eight-Week Basic Swimming Training Program on Kinanthropometric Characteristics, Flexibility, and Muscular Strength in Girls and Boys Aged 6–13 Years

8 Haftalık Temel Yüzme Eğitiminin 6–13 Yaş Kız ve Erkek Çocuklarda Kinantropometrik Özellikler, Esneklik ve Kas Kuvveti Üzerine Etkileri

Kübra Gül Kaplan¹, Zekai Çakır^{2*}

¹Bayburt University Graduate Education Institute, Bayburt University, Bayburt, Türkiye,
kubragul.e.kk@hotmail.com Orcid: 0009-0000-1584-3383

²Faculty of Sport Sciences, Bayburt University, Bayburt, Turkey,
zekaicakir@gmail.com Orcid: 0000-0002-7719-1031

*Corresponding author: Zekai ÇAKIR

Araştırma Makalesi / Research Article Doi : <https://doi.org/10.5281/zenodo.19885095>

Gönderi T. / Received : 15.10.2025

Kabul T. / Accepted : 15.03.2026

Online Yayın T. / Published : 29.04.2026

Abstract

This study aimed to examine the effects of an eight-week basic swimming training program on kinanthropometric characteristics, flexibility, and muscular strength among girls and boys attending swimming courses. A total of 37 volunteer children aged 6–13 years, including 22 girls and 15 boys, participated in the study. A quantitative research method with a single-group pretest–posttest experimental design was employed. At the beginning and end of the training program, height, body weight, arm span, hand length, and foot length were measured. Flexibility was assessed using the Sit-and-Reach Test, while muscular strength was evaluated using a handgrip dynamometer. Descriptive statistics were calculated, and a paired-samples t-test was used to determine differences between pretest and posttest measurements.

The findings showed statistically significant increases in height, body weight, arm span, hand length, and foot length from pretest to posttest ($p < 0.05$). However, no statistically significant differences were found in body mass index (BMI), flexibility, or handgrip strength ($p > 0.05$). In conclusion, the eight-week basic swimming training program appears to be associated with positive changes in certain kinanthropometric characteristics among children aged 6–13 years.

Keywords: Swimming, kinanthropometric characteristics, muscular strength, flexibility.

Öz

Bu çalışmanın amacı, yüzme kurslarına katılan kız ve erkek çocuklara uygulanan sekiz haftalık temel yüzme eğitiminin kinantropometrik özellikler, esneklik ve kas kuvveti üzerindeki etkilerini incelemektir. Araştırmaya 6–13 yaş aralığında toplam 37 gönüllü çocuk, 22 kız ve 15 erkek, katılmıştır. Çalışmada nicel araştırma yöntemi kapsamında tek gruplu ön test–son test deneysel desen kullanılmıştır. Eğitim programının başlangıcında ve sonunda katılımcıların boy, vücut ağırlığı, kulaç uzunluğu, el uzunluğu ve ayak uzunluğu ölçümleri alınmıştır. Esneklik düzeyi Otur-Eriş Testi ile, kas kuvveti ise el kavrama kuvveti dinamometresi ile değerlendirilmiştir. Verilerin analizinde tanımlayıcı istatistikler hesaplanmış ve ön test ile son test ölçümleri arasındaki farkın belirlenmesi amacıyla bağımlı örneklem t-testi kullanılmıştır.

Araştırma bulgularına göre, ön testten son teste katılımcıların boy, vücut ağırlığı, kulaç uzunluğu, el uzunluğu ve ayak uzunluğu değerlerinde istatistiksel olarak anlamlı artışlar belirlenmiştir ($p < 0.05$). Buna karşın beden kitle indeksi (BKİ), esneklik ve el kavrama kuvveti değişkenlerinde anlamlı bir farklılık tespit edilmemiştir ($p > 0.05$). Sonuç olarak, sekiz haftalık temel yüzme eğitiminin 6–13 yaş grubundaki çocukların bazı kinantropometrik özelliklerinde olumlu değişimlerle ilişkili olduğu söylenebilir.

Anahtar Kelimeler: Yüzme, kinantropometrik özellikler, kas kuvveti, esneklik.

Not: Bu çalışma, Dr. Öğr. Üyesi Zekai ÇAKIR danışmanlığında Kübra Gül KAPLAN tarafından hazırlanan ve 29.07.2025 tarihinde yüksek lisans tezi olarak kabul edilen "Yüzme Kurslarına Katılan Kız ve Erkek Çocuklarda 8 Haftalık Uygulanan Temel Yüzme Eğitiminin Esneklik, Kuvvet ve Motor Gelişimine Etkisinin İncelenmesi" başlıklı tezden üretilmiştir.

Notes: This study was derived from the master's thesis titled "Investigation of the Effects of an Eight-Week Basic Swimming Training Program on Flexibility, Strength, and Motor Development in Girls and Boys Attending Swimming Courses," prepared by Kübra Gül KAPLAN under the supervision of Asst. Prof. Dr. Zekai ÇAKIR and accepted on 29.07.2025.

Introduction

Movement is one of the fundamental characteristics of human life and is regarded as an important indicator of vitality, health, and functional capacity (Kolukısa & Dizdar, 2022). However, in the 21st century, technological advancements have significantly influenced daily routines, transportation, and work environments, leading to a decline in individuals' physical activity levels and the widespread adoption of sedentary lifestyles (Coşkuntürk et al., 2023; Yılmaz, 2014). Prolonged inactivity, excessive screen exposure, and passive lifestyle habits have been associated with numerous adverse outcomes, including obesity, musculoskeletal disorders, fatigue, social isolation, and behavioural problems (Ceyhan & Çakır, 2021; Yel et al., 2024). Therefore, physical activity and sport are considered essential not only for performance enhancement but also for maintaining a healthy lifestyle, promoting social adaptation, and improving overall quality of life.

Sport is a multidimensional phenomenon that supports individuals' physical, cognitive, emotional, and social development. Regular exercise contributes significantly to health maintenance, rehabilitation, performance improvement, and the mitigation of the negative effects of physical inactivity (Mühürhancı Dal, 2011; Çolakoğlu & Şenel, 2003). Indeed, even low-intensity physical activities have been reported to improve the health status of sedentary individuals (Biçer et al., 2009; Gönen et al., 2022). Participation in physical activity during childhood is particularly critical for supporting growth and developmental processes. Through games, physical education, and sporting activities, children develop motor skills while simultaneously strengthening social relationships, self-confidence, and psychological well-being (Coşkuntürk et al., 2023; Kaplan & Gülten, 2017).

In recent years, reduced access to safe play areas, increased reliance on technology, and the growing prevalence of screen-based lifestyles have contributed to lower physical activity among children. This trend may negatively affect developmental parameters, including muscular strength, flexibility, coordination, and fundamental motor skills. Considering that movement habits acquired during childhood are closely associated with health outcomes later in life, directing children toward appropriate sports disciplines at an early age has become increasingly important (Özgül et al., 2015; Muratlı, 2013). In this context, swimming emerges as one of the most prominent sports that effectively supports children's physical and motor development.

Swimming is a sport in which the entire body musculature is actively engaged, water's buoyancy reduces joint loading, the risk of injury is relatively low, and participation can be sustained throughout the lifespan (Selçuk, 2013; Yapıcı et al., 2016). During swimming, multiple biomotor components—including coordination, strength, flexibility, endurance, balance, and rhythm—are simultaneously utilised and developed (Yfanti et al., 2014; Sammoud et al., 2018). Furthermore, swimming has been shown to enhance cardiovascular and respiratory function, support musculoskeletal health, promote postural development, and enhance psychological well-being (Nualnim et al., 2012; Saavedra et al., 2007; Cox et al., 2010; Kargarfard et al., 2012).

Anthropometric characteristics, muscular strength, flexibility, and coordination are among the key determinants of swimming performance and the acquisition of fundamental swimming skills. Sammoud et al. (2018) categorised factors influencing swimming performance into physical fitness level, technical skills, psychological attributes, and anthropometric structure. In particular, flexibility in the shoulders, trunk, hips, and ankles plays a critical role in the proper execution of swimming techniques, while muscular strength is considered a fundamental factor in overcoming water resistance and increasing swimming speed (Rushall, 2009; Sanders et al., 2011; Barbosa et al., 2010; Toussaint & Beek, 1992). Therefore, examining the effects of basic swimming training in children is important not only for skill acquisition but also for physical development and motor competence.

Previous studies have demonstrated that swimming training improves children's physical, physiological, motor, and anthropometric characteristics. Çelebi (2008) reported that regular swimming

training improves children's physiological and motor abilities, while Yiğit (2011) indicated that swimming training supports anthropometric development. Selçuk (2013) reported significant improvements in performance indicators, including sit-ups, push-ups, handgrip strength, speed, and flexibility, following swimming training. Similarly, Yılmaz (2014) and Özerdinç (2017) reported that swimming training has a positive impact on biomotor, physical, physiological, and strength-related parameters. Nevertheless, studies examining the combined effects of basic swimming training on flexibility, muscular strength, and anthropometric parameters associated with motor development—particularly among boys and girls aged 6–13 years—remain limited.

Although the existing literature includes studies investigating the effects of swimming training on children's physical development parameters, research addressing the combined influence of short-term basic swimming programs on kinanthropometric characteristics, flexibility, and muscular strength remains scarce. Accordingly, the present study is expected to contribute to the literature by examining the effects of a short-term basic swimming training program on various indicators of physical development through a comprehensive and integrative approach.

In this context, the primary aim of the present study is to investigate the effects of an eight-week basic swimming training program applied to boys and girls aged 6–13 years on flexibility, muscular strength, and anthropometric parameters associated with motor development. It is anticipated that the findings of this study will reveal the developmental contributions of basic swimming training in children and provide valuable insights for planning swimming education programs and advancing the sports science literature.

METHOD

Research Design

In the present study, a quantitative research approach employing a single-group pretest–posttest experimental design was utilised to examine the effects of basic swimming training on kinanthropometric characteristics, flexibility, and muscular strength. Experimental designs allow researchers to examine changes in dependent variables before and after the implementation of an independent variable (Ekiz, 2003).

The single-group pretest–posttest model involves collecting data from the same group of participants before and after an intervention (Gay & Airasian, 2000; Karasar, 2012). In this study, the aforementioned experimental design was preferred due to the practical difficulties associated with establishing a demographically comparable control group.

Study Group

The study population consisted of individuals participating in swimming courses held at the semi-Olympic swimming pool affiliated with the Provincial Directorate of Youth and Sports in Bayburt, Türkiye. The study sample comprised 37 children aged 6 to 13 years who attended swimming courses at the Bayburt Semi-Olympic Swimming Pool between February and June 2025.

Table 1. Demographic Characteristics of the Participants

Gender	N	%
Female	22	59.5
Male	15	40.5
Total	37	100
Age (years)	N	%
6	5	13.5
7	2	5.4
8	10	27
9	4	10.8
10	7	18.9
11	3	8.1
12	5	13.5
13	1	2.7
Total	37	100

Table 1 presents the demographic characteristics of the participants. A total of 37 children participated in the study, of whom 22 were female (59.5%) and 15 were male (40.5%). The participants' ages ranged from 6 to 13 years, with the highest proportion observed in the 8-year-old age group (27.0%) and the lowest in the 13-year-old age group (2.7%).

To determine the study group, the convenience sampling method, a purposive sampling technique, was employed. Convenience sampling is a nonprobability sampling method that collects data from individuals who are readily accessible and willing to participate in the study (Malhotra, 2004; Haşiloğlu et al., 2015).

Data Collection Instruments

In the present study, standardised measurement instruments were used to determine the anthropometric and physical fitness characteristics of the participants. Body weight was measured using a digital scale; height was measured with a wall-mounted stadiometer; arm span was measured using a measuring tape; hand length was measured with a ruler; and foot length was measured using a portable foot length measuring device.

Flexibility was assessed using the Sit-and-Reach test, while muscular strength was evaluated using a TKK 5401 digital hand dynamometer.

Data Collection Procedure

The data collection process in this study was systematically planned and implemented. Prior to data collection, ethical approval was obtained from the Bayburt University Ethics Committee, with decision number 44 dated 12 December 2024, and the necessary permissions were secured from the relevant institutions. All participants and their parents or legal guardians were informed of the study's purpose and procedures, and written informed consent was obtained on a voluntary basis.

Pretest measurements were conducted before the commencement of the swimming training program. Participants' height, body weight, arm span, hand length, foot length, flexibility, and handgrip strength were measured according to standardised procedures. To enhance the reliability of the measurements, body weight was measured three times, while flexibility and handgrip strength were measured twice, and the average values were recorded.

Following completion of the pretest measurements, participants attended an eight-week basic swimming training program. The training program consisted of 16 sessions.

Upon completion of the training program, posttest measurements were conducted using the same instruments and procedures as in the pretest phase. The collected data were subsequently analysed and reported.

Ethics Statement

Ethical approval for this study was obtained from the Bayburt University Ethics Committee with decision number 44 dated 12 December 2024. Written informed consent was obtained from the parents or legal guardians of all participants prior to participation.

Data Analysis

The data obtained from the study were analysed using appropriate statistical methods. Prior to the analysis, the data distribution was examined to determine the suitability of parametric statistical tests.

Table 2. Normality Test of Data Distribution

Variables	n	Skewness	Std. Error	Kurtosis	Std. Error
Height Pretest	37	-.434	.388	-.694	.759
Weight Pretest	37	.001	.388	-.635	.759
BMI Pretest	37	.503	.388	-.357	.759
Arm Span Pretest	37	-.452	.388	-.459	.759
Left Hand Length Pretest	37	-.749	.388	.113	.759
Right Hand Length Pretest	37	-.762	.388	.194	.759
Left Foot Length Pretest	37	-.529	.388	-.125	.759
Right Foot Length Pretest	37	-.591	.388	-.111	.759
Sit-and-Reach Pretest	37	-.002	.388	-.389	.759
Left Handgrip Strength Pretest	37	.012	.388	-.672	.759
Right Handgrip Strength Pretest	37	.695	.388	-.265	.759
Height Posttest	37	-.439	.388	-.701	.759
Weight Posttest	37	.050	.388	-.609	.759
BMI Posttest	37	.521	.388	-.383	.759
Arm Span Posttest	37	-.460	.388	-.489	.759
Left Hand Length Posttest	37	-.685	.388	.326	.759
Right Hand Length Posttest	37	-.736	.388	.316	.759
Left Foot Length Posttest	37	-.492	.388	-.455	.759
Right Foot Length Posttest	37	-.534	.388	-.321	.759
Sit-and-Reach Posttest	37	-.077	.388	-.792	.759
Left Handgrip Strength Posttest	37	-.153	.388	-1.149	.759
Right Handgrip Strength Posttest	37	.333	.388	-.941	.759

The skewness and kurtosis coefficients were examined to determine whether the pretest and posttest data for the variables showed normal distributions. It was observed that the skewness and kurtosis values for all variables fell within the range of -2 to $+2$. This range is widely accepted as a sufficient criterion for assuming normality of the data (George & Mallery, 2010).

Accordingly, the data obtained in the present study were considered normally distributed, indicating that the assumptions for parametric statistical tests were met.

Descriptive statistics, including arithmetic mean and standard deviation values, were calculated for all variables. To determine differences between pretest and posttest measurements, a paired-samples t-test was employed. In addition, Cohen's d effect size was calculated for all variables in order to assess the magnitude of the observed changes.

Table 3. General Content of the Eight-Week Basic Swimming Training Program

Week	Number of Sessions	Content
Week 1	2 sessions	Warm-up exercises, introduction to pool rules, basic kicking exercises, breathing exercises
Week 2	2 sessions	Coordination of kicking and breathing, forward movement in water using a kickboard
Week 3	2 sessions	Kicking exercises with a kickboard and preparatory arm stroke drills
Week 4	2 sessions	Instruction of right and left arm stroke techniques, continuation of kicking practice
Week 5	2 sessions	Side breathing techniques, coordination of arm strokes and breathing

Week 6	2 sessions	Streamline position without a kickboard, coordination of arm strokes and breathing
Week 7	2 sessions	Continuous swimming practice, coordination of stroke–breathing–kicking movements
Week 8	2 sessions	Freestyle swimming practice and technical corrections

Participants were enrolled in a basic swimming training program consisting of 16 sessions over 8 weeks, held twice per week. Each session commenced with approximately 15 minutes of warm-up exercises, followed by structured activities focusing on kicking techniques, breathing control, arm stroke mechanics, and overall swimming coordination.

RESULTS

The findings related to the pretest and posttest comparisons of anthropometric characteristics, flexibility, and handgrip strength are presented in Tables 4–14. Statistically significant increases were observed in height, body weight, arm span, hand length, and foot length, whereas no significant differences were found in BMI, flexibility, or handgrip strength.

Table 4. Comparison of Pretest and Posttest Height Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Height (cm)	Pretest	134.4946	37	11.98777	1.97078	-13.598	.001	-2.236
	Posttest	135.3054	37	12.01880	1.97588			

When Table 4 is examined, a statistically significant difference is observed between the participants' pretest and posttest mean height measurements ($t = -13.598$, $p < .05$). The mean height value in the posttest ($\bar{x} = 135.3054$) was found to be higher than that recorded in the pretest ($\bar{x} = 134.4946$).

Furthermore, the calculated Cohen's d value was -2.236 , and its absolute magnitude indicated a large effect size, according to conventional interpretation criteria.

Table 5. Comparison of Pretest and Posttest Body Weight Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Body Weight (kg)	Pretest	35.8722	37	10.90564	1.79288	-3.899	.001	-.641
	Posttest	36.2762	37	10.99934	1.80828			

When Table 5 is examined, a statistically significant difference is observed between the participants' pretest and posttest mean body weight values ($t = -3.899$, $p < .05$). The mean body weight in the posttest ($\bar{x} = 36.2762$) was found to be higher than that recorded in the pretest ($\bar{x} = 35.8722$).

Furthermore, the calculated Cohen's d effect size was -0.641 , indicating a moderate effect size according to conventional interpretation criteria.

Table 6. Comparison of Pretest and Posttest Body Mass Index (BMI) Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Body Mass Index (BMI) (kg/m ²)	Pretest	19.3054	37	3.84967	.63288	-1.188	.852	-.031
	Posttest	19.3162	37	3.84950	.63285			

When Table 6 is examined, no statistically significant difference was found between the participants' pretest and posttest mean BMI values ($t = -1.188$, $p > .05$). The posttest mean BMI ($\bar{x} = 19.3162$) did not differ significantly from the pretest mean ($\bar{x} = 19.3054$).

Furthermore, the calculated Cohen's d effect size was -0.031, indicating a very small (negligible) effect size according to conventional interpretation criteria.

Table 7. Comparison of Pretest and Posttest Arm Span Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Arm Span (cm)	Pretest	128.4973	37	10.38906	1.70795	-14.283	.001	-2.348
	Posttest	129.5568	37	10.41016	1.71142			

When Table 7 is examined, a statistically significant difference was found between participants' pretest and posttest mean arm span values ($t = -14.283$, $p < .05$). Posttest values were higher than pretest values, indicating improvement following the intervention.

The calculated Cohen's d value was -2.348, and its absolute magnitude indicated a large effect size.

Table 8. Comparison of Pretest and Posttest Left Hand Length Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Left Hand Length (cm)	Pretest	14.8811	37	1.36582	.22454	-8.105	.001	-1.332
	Posttest	15.1189	37	1.36399	.22424			

When Table 8 is examined, a statistically significant difference was observed between the participants' pretest and posttest mean left hand length values ($t = -8.105$, $p < .05$). The mean left hand length in the posttest ($\bar{x} = 15.1189$) was found to be higher than that recorded in the pretest ($\bar{x} = 14.8811$).

Furthermore, the calculated Cohen's d effect size was -1.332, indicating a large effect size according to conventional interpretation criteria.

Table 9. Comparison of Pretest and Posttest Right Hand Length Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Right Hand Length (cm)	Pretest	14.8946	37	1.36421	.22428	-8.437	.001	-1.387
	Posttest	15.1405	37	1.38433	.22758			

When Table 9 is examined, a statistically significant difference was observed between the participants' pretest and posttest mean right-hand length values ($t = -8.437$, $p < .05$). The mean right-hand length in the posttest ($\bar{x} = 15.1405$) was found to be higher than that recorded in the pretest ($\bar{x} = 14.8946$).

Furthermore, the calculated Cohen's d effect size was -1.387, indicating a large effect size according to conventional interpretation criteria.

Table 10. Comparison of Pretest and Posttest Left Foot Length Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Left Foot Length (cm)	Pretest	21.0162	37	1.81254	.29798	-8.823	.001	-1.450
	Posttest	21.3676	37	1.81109	.29774			

According to Table 10, a statistically significant difference was found between the participants' pretest and posttest mean left foot length values ($t = -8.823$, $p < .05$). The posttest values were higher than the pretest values, indicating an improvement following the intervention.

Furthermore, the calculated Cohen's d effect size was -1.450, indicating a large effect size according to conventional interpretation criteria.

Table 11. Comparison of Pretest and Posttest Right Foot Length Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Right Foot Length (cm)	Pretest	21.0324	37	1.81813	.29890	-9.769	.001	-1.606
	Posttest	21.3568	37	1.77882	.29244			

According to Table 11, a statistically significant difference was found between participants' pretest and posttest mean right-foot length values ($t = -9.769, p < .05$). Posttest values were higher than pretest values, indicating improvement following the intervention.

Furthermore, the calculated Cohen's d effect size was -1.606 , indicating a large effect size according to conventional interpretation criteria.

Table 12. Comparison of Pretest and Posttest Flexibility Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Flexibility (cm)	Pretest	26.6068	37	5.57346	.91627	.227	.822	.037
	Posttest	26.4662	37	6.48562	1.06623			

When Table 12 is examined, no statistically significant difference was found between the participants' pretest and posttest mean flexibility values ($t = 0.227, p > .05$).

Furthermore, the calculated Cohen's d effect size was 0.037 , indicating a very small (negligible) effect size according to conventional interpretation criteria.

Table 13. Comparison of Pretest and Posttest Left Handgrip Strength Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Left Handgrip Strength (kg)	Pretest	13.7027	37	4.89877	.80535	-.141	.889	-.023
	Posttest	13.7622	37	4.67783	.76903			

According to Table 13, no statistically significant difference was found between the participants' pretest and posttest mean left handgrip strength values ($t = -0.141, p > .05$). The calculated effect size was very small (negligible) ($d = -0.023$).

Table 14. Comparison of Pretest and Posttest Right Handgrip Strength Measurements

Variable		Mean	n	Std. Deviation	Std. Error Mean	t	p	d
Right Handgrip Strength (kg)	Pretest	14.3581	37	5.69664	.93652	.052	.959	.009
	Posttest	14.3351	37	5.82015	.95683			

According to Table 14, no statistically significant difference was found between the participants' pretest and posttest mean right handgrip strength values ($t = 0.052, p > .05$). The calculated effect size was very small (negligible) ($d = 0.009$).

Discussion, Conclusion, and Recommendations

In the present study, the effects of basic swimming training conducted in swimming pools on kinanthropometric characteristics, flexibility, and muscular strength were examined, and the findings were evaluated in light of the participants' age range and gender distribution. The results of the study

indicate that the effects of swimming training on physical development are shaped by factors such as age, gender, training duration, program content, and individual developmental stage. Furthermore, it was demonstrated that these parameters should be systematically considered to achieve the desired outcomes. In this context, the discussion and conclusions regarding the research findings are presented below within a comprehensive, integrative framework.

Swimming is one of the important sports disciplines that contributes to individuals' physical, social, and emotional development. It is among the activities in which individuals of all ages participate for sport or recreational purposes through courses organised by various public institutions or private organisations. From this perspective, swimming is regarded as one of the fundamental physical activities that support physical development during childhood.

In the present study, which aimed to evaluate the effects of basic swimming training conducted in swimming pools on various participant-related variables, it was determined that basic swimming training was associated with a positive, statistically significant increase in participants' height. Similarly, a significant increase in participants' mean body weight was observed. When these results are considered collectively, it can be suggested that an eight-week structured basic swimming training program may contribute positively to the anthropometric development of individuals aged 6–13 years.

However, since height and body weight are directly associated with natural growth and developmental processes, it is more appropriate to interpret the observed increases not solely as the effect of swimming training, but also in conjunction with developmental processes. Yörükoğlu and Koz (2007) emphasised that developmental factors substantially influence physical growth during childhood.

The literature indicates that numerous studies support the effect of swimming training on height development. In a study by Dilek (2004) on swimmers, participants' mean height increased. Similarly, in a study by Güler (2000), it was found that height increased among individuals in the same age group. International studies have also suggested that swimming training may support children's height development (Allen et al., 1997; Novak et al., 1973). In this context, the findings of the present study are generally consistent with the existing literature.

Within the scope of the study, no statistically significant difference was detected between the pretest and posttest measurements of Body Mass Index (BMI) values. However, a slight increase in participants' mean BMI was observed. This finding suggests that short-term swimming training may have a limited effect on BMI. Similarly, Tsalis et al. (2004) reported that a training program implemented with adolescent swimmers aged 12–17 years did not result in a statistically significant change in BMI values. This situation may be explained by the fact that BMI is influenced not only by physical activity but also by multiple factors, including nutritional habits, metabolic processes, and physiological characteristics associated with growth and development during adolescence.

According to the present study's findings, basic swimming training also produced positive effects on individuals' anthropometric measurements. In this regard, statistically significant increases in participants' arm span measurements were observed from pretest to posttest. Arm span is an important parameter for swimming performance, influencing distance covered and movement efficiency. These results indicate that anthropometric length measurements increased over the eight-week training period.

When studies in the literature are examined, it is observed that findings differ regarding the effects of swimming training on arm span. In a study by Anderson et al. (2008) of elite swimmers followed over a long period, a significant increase in arm span was observed. Similarly, in research by Damsgaard et al. (2001), improvements in children's body proportions were observed. In contrast, Polat et al. (2003) found no significant difference in arm span among children aged 14 years. These differences may be associated with variations in the age characteristics of the study groups and their developmental stages.

Among the other anthropometric measurements examined in the study were hand and foot length. The findings revealed that individuals aged 6–13 years who participated in basic swimming training

demonstrated positive development in right- and left-hand length and foot length. Given the influence of physical development on sports performance, these results suggest that physical performance indicators increased alongside the basic swimming training process.

These findings are consistent with those reported in a study by Atasoy (2018) with performance-group swimmers aged 8–10 years. In that study, a significant difference was found between pretest and posttest hand length measurements. In contrast, Işıldak (2013) did not observe a significant difference in anthropometric length measurements in a study conducted with swimmers aged 12–15 years. The emergence of these differences may be attributed to the age characteristics and developmental stages of the research groups, which can be considered determining factors.

Findings related to the development of foot length also show similarities with certain studies reported in the literature. In a study by Anderson et al. (2008) of elite swimmers, a significant increase in foot length was observed. Conversely, in another study carried out by Atasoy (2018), no significant difference was observed in foot length measurements. This situation indicates that factors such as the characteristics of the study group, training level, and program structure may play a determining role in anthropometric development.

According to the study's results, no statistically significant difference was observed between the pretest and posttest measurements for the flexibility parameter. This finding suggests that the eight-week basic swimming training program may not have provided a sufficient duration for the development of flexibility. Similarly, in a study conducted by Zülkadiroğlu (1995), no significant difference was observed in flexibility measurements. International research has also indicated that swimming training may have a limited effect on flexibility (Dawson et al., 2002). This situation indicates that flexibility development is a physical characteristic that requires continuity and regular training.

In the handgrip strength test applied in the study to determine strength development, no statistically significant difference was found between the pretest and posttest measurements. This result may be attributed to the limited inclusion of exercises directly targeting strength development within the basic swimming training program. In contrast, studies by Bayır (2023) and Karakuş et al. (2018) reported that swimming training improved strength development. It is considered that the primary reason for these differences may be variations in the content and duration of the training programs.

In general terms, the findings of the present study indicate that swimming training may be associated with children's physical development parameters. While positive developments were observed in height and anthropometric measurements, it was recognised that the development of certain physical characteristics, such as flexibility and strength, requires longer-term, more systematic training programs. These findings reveal that the effects of swimming training on physical development are closely related to variables such as age, gender, training duration, program content, and individual developmental stages.

These results highlight the importance of organising the duration and content of basic swimming training programs in accordance with children's developmental stages when planning swimming education programs for young individuals.

Limitations

The present study has several limitations. First, the study used a single-group pretest–posttest design, and the absence of a control group may limit the generalizability of the findings. In addition, the relatively small sample size and the inclusion of participants across a broad age range may influence the interpretation of the results. Furthermore, the duration of the swimming training program, limited to eight weeks, may have prevented full observation of the development of certain physical characteristics, particularly flexibility and strength. The study is limited to data from 37 participants aged 6–13 years

who attended basic swimming training at a swimming pool operated by the Ministry of Youth and Sports in the city centre of Bayburt between February and June 2025.

Recommendations

For future studies, it is recommended that experimental designs incorporating control groups be employed. In this way, the effects of basic swimming training on children's physical development parameters can be evaluated more robustly. Additionally, conducting studies with larger sample groups and examining different age categories separately may enhance the generalizability of the findings.

Considering that no significant differences were observed in flexibility and handgrip strength variables following the eight-week basic swimming training program, it is recommended that future research implement longer-term programs supported by exercises specifically targeting strength and flexibility development. Moreover, planning basic swimming training programs in accordance with children's developmental stages may contribute to more effective monitoring of physical and motor development outcomes.

Conflict of Interest

The authors declare no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contributions

K.G.K. contributed to data collection, data organization, and manuscript drafting. Z.Ç. contributed to study conception, supervision, methodology, academic guidance, interpretation of findings, and critical revision of the manuscript. Both authors reviewed and approved the final version of the manuscript.

References

- Allen, H. D., Goldberg, S. J., Sahn, D. J., Schy, N., & Wojcik, R. (1977). A quantitative echocardiographic study of champion childhood swimmers. *Circulation*, 55(1), 142–145. <https://doi.org/10.1161/01.cir.55.1.142>
- Anderson, M., Hopkins, W., Roberts, A., & Pyne, D. (2008). Ability of test measures to predict competitive performance in elite swimmers. *Journal of Sports Sciences*, 26(2), 123–130.
- Atasoy, H. (2018). *Yüzme antrenmanlarının; 8-10 yaş performans grubu yüzücülerinin serbest stil dereceleri ile bazı antropometrik ve motorik özellikler üzerindeki etkisinin incelenmesi* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 503367)
- Barbosa, T. M., Bragada, J. A., Reis, V. M., Marinho, D. A., Carvalho, C., & Silva, A. J. (2010). Energetics and biomechanics as determining factors of swimming performance: Updating the state of the art. *Journal of Science and Medicine in Sport*, 13(2), 262–269.
- Bayır, R. (2023). *8-10 yaş arası çocuklara uygulanan 8 haftalık yüzme eğitiminin fiziksel, fizyolojik ve kuvvet değerleri üzerine etkisinin incelenmesi* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 849292)
- Biçer, B., Yüktaşır, B., Yalçın, H. B., & Kaya, F. (2009). Yetişkin bayanlarda 8 haftalık aerobik dans egzersizlerinin bazı fizyolojik parametreler üzerine etkisi. *Beden Eğitimi ve Spor Bilimleri Dergisi*, 11(3), 1–14. <https://dergipark.org.tr/en/download/article-file/297033>
- Ceyhan, M. A., & Çakır, Z. (2021). Examination of Fear of Missing Out (FOMO) states of students who study at the School of Physical Education and Sports in terms of some variables. *Education Quarterly Reviews*, 4(4), 419–427. <https://doi.org/10.31014/aior.1993.04.04.404>
- Coşkuntürk, O. S., Kurcan, K., Yel, K., & Güzel, S. (2023). Teknolojik gelişmelerin hareketsiz yaşama ve çocuklarda psiko-motor gelişime etkileri. *Dede Korkut Spor Bilimleri Dergisi*, 1(1), 48–59. <https://dergipark.org.tr/pub/dksbd/issue/77859/1309808>
- Cox, K. L., Burke, V., Beilin, L. J., & Puddey, I. B. (2010). A comparison of the effects of swimming and walking on body weight, fat distribution, lipids, glucose, and insulin in older women: The sedentary women exercise adherence trial 2. *Metabolism*, 59(11), 1562–1573. <https://doi.org/10.1016/j.metabol.2010.02.001>

- Çelebi, Ş. (2008). Yüzme antrenmanı yaptırılan 9-13 yaş grubu ilköğretim öğrencilerinde vücut yapısal ve fonksiyonel özelliklerinin incelenmesi. *Erciyes Üniversitesi, Sağlık Bilimleri Enstitüsü, Beden Eğitimi Ve Spor Anabilim Dalı, Yüksek Lisans, Yök Tez Tarama Merkezi, Tez Künye*, (225902).
- Çolakoğlu, F. F., & Şenel, Ö. (2003). Sekiz haftalık aerobik egzersiz programının sedanter orta yaşlı bayanların vücut kompozisyonu ve kan lipidleri üzerindeki etkileri. *Sportmetre Beden Eğitimi ve Spor Bilimleri Dergisi*, 1(1), 57–61. https://doi.org/10.1501/Sporm_0000000007
- Damsgaard, R., Bencke, J., Matthiesen, G., Petersen, J. H., & Müller, J. (2001). Body proportions, body composition and pubertal development of children in competitive sports. *Scandinavian Journal of Medicine & Science in Sports*, 11(1), 54–60. <https://doi.org/10.1034/j.1600-0838.2001.011001054.x>
- Dawson, B., Vladich, T., & Blanksby, B. A. (2002). Effects of 4 weeks of creatine supplementation in junior swimmers on freestyle sprint and swim bench performance. *The Journal of Strength & Conditioning Research*, 16(4), 485–490.
- Dilek, H. (2004). *İstanbul bölgesinde faaliyet gösteren yüzme kulüplerinin 10-11 yaş yüzücülerinin fiziksel özelliklerinin belirlenmesi* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 157429)
- Ekiz, D. (2003). *Eğitimde araştırma yöntem ve metotlarına giriş: Nitel, nicel ve eleştirel kuram metodolojileri*. Anı Yayıncılık.
- Gay, L. R., & Airasian, P. (2000). *Educational research: Competencies for analysis and application*. Prentice Hall.
- George, D., & Mallery, P. (2010). *SPSS for Windows step by step: A simple guide and reference 17.0 update*. Pearson.
- Gönen, M., Ceyhan, M. A., Çakır, Z., Zorba, E., & Coşkuntürk, O. S. (2022). Spor Bilimleri Fakültesi öğrencilerinin rekreasyon alanı kullarımlarına ilişkin engel ve tercihleri. *The Online Journal of Recreation and Sports*, 11(4), 59–76. <https://doi.org/10.22282/ojrs.2022.109>
- Güler, Ç. G. (2000). *9-18 yaş grubu müsabık yüzücülerde eklem hareket genişliğinin ve antropometrik parametrelerin yüzme performansı ile ilişkisi ve bunu temel alan yeni bir esneklik programının düzenlenmesi* (Doktora tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 99292)
- Haşiloğlu, S. B., Baran, T., & Aydın, O. (2015). Pazarlama araştırmalarındaki potansiyel problemlere yönelik bir araştırma: Kolayda örnekleme ve sıklık ifadedi ölçek maddeleri. *Pamukkale İşletme ve Bilişim Yönetimi Dergisi*, 2(1), 19–28. <https://izlik.org/JA96UW28UU>
- Işıldak, K. (2013). *12-15 yaş arasındaki elit yüzücülerde dönemlik antrenmanların bazı antropometrik, fizyolojik ve biyomotorik özelliklerin gelişimine etkisi* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 331518)
- Kaplan, K., & Gülden, B. (2017). Oğuz Atay'ın *Bir Bilim Adamının Romanı Mustafa İnan* isimli eserinde yer alan lider öğretmen özellikleri. *International Journal of Languages Education and Teaching*, 5(4), 115–136. <https://izlik.org/JA22AX43SW>
- Karakuş, M., Çelenk, Ç., Kaya, M., Sucan, S., & Turna, B. (2018). Çocuklarda 12 haftalık yüzme egzersizinin bazı fiziksel fizyolojik parametrelere etkisi. *Akdeniz Spor Bilimleri Dergisi*, 1(1), 50–57. <https://dergipark.org.tr/en/download/article-file/616860>
- Karasar, N. (2012). *Bilimsel araştırma yöntemi*. Nobel Yayıncılık.
- Kargarfard, M., Etemadifar, M., Baker, P., Mehrabi, M., & Hayatbakhsh, R. (2012). Effect of aquatic exercise training on fatigue and health-related quality of life in patients with multiple sclerosis. *Archives of Physical Medicine and Rehabilitation*, 93(10), 1701–1708. <https://doi.org/10.1016/j.apmr.2012.05.006>
- Kolukısa, Ş., & Dizdar, S. (2022). 10-12 yaş grubu çocuklara yüzme sporunun anatomik ve fiziksel gelişimine etkisinin incelenmesi. *Uluslararası Bozok Spor Bilimleri Dergisi*, 3(1), 13–26. <https://izlik.org/JA83MM57WJ>
- Malhotra, N. K. (2004). *Marketing research: An applied orientation*. Prentice Hall.
- Muratlı, S. (2013). *Çocuk ve spor*. Nobel Basımevi.
- Mühürhancı Dal, A. (2011). *12 haftalık düzenli yüzme egzersizlerinin 11-12 yaş kız çocuklarında antropometrik, spirometrik ve kardiyovasküler uyum değerleri üzerine etkisi* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 288508)
- Novak, L. P., Bierbaum, M., & Mellerowicz, H. (1973). Maximal oxygen consumption, pulmonary function, body composition, and anthropometry of adolescent female athletes. *Internationale Zeitschrift für Angewandte Physiologie Einschließlich Arbeitsphysiologie*, 31, 103–119. <https://doi.org/10.1007/BF00693730>
- Nualnim, N., Parkhurst, K., Dhindsa, M., Tarumi, T., Vavrek, J., & Tanaka, H. (2012). Effects of swimming training on blood pressure and vascular function in adults 50 years of age. *The American Journal of Cardiology*, 109(7), 1005–1010. <https://doi.org/10.1016/j.amjcard.2011.11.029>
- Özerdinç, A. (2017). *12-14 yaş çocuklara uygulanan 8 haftalık temel yüzme antrenmanlarının bazı fiziksel, fizyolojik ve kuvvet değerleri üzerine etkisinin araştırılması* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 482806)

- Özgül, F., Eliöz, M., Otağ, A., & Atan, T. (2015). Yüzme sporu yapan 10-14 yaş grubundaki çocukların solunum parametrelerinin karşılaştırılması. *Türkiye Klinikleri Journal of Sports Sciences*, 7(2), 35–40. <https://doi.org/10.5336/sportsci.2014-43151>
- Polat, Y., Çınar, V., Şahin, M., & Pepe, O. (2003). 14 yaş çocukların fiziksel uygunluk düzeyleri ile antropometrik özelliklerinin incelenmesi. *İstanbul Üniversitesi Spor Bilim Dergisi*, 19(3), 127–130. <https://dergipark.org.tr/en/download/article-file/101413>
- Rushall, B. S. (2009). The future of swimming: Myths and science. *Swimming Science Bulletin*, 12, 1–34. <https://coachsci.sdsu.edu/swim/bullets/energy39.pdf>
- Saavedra, J. M., Cruz, E. D. L., Escalante, Y., & Rodríguez, F. A. (2007). Influence of a medium-impact aquaerobic program on health-related quality of life and fitness level in healthy adult females. *Journal of Sports Medicine and Physical Fitness*, 47(4), 468–474.
- Sammoud, S., Nevill, A. M., Negra, Y., Bouguezzi, R., Chaabene, H., & Hachana, Y. (2018). 100-m breaststroke swimming performance in youth swimmers: The predictive value of anthropometrics. *Pediatric Exercise Science*, 30(3), 393–401. <https://doi.org/10.1123/pes.2017-0220>
- Sanders, R. H., Thow, J., & Fairweather, M. (2011). Asymmetries in swimming: Where do they come from. *Journal of Swimming Research*, 18, 1–11.
- Selçuk, H. (2013). *11-13 yaş grubu erkek yüzücülerde 12 haftalık terabant antrenmanının bazı motorik özellikler ile yüzme performansına etkileri* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 329297)
- Toussaint, H. M., & Beek, P. J. (1992). Biomechanics of competitive front crawl swimming. *Sports Medicine*, 13, 8–24. <https://doi.org/10.2165/00007256-199213010-00002>
- Tsalis, G., Nikolaidis, M. G., & Mougios, V. (2004). Effects of iron intake through food or supplement on iron status and performance of healthy adolescent swimmers during a training season. *International Journal of Sports Medicine*, 25(4), 306–313. <https://doi.org/10.1055/s-2003-45250>
- Yapıcı, A., Maden, B., & Fındıkoğlu, G. (2016). 13-16 yaş grubu yüzücülerde 6 haftalık kara ve direnç antrenmanlarının alt ekstremite izokinetik kuvvet performansına ve yüzme derecelerine etkisi. *Journal of Human Sciences*, 13(3), 5269–5281. <https://www.j-humansciences.com/index.php/IJHS/article/view/4158>
- Yel, K., Şencan, D., Güzel, S., & Erkihç, A. O. (2024). Physical activity, nutrition, and healthy living. *International Journal of Health, Exercise, and Sport Sciences*, 1(3), 15–28. <https://www.ijoss.org/Archive/ijoss-Volume1-issue3-02.pdf>
- Yfanti, M., Samara, A., Kazantzidis, P., Hasiotou, A., & Alexiou, S. (2014). Swimming as physical activity and recreation for women. *Tims.Acta: Naučni časopis za sport, turizam i velnes*, 8(2), 137–145. <https://doi.org/10.5937/timsact8-6427>
- Yılmaz, E. (2014). *8-12 yaş çocuklara uygulanan yüzme antrenmanlarının fiziksel, fizyolojik ve bazı biyomotorik özelliklerine etkisinin incelenmesi* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 377025)
- Yiğit, M. (2011). *Düzenli yüzme antrenmanı yapan çocukların antropometrik gelişimlerinin incelenmesi* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 288940)
- Yörükoğlu, U., & Koz, M. (2007). Spor okulu çalışmaları ile basketbol antrenmanlarının 10-13 yaş grubu erkek çocukların fiziksel, fizyolojik ve antropometrik özelliklerine etkisi. *Sportmetre Beden Eğitimi ve Spor Bilimleri Dergisi*, 5(2), 79–83. https://doi.org/10.1501/Sporm_0000000075
- Zülkadiroğlu, Z. (1995). *5-6 yaş grubu kız ve erkek çocuklarda 12 haftalık cimnastik ve yüzme çalışmalarının esneklik ve kondisyonel özellikleri üzerine etkisi* (Yüksek lisans tezi). Yükseköğretim Kurulu Ulusal Tez Merkezi. (Tez No. 40353).