Physical and Performance Indicators of Fencers Competing in Saber Branch: A Relational Study

Kılıç Branşında Yarışan Eskrimcilerin Fiziksel ve Performans Göstergeleri: İlişkisel Bir Çalışma

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Abstract

This study examines the relationship between physical characteristics and athletic performance among athletes competing in the saber discipline of fencing. Conducted at the Tim Morehouse Fencing Club in New York, USA, the research involved 33 male athletes (mean age: 12.26±1.21 years; mean height: 151.30±12.85 cm). Physical attributes such as height, along with performance indicators including agility, flexibility, 2-meter lunge speed, vertical jump, and horizontal jump performance, were assessed. Data analysis was performed using SPSS software. Normality was tested using the Kolmogorov-Smirnov test, and correlations were examined using Spearman correlation analysis. Significant relationships were identified between physical characteristics and athletic performance. A positive correlation was found between agility and vertical jump performance, suggesting that increased agility enhances jumping ability. Conversely, a negative correlation between lunge speed and flexibility indicates that greater flexibility is associated with slower lunge speed.

Keywords: Agility, fencing, flexibility, speed, saber.

Özet

Bu araştırmanın amacı, eskrim kılıç branşındaki sporcuların fiziksel özellikleri ile atletik performansları arasındaki ilişkiyi incelemektir. Araştırma Amerika Birleşik Devletleri Newyork eyaletinde bulunan Tim Morehouse Eskrim Kulübü'nde yapılmıştır. Araştırmaya bu kulüpte kılıç branşında yarışan (yaş 12.26 ±1.21, boy uzunluğu 151.30±12.85) toplam 33 erkek sporcu gönüllü katılmıştır. Araştırmada eskrimcilerin fiziksel özelliklerinden boy uzunluğu, performans göstergelerinden ise çeviklik, esneklik, 2m hamle sürati, dikey ve yatay sıçrama performansları ölçülmüştür. Elde edilen veriler için SPSS paket programı kullanılmıştır. Verilerin normalliği Kolmogorov-Smirnov testi ile incelenmiştir. Eskrimcilerin performans değerlerindeki ilişkiyi tespit etmek amacıyla Spearman korelasyon analizi yapılmıştır. Araştırmanın sonucunda, eskrim sporu kılıç branşında mücadele eden sporcuların fiziksel özellikleri ile atletik performansları arasında anlamlı ilişkiler tespit edilmiştir. Ayrıca performans göstergelerinden çeviklik performansı ile dikey sıçrama performansının olumlu ilişkinin olduğu ve çevikliği iyi olan sporcuların dikey sıçrama performansının da iyi olduğu sonucuna varılmıştır. Diğer performans göstergelerinden hamle sürati ile esneklik arasında ise negatif yönde bir ilişki olduğunu sonucuna varılmıştır.

Anahtar Kelimeler: Çeviklik, eskrim, esneklik, hız, kılıç.

Introduction

Fencing is a dynamic sport that requires the integration of physical, technical, and cognitive abilities. Success in fencing depends on the precise coordination of complex movements, swift execution, and strategic decision-making. The sport is divided into three primary disciplines: épée, foil, and saber, each with distinct rules and technical demands. The saber discipline, in particular, involves cutting movements, with valid target areas including the torso, arms, and head. Unlike épée, which follows a defensive-oriented strategy, saber fencing requires rapid and decisive actions due to its priority-based scoring system.

Motor skills such as agility, flexibility, and jumping ability play a crucial role in fencing performance. Agility refers to an athlete's ability to change direction efficiently, rapidly, and in a controlled manner (Turner, 2011). This attribute is closely associated with balance, speed, strength, and neuromuscular coordination, all of which can be developed through structured training programs. Agility is considered a key performance indicator in fencing, as fencers must execute quick foot movements to launch attacks and react to opponents (Greig & Naylor, 2017; Rachman & Nurdiansyah, 2020).

Flexibility also significantly influences fencing performance, particularly in lunges and mobility. Greater flexibility allows for an extended range of motion, which can contribute to effective attacks and defensive maneuvers (Aksoy et al., 2024; Yel et al., 2023). Proper training methods focused on enhancing flexibility may lead to improved performance among fencers. However, excessive flexibility may also impact movement efficiency, necessitating a balanced approach.

Jumping ability, which enhances lower-body power and mobility, is another essential determinant of performance. Power generation and explosiveness are critical components of fencing performance, particularly in executing rapid lunges and directional changes (Pratama, 2020). Jumping performance has been linked to lower-extremity muscle strength, further supporting its role in overall athletic capability (Markovic et al., 2004; Maulder & Cronin, 2005; Van Hooren & Zolotarjova, 2017; Kul et al., 2021;).

Fencing performance is not solely dependent on technical, tactical, and mental competencies. Physical and motor skill attributes, along with their interrelationships, also play a crucial role. Therefore, this study aims to examine these characteristics in young saber fencers and assess their impact on performance outcomes.

Methods

Participants

This study was conducted at the Tim Morehouse Fencing Club, located in New York, United States. A total of 33 male athletes (mean age: 12.26±1.21 years, mean height: 151.30±12.85 cm) actively competing in the saber discipline participated in the study. The research was designed in accordance with the ethical principles outlined in the Declaration of Helsinki. Prior to data collection, informed consent was obtained from the club coaches, and parental consent forms were secured for athletes under the age of 18.

Procedure

Anthropometric Measurements

The height of each participant was measured while standing barefoot in an anatomical posture, with feet together and heels aligned against a vertical surface. Measurements were recorded in centimeters (Baydemir et al., 2018).

Agility Assessment

Agility performance was evaluated using the pro-agility test. Markers were placed at distances of 4.57 meters (5 yards) to the left and right of a central starting position. A photocell timing system was positioned at the starting line to accurately record transition times. Participants initiated the test from the center, touching the right-side marker first, followed by the left-side marker, before crossing the starting line to complete the sequence.

Flexibility Assessment

Flexibility was assessed using the sit-and-reach test, a widely recognized measure of hamstring and lower back flexibility. Each participant performed two trials, with the highest score recorded in centimeters (Arora et al., 2014).

Speed Assessment

The 2-meter lunge test was conducted on a standardized fencing piste within an indoor fencing hall. Participants commenced from the en-garde position, positioned behind the starting line. Photocell timing gates were placed at both the start and finish lines to precisely measure the time taken to complete the lunge over a 2-meter distance.

Vertical Jump Performance

Vertical jump height was measured using the My Jump 2 application, a validated tool for assessing lower limb explosive power. The application recorded the jump movement, identifying the moment of take-off and landing to calculate jump height in centimeters. The best score from two attempts was recorded (Balsalobre-Fernández et al., 2015).

Horizontal Jump Performance

A standing long jump test was used to assess lower-body power. Participants were instructed to perform a maximal effort jump from a standardized starting position, utilizing arm swing for momentum. A tape measure fixed to the ground was used to record the total jump distance, measured from the take-off point to the nearest landing point. The best score from two attempts was recorded (Porter et al., 2010).

Data Analysis

All statistical analyses were conducted using SPSS software. The normality of the data distribution was assessed using the Kolmogorov-Smirnov test, in conjunction with Q-Q plots and histogram visualizations. Spearman correlation analysis was employed to evaluate the relationships between performance variables. A significance threshold of $p<0.05$ and $p<0.01$ was applied to determine statistical relevance.

Results

Descriptive statistics of the fencers participating in the study are presented in the table below (Table 1).

Table 1. Descriptive Characteristics of the Athletes Participating in the Study

Variables	N	X	SS	Min	Max
Age (year)	23	12.26	1.21	11	14
Height (cm)		151.30	12.85	130	177
Pro Agility (sn)		5.86	45.49	5.15	6.83
Flexibility (cm)		20.83	0.26	21	41.5
2m Lunge Test (sn)		1.03	39.79	0.61	1.47
Vertical Jump (cm)		23.5	39.91	15	31
Horizontal Jump (cm)		142.5	25.61	105	193

A normality test was conducted to determine whether the obtained data conformed to a normal distribution. Given that the number of athletes participating in the study was less than 30, Shapiro-Wilk values were used for the analysis. The results indicated that age and flexibility values did not conform to a normal distribution. Additionally, height, agility, 2m lunge speed, vertical jump, and horizontal jump values also failed to conform to a normal distribution (p>0.05). The data obtained are presented in the table below (Table 2).

Table 2. Normality test

	Kolmogorov-Smirnov[a]		
Variables	**Statistic**	**df**	**Sig.**
Age (year)	.819	23	.001
Height (cm)	.975	23	.809*
Pro Agility (sn)	.937	23	.157*
Flexibility (cm)	.842	23	.002
2m Lunge Test (sn)	.864	23	.005*
Vertical Jump (cm)	964	23	.556*
Horizontal Jump (cm)	958	23	.431*

*p>0.05

As a result of the Spearman Rank Difference Correlation test performed to determine the relationship between the physical and biomotor characteristics of the athletes participating in the study; a significant positive relationship was found between age and height (r=.928, p<0.01), agility and vertical jump (r=1.000, p<0.01). A negative significant relationship was found between flexibility and 2m lunge speed (r=-.612**p<0.01). The data obtained are presented in the table below (Table 3).

Table 3. Correlation Analysis of Physical and Biomotor Characteristics of Fencers

		Age	Height (cm)	Pro Agility (sn)	Flexibility (cm)	2m Lunge (sn)	Vertical Jump (cm)	Horizontal Jump (cm))
Age	**r**	1.000	.928**	-.106	.168	-.156	-.094	.063
	p	.	.000	.631	.444	.478	.670	.776
Height (cm)	**r**		1.000	-.135	.204	-.058	-.122	-.052
	p		.	.538	.350	.794	.578	.813
Pro Agility (sn)	**r**			1.000	-.213	.285	1.000**	-.120
	p			.	.328	.188	.000	.587
Flexibility (cm)	**r**				1.000	-.612**	-.213	.010
	p				.	.002	.329	.963
2m Lunge (sn)	**r**					1.000	.282	.251
	p					.	.192	.247
Vertical Jump (cm)	**r**						1.000	-.125
	p						.	.571
Horizontal Jump (cm)	**r**							1.000
	p							.

**p<0.01

Discussion

This study aimed to investigate the relationships between key performance indicators among young fencers competing in the saber discipline. The findings revealed a positive correlation between age and height, as well as between agility and vertical jump performance, suggesting that increased agility contributes to improved lower-body explosiveness. Conversely, a negative correlation was observed between flexibility and 2m lunge speed, indicating that greater flexibility may lead to a reduction in lunge execution speed.

The existing literature primarily emphasizes the role of balance as a key motor skill in fencing. Previous studies have established that fencers with superior postural and dynamic balance tend to achieve higher competitive success (Behm, 2019; Di Cagno et al., 2018). Additionally, research suggests that postural balance control significantly enhances both defensive and offensive performance in fencing (Gholipour et al., 2008; Paillard & Noé, 2015). Studies have also demonstrated that balance training positively influences both amateur and elite fencers, contributing to overall performance improvements (Santinelli, 2021). Regarding dynamic balance, Zemkova and Hamar (2014) emphasized its critical role in the execution of movements such as lunges and fleches, with findings suggesting that athletes with superior balance control exhibit higher technical proficiency in these movements. Moreno et al. (2015) further highlighted the benefits of dynamic balance training, particularly in improving lunges and rapid directional changes.

In terms of injury prevention, studies have demonstrated that fencers with poor balance control face a heightened risk of knee and ankle injuries (Williams et al., 2017). However, targeted balance training can mitigate this risk. Similarly, Croisier et al. (2007) reported that athletes with insufficient balance performance were more susceptible to lower limb injuries, but implementing balance-focused training programs significantly reduced injury incidence. Supporting this perspective, Borms and Cools (2018) found that balance-specific exercises enhance body stability, thereby lowering injury risk. Additionally, Fong et al. (2013) established that fencers with superior balance control exhibit a lower likelihood of sustaining injuries.

Beyond balance, technical elements in fencing have been shown to impact overall performance. Roi and Bianchedi (2008) identified balance as a determinant of reaction time and movement speed. Santos et al. (2020) highlighted the benefits of dynamic balance training on technical execution, while Gonzalez-Galvez et al. (2021) suggested that improving postural balance directly enhances technical precision. Lichtenstein et al. (2022) found that balance plays a crucial role in in-game performance and overall success, particularly in lunge execution. Additionally, Moreno-Perez et al. (2023) reported that athletes with superior balance capabilities demonstrated enhanced lower-body stability and proprioceptive development, further supporting the need for balance-oriented training interventions.

This study identified significant relationships between physical characteristics and motor skill performance in young saber fencers. Specifically, agility was positively correlated with vertical jump performance, suggesting that enhanced agility contributes to improved lower-limb explosiveness. Additionally, a negative correlation between lunge speed and flexibility was observed, indicating that increased flexibility may negatively impact lunge execution speed. These findings underscore the importance of incorporating targeted flexibility training into fencing conditioning programs, particularly for young athletes. Therefore, it is recommended that flexibility training be integrated with explosive strength, jump, and reaction training, alongside balance exercises, to optimize overall performance in saber fencers. Future research should further explore the longitudinal effects of such training interventions on fencing-specific motor skills and competitive success.

Authors' Contribution

Study Design: İİÜ, BB; Data Collection: İİÜ, BB; Statistical Analysis: BB, İİÜ; Manuscript Preparation: BB, İİÜ; Funds Collection: BB, İİÜ.

Ethical Approval

The study was approved by the Çanakkale Onsekiz Mart University Ethical Committee (2025/09) and it was carried out in accordance with the Code of Ethics of the World Medical Association also known as a declaration of Helsinki.

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Conflict of interest

The authors hereby declare that there was no conflict of interest in conducting this research.

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