



The Effectiveness of Physical Exercise on the Speed and Endurance of Fencing Athletes: A Systematic Literature Review

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Abstract

Physical exercise is one of the essential aspects in maintaining health and physical fitness. This activity not only helps improve muscle strength and body endurance, but also plays a role in maintaining heart health, increasing flexibility, and reducing the risk of various chronic diseases such as diabetes and hypertension. In the modern era, where lifestyles tend to be more sedentary due to technological advancements and the prevalence of online work, it is crucial for every individual to remain physically active. This study aims to determine the effect of physical training on the performance of fencing athletes, with the main focus on speed, accuracy and endurance. This study uses the Systematic Literature Review (SLR) method, in which researchers collect data through accessible journal portals, especially Sinta, using the Harzing's Publish or Perish application. Out of 200 related articles, 6 were found to be relevant after a screening process using Covidence. The data analyzed in this study were drawn from the 2017–2024 period and are indexed in Sinta and publicly accessible. Based on the results and discussion, it can be concluded that regular and targeted physical training plays an important role in improving the performance of fencing athletes. Increasing explosive muscle strength results in athletes being able to make faster, more effective and targeted attacks on each stab accuracy, thus minimizing the opponent to make defensive movements.

INTRODUCTION

Sport is a physical activity performed regularly to improve physical fitness, maintain health, and develop motor skills (Nisaa & Ismalasari, 2023). Since ancient times, sport has been an important part of human life, serving not only as a form of entertainment and competition but also as a means to maintain physical and mental balance. In various cultures, sport is not merely viewed as a physical activity, but also as a platform to foster discipline, teamwork, and sportsmanship. The benefits of sport are extensive, encompassing physical, mental, and social aspects (Rizkiyati et al., 2024). Physically, sport helps improve endurance, strengthen muscles and bones, and reduce the risk of various diseases such as obesity, diabetes, and heart disorders. From a mental perspective, engaging in sports activities can stimulate the production of endorphins, which help reduce stress, enhance mood, and improve sleep quality. In addition, sport also plays a role in building self-confidence, increasing concentration, and instilling values such as hard work and sportsmanship (Jannah et al., 2021).

Physical exercise is one of the key aspects of maintaining health and physical fitness. This activity not only helps improve muscle strength and endurance but also plays a role in maintaining heart health, increasing flexibility, and reducing the risk of various chronic diseases such as diabetes and hypertension (Munawar et al., 2023). In the modern era, where lifestyles tend to be more sedentary due to technological advancements and the prevalence of remote work, it is essential for individuals to remain physically active (Suryadi, 2022). Physical exercise can be performed in various forms,

ranging from light activities such as walking and yoga to high-intensity workouts like weightlifting and HIIT (High-Intensity Interval Training). Moreover, the benefits of physical exercise are not limited to physical health but also positively impact mental health, including reducing stress, improving mood, and helping to overcome sleep disorders. In the midst of a modern lifestyle increasingly dominated by sedentary activities, such as working long hours in front of a computer and lack of physical activity, the risk of various chronic diseases like obesity, type 2 diabetes, high blood pressure, and cardiovascular disorders continues to rise. Therefore, maintaining fitness through physical exercise becomes increasingly important, not only for physical health but also for mental well-being. (Irawati et al., 2024).

Speed and endurance are two main components of physical fitness that play a crucial role in various sports activities and everyday life (Atri Widowati, 2018). Speed refers to a person's ability to move or react in the shortest possible time, while endurance relates to the body's capacity to maintain physical performance over an extended period without excessive fatigue. Both are interconnected and often become determining factors in sports such as running, soccer, cycling, and various other athletic disciplines. In the world of sports, improving speed and endurance is key for athletes to achieve their best performance. High speed allows an athlete to move faster and react more quickly to situations on the field, while good endurance ensures they can sustain energy and optimal performance until the end of the competition. However, the benefits of speed and endurance are not limited to athletes alone. In everyday

life, having good speed can help a person perform physical activities more efficiently, whereas optimal endurance contributes to improved cardiovascular, pulmonary, and muscular health (Akbar Hidayat, 2024).

Fencing is a martial art that emphasizes speed, agility, strategy, and skill in weapon control (Akbar Hidayat, 2024). This sport has evolved from classical sword dueling techniques into a competitive discipline featured in various international events, including the Olympics. In fencing, two athletes face each other and try to score points by thrusting or cutting their opponent using one of the three types of weapons used in the sport: foil, épée, and sabre (Megarany & Soenyoto, 2021).

Besides being a physically demanding sport, fencing also requires tactical intelligence and quick reflexes. A fencer must be able to read the opponent's movements, plan attacks, and defend using effective strategies. Therefore, fencing is often described as a sport that combines elements of art, technique, and quick thinking. In addition to its benefits in improving muscle strength, balance, and body coordination, fencing also positively impacts mental development.

Fencing training can enhance concentration, self-confidence, and the ability to make quick decisions. Speed plays an important role for an athlete to attack and block quickly and precisely so that it can provide an advantage in every point. Meanwhile, endurance is needed to maintain physical performance and concentration during a match that lasts for several rounds with high intensity. The combination of speed of movement and endurance allows fencers to remain aggressive, responsive and effective in making movement

decisions throughout the match and reduce the risk of fatigue that can reduce the accuracy of the thrust. It is no wonder that this sport is often regarded as “physical chess” because it demands a combination of strategy and high-level motor skills (Kusumajati, 2011). Physical training, increasing speed and endurance are closely related and contribute directly to improving athlete performance to perform each movement effectively and optimally during the match.

METHOD

This study uses a Systematic Literature Review (SLR) method. SLR is a research approach that involves identifying, reviewing, evaluating, and interpreting all relevant studies collected by the researcher. The researcher systematically examines and analyzes articles in a thorough and organized manner. A Systematic Literature Review is a method used to identify, assess, and interpret all research related to a specific research question, topic area, or phenomenon of interest (Barbara Kitchenham, 2014).

Research design refers to the methods used to collect research data so that the results can be verified. In this study, the author employs a Systematic Literature Review (SLR) design, which is a method that allows the evaluation and interpretation of all accessible research relevant to the research questions, subject matter, or phenomena of interest. The steps for conducting a Systematic Literature Review consist of four stages: (1) identifying journals to be included in the meta-analysis, (2) selection, which involves assessing the quality of research reports, (3) abstraction, which entails quantifying the results of each study to be combined, and (4) analysis, which involves

synthesizing and reporting the findings of the SLR (Pizard et al., 2021).

In this study, the researcher conducted data searches through accessible journal portal websites, specifically using Google Scholar via the Harzing's Publish or Perish application. Based on the research title, "The Effectiveness of Physical Training on the Speed and Endurance of Fencing Athletes," the researcher searched for journal articles using the keywords "Physical Training and Speed and Endurance of

Fencing Athletes," with a time frame set from 2017 to 2024.

For screening or filtering, Covidence was used. Covidence is a platform utilized in evidence-based research to screen literature, assess the quality of studies, and collect data from various sources. It includes the process of screening articles for inclusion or exclusion. The results generated by Covidence can be used to compile a PRISMA report.

Table 1. Inclusion and Exclusion Criteria

Type	Inclusion	Exclusion
Article Type	Research articles	Research reports (theses, dissertations, seminar papers)
Language	Indonesian	Other than Indonesian
Participants	Elementary and secondary school students, athletes	Other than elementary and secondary school students, athletes
Publication Year	2017 -2024	Before 2017
Research Variables	Effectiveness of Physical Training on Speed and Endurance of Fencing Athletes	Effectiveness of Physical Training on Speed and Endurance of Fencing Athletes
Scope	Physical education	-
Index	Sinta-indexed journal	Non-Sinta-indexed journals

In the quality assessment for the Systematic Literature Review (SLR) method, the following criteria are applied:

QA1: Is the journal published in the Indonesian language?

QA2: Was the journal article published between 2017 and 2024?

QA3: Does the journal address research problems relevant to this study?

QA4: Is the journal article a full paper?

Each paper will be scored based on the answers to the questions above as follows:

Y (Yes): For criteria that are clearly stated in the journal article published between 2020 and 2024.

X (No): For criteria that are not mentioned.

Tabel 2. Quality Assesment

NO	Author(s)	Title	Year	Q1	Q2	Q3	Q4	Result
1	(Atri Widowati, 2018)	Latihan Shadow Fencing Anggar Untuk Atlet Anggar Provinsi Jambi	2018	Y	Y	Y	X	X
2	(Hansen Pasaribu, Nina Sutresna, 2024)	Pengaruh Latihan Serangan Balasan Menggunakan Metode Drill Terhadap Ketepatan Tusukan Senjata Floret pada Atlet Anggar Kabupaten Bogor	2024	Y	Y	Y	Y	V
3	(Pratama, 2021)	Pengaruh Latihan Squat Jump dan Naik Turun Tangga terhadap Daya Ledak Otot Tungkai Atlet Anggar UKM Universitas Jambi	2021	Y	Y	Y	Y	V
4	(Aldera, 2017)	Analisis Kecepatan, Kelincahan, Kekuatan, dan VO2Max terhadap Atlet Cabang Olahraga Anggar Putra Kabupaten Situbondo	2017	Y	Y	Y	Y	V
5	(Kusumajati, 2011)	Hubungan Antara Kecemasan Menghadapi Pertandingan Dengan Motivasi Berprestasi Pada Atlet Anggar Di Dki Jakarta	2011	Y	Y	Y	X	X
6	(Akbar Hidayat, 2024)	Pengembangan Media Sasaran Tangan Sebagai Alat Bantu Latihan Senjata Degen Dalam Olahraga Anggar	2024	Y	Y	X	Y	X
7	(Yanto, 2013)	Perbandingan Antara Tangkisan Dua Dengan Tangkisan Delapan Terhadap Ketepatan Tusukan Riposte Pada Atlet Anggar Jenis Senjata Degen	2013	Y	Y	X	Y	X
8	(Rasyono, 2019)	Pengaruh Variasi Latihan Serangan Terhadap Ketepatan Tusukan Atlet Anggar Provinsi Jambi	2019	Y	Y	Y	Y	V
9	(Sartono, 2010)	Konstruksi Tes Kemampuan Fisik Atlet Anggar	2010	Y	Y	X	Y	X
10	(Munawarah & Hamid, 2023)	Analisis Daya Ledak Otot Lengan, Daya Ledak Otot Tungkai, Kecepatan Reaksi, dan Ketepatan Serangan pada Atlet Anggar Kabupaten Balangan	2023	Y	Y	Y	Y	V
11	(Decheline et al., 2021)	Pelatihan Model Pendekatan Pembelajaran Teaching Games for Understanding (TGfU) Untuk Atlet Anggar Jambi	2021	Y	Y	Y	X	X
12	(Prasetyo et al., 2021)	Kontribusi Panjang Lengan, Kekuatan Otot Lengan, dan Kekuatan Otot Tungkai terhadap Kecepatan dan Ketepatan Serangan Atlet Anggar Kabupaten Tabalong	2021	Y	Y	Y	Y	V

Symbol Explanation:

V: For journals or data used in the study. These data were selected because they are relevant to the research title.

X: Journals or data not used in the study because they are not relevant.

A total of 150 journals were identified through the search process. After data selection based on the inclusion and exclusion criteria using the keywords “Physical Training and

Speed and Endurance of Fencing Athletes” within the period 2017–2024, most items were excluded because the articles were not relevant to the research title. Based on the Quality Assessment (QA), six relevant journal articles were identified and then grouped according to the development platform and approach used to answer the research questions. The following PRISMA flow diagram serves as a guideline for this study (Figure 1).

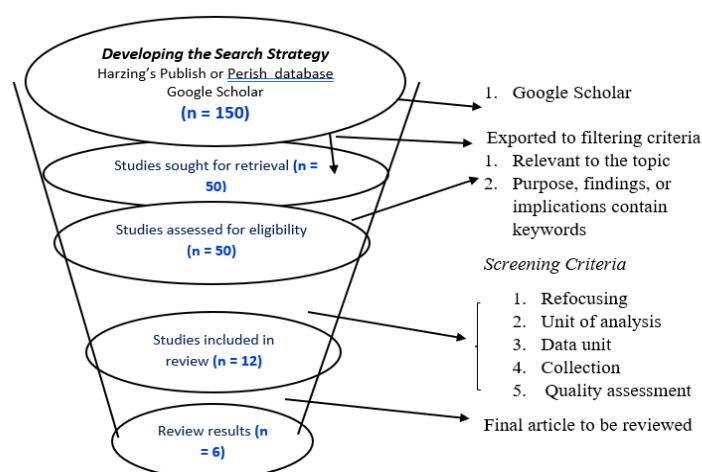


Figure 1. Article Search Flow

RESULT AND DISCUSSION

Based on the systematic literature review conducted, six articles were deemed suitable for analysis. The articles were searched through a designated database, Google Scholar, using the Harzing's Publish or Perish application. Guided by the research title, "The Effectiveness of Physical Training on the Speed and Endurance of Fencing Athletes," the researcher used the keywords "Physical Training and Speed and Endurance of Fencing Athletes" with a time

frame set from 2017 to 2024. A total of 150 articles were initially retrieved through the search process, which was narrowed down to 50 articles after screening the titles. Following the application of inclusion and exclusion criteria, 12 journal articles remained and were subjected to a Quality Assessment. From the Quality Assessment results, six relevant journal articles were identified and subsequently grouped based on the development platform and approach used to address the research questions.

Table 3. Article Review Results

No.	Author(s)/ Year	Article Title	Research Method	Results
1	(Hansen Pasaribu, Nina Sutresna, 2024)	Pengaruh Latihan Serangan Balasan Menggunakan Metode Drill Terhadap Ketepatan Tusukan Senjata Floret pada Atlet Anggar Kabupaten Bogor	Experimental Approach	Counterattack training using the drill method significantly improved the accuracy of fencers' thrusts. This indicates that the drill method can be an effective approach in training programs to enhance athletes' technical skills, especially in foil fencing.
2	(Pratama, 2021)	Pengaruh Latihan Squat Jump dan Naik Turun Tangga terhadap Daya Ledak Otot Tungkai Atlet Anggar UKM Universitas Jambi	Quantitative (Experimental)	Squat jump and stair climbing training proved effective in increasing explosive power of lower limb muscles in fencers. This training helps athletes improve attack bursts and maintain a stable "on guard" position, which is crucial for offensive and defensive techniques.

3	(Aldera, 2017)	Analisis Kecepatan, Kelincahan, Kekuatan, dan VO2Max terhadap Atlet Cabang Olahraga Anggar Putra Kabupaten Situbondo	Quantitative	Athletes' speed and endurance are still low and require improvement through more specific and structured training. Agility is fairly good but can be further developed
4	(Rasyono, 2019)	Pengaruh Variasi Latihan Serangan Terhadap Ketepatan Tusukan Atlet Anggar Provinsi Jambi	Experimental	This study aimed to examine the effect of attack variation training on fencing athletes' thrust accuracy. The training improved accuracy significantly by enhancing reflexes, accuracy, and more effective attack techniques.
5	(Munawarah & Hamid, 2023)	Analisis Daya Ledak Otot Lengan, Daya Ledak Otot Tungkai, Kecepatan Reaksi, dan Ketepatan Serangan pada Atlet Anggar Kabupaten Balangan	Quantitative Descriptive	Arm and leg muscle explosiveness of athletes is moderate to low, requiring improvement through more specific physical training. Reaction speed is generally suboptimal, which may affect competition performance. Attack accuracy is good but still needs enhancement to face stronger opponents.
6	(Prasetyo et al., 2021)	Kontribusi Panjang Lengan, Kekuatan Otot Lengan, dan Kekuatan Otot Tungkai terhadap Kecepatan dan Ketepatan Serangan Atlet Anggar Kabupaten Tabalong	Expost Facto	Arm length, arm muscle strength, and leg muscle strength significantly contribute to the speed and accuracy of fencers' attacks. Athletes with longer arms and better muscle strength tend to have faster and more accurate attacks. Coaches should focus on strengthening arm and leg muscles to improve athletes' performance in competitions.

DISCUSSIONS

The first article, titled “*Pengaruh Latihan Serangan Balasan Menggunakan Metode Drill Terhadap Ketepatan Tusukan Senjata Floret pada Atlet Anggar Kabupaten Bogor*”, shows that counterattack training using the drill method has a significant impact on improving the accuracy of floret thrusts in fencing athletes from Bogor Regency. This is evidenced by statistical test results using the Kuhadja Fencing Test, which indicated an increase in the average accuracy score after the athletes underwent training using the drill method. Drill-based training proved effective as it allowed athletes to perform movements repeatedly with correct techniques, thereby creating more precise and consistent

movement automation. Moreover, this training method provided coaches with opportunities to monitor and correct athletes' techniques directly during practice sessions. This approach is considered effective within fencing training programs, particularly in enhancing the accuracy of floret thrusts. These findings can serve as a practical reference for coaches in designing more structured and evidence-based training programs to improve athlete performance in fencing competitions.

The article titled “*Pengaruh Latihan Squat Jump dan Naik Turun Tangga terhadap Daya Ledak Otot Tungkai Atlet Anggar UKM Universitas Jambi*” demonstrates that squat jump and stair climbing exercises have a significant effect on the explosive power of the leg muscles in fencing athletes at UKM Jambi University. The study showed that before the training (pre-test),

the average jump distance of the athletes was 248 cm. After being given the training using the squat jump and stair climbing methods (post-test), the average jump distance increased to 254 cm. The results of the statistical t-test revealed a t-value (T count) of 18.4190355, which is greater than the t-table value of 1.81246, indicating that the improvement is statistically significant. This research confirms that exercises focused on enhancing the explosive power of the leg muscles can improve fencing athletes' performance, particularly in generating explosive attacks and maintaining stability in the en garde position. With better leg muscle explosiveness, athletes can execute faster and more effective attacks, while also reducing their opponents' chances of countering. Therefore, squat jump and stair climbing exercises can be considered effective training methods for increasing the explosive power of the lower limbs in fencing athletes, ultimately boosting their performance in competition.

The third article, titled “*Analisis Kecepatan, Kelincahan, Kekuatan, dan VO₂Max terhadap Atlet Cabang Olahraga Anggar Putra Kabupaten Situbondo*” reveals that the physical condition of male fencing athletes in Situbondo Regency still requires improvement in several areas to be able to compete effectively with athletes from other regions, particularly in East Java. The study evaluated four physical components: speed, agility, strength, and VO₂Max, each showing varying levels of achievement. In terms of speed, the findings indicate that only 40% of the athletes were in the “adequate” category, while 30% fell into the “poor” category, and the remaining 30% were classified as “very poor.” This shows that the athletes' speed is still suboptimal and needs to

be prioritized in training programs. For agility, all athletes (100%) were in the “adequate” category, suggesting a decent level of agility, although there is still room for improvement to reach a higher performance level. Strength emerged as the strongest aspect among the components evaluated, with 100% of the athletes classified in the “very good” category. This indicates that the athletes possess excellent muscular strength, meeting the required standards for fencing performance.

The fourth article, titled “*Pengaruh Variasi Latihan Serangan Terhadap Ketepatan Tusukan Atlet Anggar Provinsi Jambi*” explores how a structured training program involving various types of attack drills can improve the thrust accuracy of fencing athletes. The study revealed a measurable increase of approximately 1.1% in thrust accuracy after athletes underwent the intervention, based on a comparison of pre-test and post-test results. The statistical analysis, conducted using the Liliefors normality test, confirmed that the data followed a normal distribution pattern, with the calculated Lo value (0.0009) falling well below the critical value (0.220). This indicates that the hypothesis—stating there is a significant effect of attack variation training on thrust accuracy—was accepted. The training in this study was designed to simulate realistic match scenarios and focused on improving both the technical and strategic execution of attacks. It involved movements such as combining forward and backward steps before attacking, creating unpredictable rhythms to confuse opponents, and integrating cone-based drills to increase focus and targeting accuracy. One notable element was the inclusion of parry drills, which trained athletes to first defend against an attack

and immediately follow up with a precise counter-thrust. Overall, this study concluded that applying systematic and varied attack training enhances the precision of thrusts in fencing. These findings support the integration of such methods into regular training regimens to improve athlete performance, especially in competitive environments.

The fifth article, titled “*Analisis Daya Ledak Otot Lengan, Daya Ledak Otot Tungkai, Kecepatan Reaksi, dan Ketepatan Serangan pada Atlet Anggar Kabupaten Balangan*” reveals that the physical condition of fencing athletes in Balangan still requires significant improvement to compete optimally in tournaments. The study evaluated four key physical attributes: arm explosive power, leg explosive power, reaction speed, and attack accuracy—each demonstrating varying levels of achievement. For arm explosive power, test results indicated that most athletes fell within the moderate category, with only a few demonstrating good or excellent power. This suggests a lack of uniformity in upper body explosiveness among athletes, highlighting the need for targeted training to improve attack performance. Regarding leg explosive power, the Standing Broad Jump test showed that the average male athlete ranked in the moderate category, while female athletes generally scored in the lower category. This condition may adversely affect the effectiveness of lunges and overall mobility during fencing matches, as low leg explosiveness can hinder the execution of quick and powerful attacks. In terms of reaction speed, test results revealed that the majority of athletes were within the moderate to poor categories. Slow reaction times can result in delayed responses to opponents’ attacks, making athletes more

vulnerable to being hit or less capable of executing swift counterattacks. This factor is particularly critical in fencing, where rapid reflexes are essential for both offensive and defensive success. On a more positive note, attack accuracy emerged as the strongest aspect among the athletes. Most participants were in the good category, with a few achieving very good results. However, there were still some who fell into the moderate range, indicating that there is room for improvement in precision to optimize scoring during matches. Overall, the study emphasizes that although fencing athletes in Balangan have relatively strong attack accuracy, they continue to face challenges in leg and arm explosive power as well as reaction speed. To enhance performance, athletes must undergo more intensive and structured training programs, particularly focused on muscular strength and reflex development.

The sixth article, titled “*Kontribusi Panjang Lengan, Kekuatan Otot Lengan, dan Kekuatan Otot Tungkai terhadap Kecepatan dan Ketepatan Serangan Atlet Anggar Kabupaten Tabalong*” demonstrates that arm length, arm muscle strength, and leg muscle strength significantly contribute to the speed and accuracy of attacks among fencing athletes in Tabalong Regency. Statistical analysis revealed that these three variables collectively contribute 62.50% to the effectiveness of attack speed and precision. With an F-value (Fh) of 4.44, which exceeds the critical value $F_{t(0.05)} = 4.07$, it can be concluded that there is a significant relationship between these physical attributes and attack performance in fencing. This study confirms that a combination of longer arm length, stronger arm muscles, and powerful leg muscles plays a critical role in supporting

fencing athletes' performance, particularly in terms of attack speed and accuracy. Athletes with longer arms, stronger upper limbs, and explosive leg power tend to execute attacks that are faster, more precise, and harder for opponents to avoid.

Based on the analysis of six research studies related to fencing performance, it is evident that technical and physical capabilities can be significantly enhanced through structured, targeted, and evidence-based training programs. One of the most prominent findings highlights the effectiveness of counterattack drills in improving thrust accuracy. These drills emphasize consistent repetition, which promotes motor automation, while also allowing coaches to make real-time corrections to technique. This supports the notion that motor learning in fencing heavily relies on structured and corrective practice.

In addition to technical refinement, physical components—particularly explosive power—play a vital role in performance enhancement. Research on squat jump and stair climbing exercises shows a marked improvement in lower limb explosive strength, which directly contributes to better stability in the en garde position and more powerful offensive movements. Plyometric training of this nature stimulates the major muscles of the legs to contract explosively, reinforcing the athlete's ability to initiate rapid attacks. However, not all physical attributes among fencing athletes are balanced. A study analyzing the fitness profile of fencers in Situbondo revealed a disparity between excellent muscular strength and poor speed and aerobic endurance (VO_{2Max}). This imbalance can hinder performance, especially during prolonged or high-intensity matches. As

such, there is a critical need to prioritize speed and endurance training to develop more well-rounded athletes who are physically prepared for elite-level competition.

Furthermore, varied attack training has also proven to be an effective method to enhance accuracy. This approach, which incorporates realistic bout simulations, unpredictable attack rhythms, and precision-focused drills such as cone navigation and parry-thrust combinations, allows fencers to adapt to dynamic combat situations while fine-tuning their targeting precision. This underscores the importance of integrating match-like conditions into training in order to develop more responsive and accurate athletes. An additional study examining fencers in Balangan found that while attack accuracy was generally strong, deficiencies remained in arm and leg explosive power as well as reaction speed. These physical shortcomings limit the athlete's ability to launch quick, powerful attacks or to effectively counter an opponent's moves. This highlights the need for comprehensive physical conditioning programs that focus specifically on reflex development and muscular explosiveness.

The final study emphasizes the importance of anthropometric and strength variables in fencing performance. It found that arm length, arm muscle strength, and leg muscle strength collectively contributed 62.5% to the speed and accuracy of attacks—a statistically significant influence. This indicates that physical attributes such as reach and muscle power are not only supportive of technical skills but are critical determinants of a fencer's success in delivering fast, forceful, and accurate strikes.

Overall, these six studies provide a comprehensive overview that the key

performance indicators in fencing—such as strength, explosive power, speed, endurance, reaction time, and accuracy—are both **trainable and interrelated**. Improvement in one area often enhances others due to the integrative demands of the sport. Therefore, a **holistic and balanced training approach**, combining technical drills, physical conditioning, and tactical simulations, is essential for maximizing athlete performance in fencing.

CONCLUSION

Based on the review of each article, it can be concluded that physical training is effective in enhancing the speed and endurance of fencing athletes, particularly in improving the accuracy of thrusts using the foil weapon. With greater explosive muscle power, athletes are able to execute attacks more quickly and effectively while minimizing the opponent's chances to defend. These findings can also serve as a reference for coaches in designing more structured training programs to improve athletes' performance in fencing competitions.

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