Modern Sport

Volume 24 | Issue 2 Article 2

6-30-2025

Visual Tracking and its Relationship to Dynamic Visual Acuity Among National Youth Foil Fencing Team Athletes

Ishraq Ghalib Oudah
University of Baghdad-college of physical education and sport science for women,
ishraq@copew.uobaghdad.edu.iq

Huda Shihab Jari
University of Baghdad-college of physical education and sport science for women,
huda@copew.uobagdad.edu.iq

Hind Salem Taih
University of Baghdad-college of physical education and sport science for women,
hind.s@copew.uobaghdad.edu.iq

Asal Hassan Sameer
University of Baghdad-college of physical education and sport science for women,
asal.h@copew.uobagdad.edu.iq

Recommended Citation

Oudah, Ishraq Ghalib; Jari, Huda Shihab; Taih, Hind Salem; and Sameer, Asal Hassan (2025) "Visual Tracking and its Relationship to Dynamic Visual Acuity Among National Youth Foil Fencing Team Athletes," *Modern Sport*: Vol. 24: Iss. 2, Article 2.
DOI: https://doi.org/10.54702/2708-3454.2058

MODERN SPORT 2025;24:131–136

ORIGINAL STUDY

Visual Tracking and its Relationship to Dynamic Visual Acuity Among National Youth Foil Fencing Team Athletes

Ishraq Ghalib Oudah *, Huda Shihab Jari, Hind Salem Taih, Asal Hassan Sameer

University of Baghdad-college of physical education and sport science for women

Abstract

The significance of this study lies in its focus on the relationship between visual tracking and dynamic visual acuity, both regarded as essential perceptual abilities influencing technical and dynamic performance in foil fencing. This supports coaches and specialists in designing effective training units to improve players' visual and motor efficiency. Given the interactive, fast-paced nature of the sport—which demands instantaneous reactions and high precision in thrusting—there is a need to determine the impact of visual tracking on performance quality. The research problem arose from the authors' observation of the limited attention to visual perceptual aspects in preparation programs, despite their role as key determinants of successful performance. The study aimed to assess visual tracking and dynamic visual acuity levels among youth foil fencers and explore the correlation between them. A descriptive methodology using a correlational approach was adopted. The sample included ten athletes from the national youth foil fencing team, aged 17 to 19 years. Specialized tests measured visual tracking and dynamic visual acuity. Data were collected during a defined period using precise instruments, and results were analyzed using Pearson's simple correlation coefficient. The findings revealed a strong, statistically significant positive correlation between visual tracking and dynamic visual acuity (r = 0.752), indicating that efficient visual tracking contributes to improving thrust accuracy during fencing bouts. The study concluded that developing visual perceptual skills—particularly visual tracking—is fundamental to enhancing technical performance in fencing. It is recommended that visual perception training be integrated into preparation stages and that future studies include various age groups and skill levels. and this achieves one of the sustainable development goals of the United Nations in Iraq which is (Quality Education)

Keywords: Dynamic visual acuity, Foil fencing, Visual tracking

1. Introduction

Foil fencing is a sport that demands a high level of both perceptual and motor skills, relying heavily on precise eye-hand coordination, rapid decision-making, and accurate motor targeting toward a moving or shifting opponent. Within this context, visual tracking emerges as a vital and fundamental component of successful performance, particularly when fencers are confronted with dynamic situations that require immediate responses to sudden movements made by their opponents.

Visual tracking is defined as the ability to accurately and continuously follow the motion of a moving object within the visual field through both voluntary and involuntary eye movements. These include smooth pursuit movements and rapid saccadic shifts, both of which are essential for maintaining the image of the target on the fovea—the center of visual acuity in the retina—thereby enabling the athlete to track the opponent's weapon or position with precision (Yarrow et al., 2009).

Dynamic visual acuity refers to the ability to clearly distinguish moving targets either during eye

Received 13 May 2025; revised 30 May 2025; accepted 8 June 2025.
Available online 30 June 2025

* Corresponding author.
E-mail addresses: ishraq@copew.uobaghdad.edu.iq (I. G. Oudah), huda@copew.uobagdad.edu.iq (H. S. Jari), hind.s@copew.uobaghdad.edu.iq (H. Salem Taih), asal.h@copew.uobagdad.edu.iq (A. H. Sameer).

https://doi.org/10.54702/2708-3454.2058

movement or while the entire body is in motion. It is considered a fundamental indicator of an athlete's capacity to respond effectively to rapidly changing situations on the field. This visual capacity is believed to be closely linked to the level of visual tracking ability. Several studies have shown that athletes with superior visual tracking skills tend to exhibit higher levels of dynamic visual acuity compared to their peers (Williams et al., 2002).

Recent research suggests that athletes engaged in interactive sports—such as fencing—develop advanced perceptual abilities through repeated practice and continuous exposure to complex competitive scenarios (Mann et al., 2007).

Elite athletes have been found to exhibit more efficient gaze patterns, faster responses, and greater accuracy in tracking targets compared to novices. Additionally, youth athletes tend to show significant development in their visual abilities with age and continued training, highlighting the importance of investigating the relationship between visual tracking and dynamic visual acuity within this age group. As noted by Field (2013), visuomotor skills are among the most critical factors influencing performance accuracy in fencing. Furthermore, enhancing these skills through targeted visual training can positively impact the quality of motor performance, including both defensive and offensive actions in the sport (Al-Deeb, 2018).

The use of training programs specifically designed to develop visual and motor perception may lead to significant improvements in the performance of novice foil fencers. Based on this premise, the importance of the present study lies in its attempt to explore the relationship between visual tracking and dynamic visual acuity among young foil athletes. This relationship is critical for informing the design of training programs aimed at enhancing visuomotor performance in this sport.

Moreover, the findings of this study may contribute to establishing a scientific foundation that deepens our understanding of the perceptual characteristics that distinguish successful athletes in sports that rely heavily on visual processing and rapid response, such as fencing.

Fencing, in particular, is a sport that demands high-precision visuomotor responses under competitive conditions marked by rapid and continuous changes in performance. The ability to accurately track the opponent's movements and weapon is essential for making effective offensive or defensive decisions in real time.

The fencer relies heavily on their ability to accurately track the opponent's movements and weapon in order to make timely offensive or defensive decisions. However, the relationship between visual tracking and dynamic visual acuity among young foil fencers remains insufficiently addressed in Arabic-language literature, despite the frequent emphasis in international research on the critical role of these abilities in enhancing athletic performance.

Based on the researchers' field observations and practical experience, along with their review of training programs for foil fencers, it has become evident that many of these programs focus primarily on physical and technical components, while often neglecting the visual-cognitive dimension. This is despite the fact that visual cognition constitutes a fundamental pillar in enabling athletes to make quick and accurate decisions during bouts.

1.1. Research problem

Accordingly, the problem of the study is defined by the following research question:

What is the relationship between visual tracking and dynamic visual acuity among young foil fencers?

1.2. Research objectives

- To identify the level of visual tracking and dynamic visual acuity among young foil fencers.
- To examine the correlation between visual tracking and dynamic visual acuity in this population.

1.3. Research hypothesis

There is a statistically significant correlation between visual tracking and dynamic visual acuity among young foil fencers.

1.4. Research scope

The scope of the research included the following domains:

- **Human Domain**: The sample consisted of 10 athletes from the Iraqi national youth foil fencing team.
- **Temporal Domain**: The study was conducted over the period from February 1, 2025, to March 15, 2025.
- **Spatial Domain**: The research was carried out at the Al-Shaab Sports Hall, located in the Zayouna district of Baghdad, Iraq.

2. Methodology and procedures

The researchers adopted the descriptive correlational approach, as it is appropriate for the nature of the study, which aims to determine the degree of relationship between two variables (El-Din, 1999). The research sample was selected intentionally in

order to achieve the objectives of the study. The sample consisted of 10 athletes from the national youth foil fencing team for the 2024–2025 sports season, aged between 17 and 19 years. These athletes represented the entire research population (100%). The sample was divided into two groups: eight participants were assigned to the main experiment, while two were designated for the pilot study. It is worth noting that the sample was homogeneous, as all participants were within the same age range.

2.1. *Research tools used in the study*

- Arabic and foreign academic sources.
- Official websites from the global information network (Internet).
- Observation and experimentation.
- Measurements and standardized tests.

2.2. *Devices and equipment used*

- Fencing court and ten foil swords.
- Chalk and adhesive tape.
- Stopwatch with a specialized head-mount holder.
- A mannequin-shaped target.
- Flashlight and King-Devick test board.

2.3. *Tests used in the study*

- **Test of Dynamic Visual Accuracy**

Test Name: Dynamic Visual Accuracy
Equipment Used: Foil fencing weapon, fencing target (dummy) with irregularly arranged and clearly marked target points numbered (1–6) at a height appropriate to the player's stature.
Test Procedure: The player stands in a ready position, holding the foil at a suitable distance based on their height. Upon hearing the signal from the referee, the player takes a forward step and executes a lunge toward the target point announced by the referee. Each player is given ten attempts to strike the designated point with the foil immediately following the forward step.
Scoring Method: The score is calculated based on the number of successful hits out of ten attempts. The highest possible score is 10, and the lowest is zero. (Wafaa, 2011)

- **Visual Tracking Test**

Purpose of the Test: To measure visual tracking ability.
Instruments Used: King-Devick charts, stopwatch, spotlight, and a head stabilizer.
Test Procedure: The King-Devick charts are affixed to the wall at a distance of three meters from the subject, with adequate lighting provided by a spotlight. The subject is instructed to visually track the letters displayed on the charts from left to right as quickly as possible, without making any errors.
Note: During the test, the subject must not move their head. Eye movement alone should be used for tracking, and the head must be stabilized using a specially designed head support.
Scoring Method: Time is recorded for each trial as well as the total time. The subject is allowed three attempts, and the score is determined based on the trial completed with the fewest errors, preferably none (Wafaa, 2011). As shown in Fig. 1.

2.4. *Pilot study*

Before initiating the main field experiment, it was essential to conduct a pilot study on a sample drawn from outside the primary research group. This preliminary trial involved two fencers who were preassigned to participate. The pilot was conducted on Tuesday, February 18, 2025, at 4:00 PM. The primary objectives of the pilot study were:

1. To identify any obstacles that might arise during the main experiment and address them in advance.
2. To verify the functionality and suitability of the instruments and tools employed in the research.
3. To determine the duration required for each test, as well as the total time needed for the full assessment.

2.5. *Main experiment*

The researchers conducted the study's primary tests on Wednesday, February 26, 2025, at 4:00 PM. The application of the research instruments took place at Al-Shaab Sports Hall, under optimal conditions that ensured the readiness of all necessary equipment, tools, and logistical arrangements. These preparations were crucial to administering the tests with precision and high efficiency to secure accurate and reliable results for subsequent statistical analysis.

2.6. *Statistical tools*

The data collected from the tests were analyzed using the Statistical Package for the Social Sciences (SPSS). The primary statistical method employed was Pearson's simple correlation coefficient.

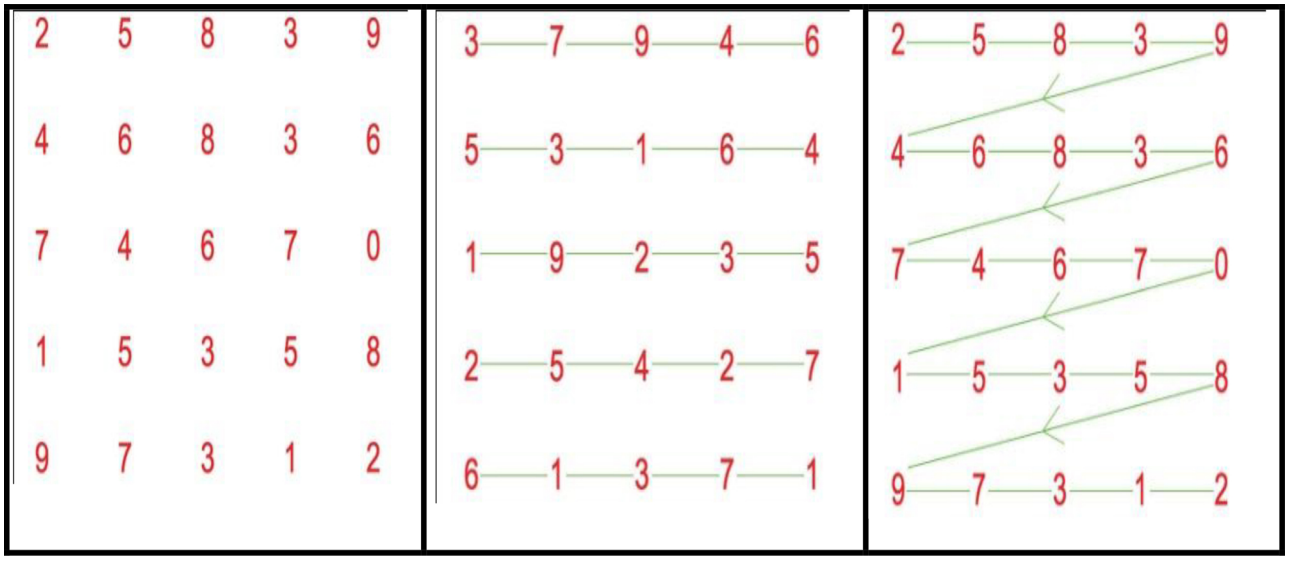

Fig. 1. Illustrates the visual tracking test using the King-Devick charts, where the subject is required to visually follow the sequence of numbers displayed on the chart.

3. Presentation and discussion of results

3.1. Presentation and discussion of the findings related to visual abilities and lunge accuracy

Analysis and Discussion of the Table:

Table 1. Illustrates the values of the correlation coefficient between visual abilities and lunge accuracy among the study sample.

Variables	Calculated R-value	Sig	Statistical Significance
Dynamic Visual Acuity / Visual Tracking	0.752	0,000	Significant

The results in Table 1 indicate a positive correlation between dynamic visual accuracy and visual tracking. The correlation coefficient ($r = 0.752$) falls within the range that reflects a high level of association (145:5). Furthermore, the p-value ($Sig = 0.000$) is significantly lower than the accepted level of significance ($\alpha = 0.05$), which confirms that the relationship is not random but statistically meaningful and generalizable to the broader study population.

The researchers attribute this outcome to the inherent nature of fencing, which encompasses both motor and visual components. When the visual system fails to function optimally, it negatively impacts the motor aspect, which demands swift and precise movements to score touches against the opponent. Therefore, fencers must possess high dynamic visual accuracy, particularly during bouts. A precise athlete is capable of scoring touches with ease and speed before the opponent. As Abbas and Ghaleb (2022) noted, the target remains fixed, while the athlete becomes the axis of movement throughout the bout to ensure victory over the opponent.

An athlete's ability to accurately track moving targets—particularly through voluntary smooth pursuit eye movements—is directly associated with improved performance in motor tasks that require high precision, such as the lunge in fencing (Yarrow et al., 2009). This correlation is logical, given that the lunge demands precise timing and direct targeting of a moving opponent. Therefore, the ability to visually track the opponent and their weapon becomes a fundamental element in achieving a successful touch.

Elite athletes in sports that require rapid reaction and quick decision-making—such as fencing, tennis, and table tennis—demonstrate higher levels of dynamic visual acuity and visual tracking ability compared to their non-elite counterparts (Mann et al., 2007). This phenomenon is explained by the fact that the visuomotor system of elite athletes is more efficient in adapting to moving stimuli, which enables them to make precise decisions under time pressure.

Fencers who participated in visual training programs demonstrated a significant improvement in the accuracy of their lunge movements. This enhancement was attributed to their improved ability to visually track the opponent's weapon and position with greater precision, thereby accelerating the process of selecting the optimal moment for attack (Al-Deeb, 2018).

Furthermore, visuomotor coordination—particularly that which pertains to target tracking—is regarded as one of the most influential factors affecting the efficiency of motor performance in

individual sports. It contributes to the acceleration and refinement of precise motor responses, such as the fencing lunge (Al-Zaghbi, 2016).

The sport of foil fencing is characterized by the rapid alternation between offensive and defensive roles within fractions of a second. Players must continuously track the opponent's movements and weapon, while maintaining precision in targeting sensitive strike zones. In this context, the strong correlation observed in the study's findings indicates that an enhanced ability for visual tracking directly translates into greater accuracy in executing lunges. This is because the fencer becomes more adept at perceiving target movement and identifying the optimal moment to launch an attack with precision.

4. Conclusions

1. A strong and statistically significant positive correlation was found between visual tracking and dynamic visual acuity among youth foil fencers, confirming that improvements in visual tracking contribute to enhanced technical performance, particularly in executing lunges.
2. The results indicate that athletes with higher visual capabilities demonstrate greater lunge accuracy, highlighting the pivotal role visual skills play in the success of precise motor performance in fencing.
3. Findings emphasize the importance of visual tracking as a critical cognitive component in fencing, contributing to improved real-time decision-making and the accurate targeting of moving opponents.
4. Visual abilities—particularly visual tracking—may serve as reliable predictors of technical performance quality in youth foil fencers, thereby reinforcing their value in talent identification and athletic training processes.

5. Recommendations

1. Integrate visual perception training—particularly visual tracking—into the physical and technical preparation programs for foil fencers, starting from early developmental stages.
2. Design specialized training programs aimed at developing dynamic visual acuity using advanced tools and technologies, such as eye-tracking devices and visual simulation software.
3. Conduct regular assessments to measure visual skills among young athletes, and utilize the results to identify weaknesses and implement systematic interventions for targeted improvement.
4. Train coaches on the significance of visual perceptual skills and their role in athletic performance, equipping them with practical tools to assess and develop these abilities within applied training settings.
5. Broaden the scope of future research to include different age groups, and compare the outcomes of visual tracking and dynamic visual acuity between elite and novice athletes across various sports. Researchers should also be encouraged to conduct field-based applied studies utilizing modern technologies and implementing them practically in training environments.

Conflict of interest

No conflict of interest declared.

Ethical approval

Not applicable.

Author's contributions

- **Asst. Prof. Dr. Ishraq Ghalib**: Research idea, manuscript writing, and overall supervision
- **Prof. Dr. Huda Shihab**: Oversight of research requirements, scientific consultation, and general supervision
- **Lect. Dr. Hind Salem**: Comprehensive review of English-language sources and coordination with the linguistic editor
- **Ms. Asal Hassan**: General follow-up, document formatting, and manuscript preparation for printing

Funding statement

This research received no external funding.

Data availability

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

References

Abbas, R., & Ghaleb, I. (2022). Visual response speed and its relationship to some visual abilities in fencing. *Modern Sports Journal, 21*(2). Retrievedfrom https://www.jcopew.uobaghdad.edu.iq/index.php/sport/article/view/911/1217.

Al-Deeb, S. (2018). The effect of visual perceptual training programs on some motor variables of fencing players. *Scientific Journal of Physical Education and Sports Sciences*, Helwan University.

Al-Zaghbi, A. (2016). Visual-motor skills and their role in improving athletic performance. *Journal of Physical Education*, University of Baghdad.

El-Din, A. K. (1999). Scientific research guide. Cairo: Arab Thought House.

Field, A. (2013). Discovering statistics using IBM SPSS statistics (4th ed.). Sage Publications.

Mann, D. L., Williams, A. M., Ward, P., & Janelle, C. M. (2007). Perceptual-cognitive expertise in sport: A meta-analysis. *Journal of Sport and Exercise Psychology, 29*(4), 457–478.

Wafaa, F. (2011). The percentage of contribution of some visual abilities and their relationship to the results of competitions among fencing players (Master's thesis). University of Baghdad, College of Physical Education for Women.

Williams, A. M., Keith, D., & Williams, J. G. (2002). Visual perception and action in sport. Taylor & Francis.

Yarrow, K., Brown, P., & Krakauer, J. W. (2009). Inside the brain of an elite athlete: The neural processes that support high achievement in sports. *Nature Reviews Neuroscience, 10*(8), 585–596.