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## Predicting Performance Outcomes in Fencing Based on Specific Physical and Motor Abilities Among Third-Year Female Students

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### Abstract

Fencing is considered a sport that requires a high level of coordination between physical and motor abilities. The importance of the research depends on the details of these abilities and their relationship to practical performance outcomes, in order to focus on them to achieve optimal outcomes. The research problem was the uncertainty about the future development that should occur among the research sample. Therefore, the study was conducted to predict the extent to which certain physical and motor abilities contribute to practical performance outcomes. The researchers aimed to identify and address this problem by answering the following question: Can practical performance outcomes be predicted based on certain physical and motor abilities among the research sample? The study aimed to investigate the relationship between physical and motor abilities and practical performance outcomes among the sample, to find the contribution of these variables to fencing performance results, and to predict practical performance outcomes in fencing based on certain physical and motor abilities in the sample. The research hypotheses indicated statistically significant relationships between the variables under study and practical performance outcomes in the sample. It was found that there is variability in the contribution of the variables to practical performance outcomes in fencing among the sample. The sample consisted of third-year female students from the College of Physical Education and Sports Sciences for Women at the University of Baghdad. The tests under study were conducted, then categorized and statistically analyzed. It was concluded that there is a significant correlation between accuracy and the results of practical performance. The results emphasize the importance of physical and motor abilities in the sports field, along with the implementation of a specialized training program in order to develop these abilities, one of the recommendations is to conduct further studies examining the impact on other sports and different samples, as well as to carry out additional research on the contribution of abilities to various factors in skill level in fencing. and this achieves one of the sustainable development goals of the United Nations in Iraq which is (Quality Education).

### Keywords

Prediction, practical performance outcomes, physical and motor abilities

### Introduction:

Fencing is considered one of the oldest sports in history, as humans have used swords in their conflicts since the Iron Age. The properties and shapes of these swords varied according to their needs. The sport has experienced significant

development in achieving high levels of performance, a result of research and studies that have focused on various aspects of this activity. The aim has been to reach the highest level of player performance in executing different skills. A fencer's ability to exert effort and achieve

victory depends on many variables, with physical and motor abilities being among the most crucial for achieving advanced results, as stated by Ishraq Ghalib (5). Fencing is a game of intelligence, a contest between two opponents each trying to score a touch in the shortest possible time to ensure victory in the bouts. Therefore, it is necessary for professionals in the sports field, in general, and fencing in particular, to develop modern methods and techniques for proper training to ensure victory and achieve success in local, national, or international competitions. We can recognize the importance of scientific and technological advancement in sports through the significant achievements of athletes in various disciplines, especially individual sports. These advancements have provided ideal solutions for enhancing athletic performance by developing and innovating the best modern training methods and techniques. Due to the specific requirements of the game, it is essential to research and investigate methods of development concerning aspects such as physical and motor variables. As Ashraf Abdul Hamid (2) mentioned, the importance of this research lies in understanding the details of physical and motor abilities and their relationship with practical performance outcomes among third-year female students of the Faculty of Physical Education and Sports Sciences at the University of Baghdad, enabling coaches to focus on these aspects to achieve the best results. One of the key issues in the research is that practical performance outcomes are crucial in fencing for third-year female students. This requires a high level of coordination and synchronization between physical and motor abilities. The research problem is the lack of understanding regarding the extent of development required in the future for these students in fencing. Therefore, the current study was conducted to predict and determine the extent to which certain physical and motor abilities contribute to practical performance outcomes in fencing for these students. The researchers will

define and address the problem by answering the following questions, which will provide us with sufficient insights:

1. Can practical performance outcomes in fencing be predicted based on certain physical and motor abilities among third-year female students?

One of the main objectives that the research aims to achieve is:

- 1- Determining the contribution percentage of the studied variables (such as certain physical and motor abilities) to the practical performance outcomes in fencing among the research sample.
- 2- Predicting practical performance outcomes in fencing based on certain physical and motor abilities among the research sample.

The most important hypotheses of the research are:

1. There is a statistically significant relationship between the investigated variables (some physical and motor abilities) and practical performance outcomes in fencing among the research sample.
2. There is variation in the contribution percentage of certain physical and motor abilities to the practical performance outcomes in fencing among third-year female students.

The human field included third-year female students at the College of Physical Education and Sports Sciences for Women, University of Baghdad. The time frame for the study was from October 10<sup>th</sup>, 2023, to December 12<sup>th</sup>, 2023. The spatial field was represented by the fencing hall at the College of Physical Education and Sports Sciences for Women, University of Baghdad.

#### **Research Methodology and Field Procedures:**

The researchers employed a descriptive methodology with a correlational approach, as it was suitable for addressing the research problem. The research population was defined as third-year female students at the College of Physical Education and Sports Sciences for Women, University of Baghdad, totaling 60 students

across 4 sections. The sample, consisting of 30 students from sections A and C, was selected randomly using a lottery method, representing 50% of the original population.

Regarding the research tools and data collection methods, these included:

Arabic and foreign sources and references, a questionnaire form, data and information extraction from observation and experimentation, an information network (Internet), an expert opinion survey form, 12 fencing masks, 12 fencing swords, 12 electronic vests for fencing, representing the legal target, and an electronic stopwatch.

### Determining Some Physical and Motor Abilities and their Tests in Fencing

To ensure the validity of the selected physical and motor abilities, the researchers prepared a questionnaire containing a set of these abilities. This was distributed to 10 experts in the field of fencing (Appendix 1) to assess and determine their validity. After analyzing the data, the ( $X^2$ ) (Chi-Square Test) was used (see Table 1). It was found that the selected physical and motor abilities, which were established by the researchers, achieved a high level of acceptance for their validity, as the calculated  $X^2$  value for these abilities was greater than the table value of 3.84 at 1 degree of freedom and a significance level of 0.05.

**Table .1** It shows the opinions of experts and specialists in determining some of the physical and motor abilities under study, as well as the calculated  $X^2$  value in relation to the experts' recommendations.

Sq.	Abilities	Number of experts				Value $X^2$		Statistical significance	
		Agree	%	Disagree	%	Calculated	Table value		
1	Speed of thrust movement	9	%90	1	%10	6.4	3,84	Significant	
2	Speed of the armed arm	10	%100	0	%0	10		Significant	
3	Endurance of performance speed for the arms and legs	9	%90	1	%10	6.4		Significant	
4	Speed-strength	3	%30	7	%70	1.6		Non-significant	
5	Court movement speed	3	%30	7	%70	1.6		Non-significant	
6	Agility	3	%30	7	%70	1.6		Non-significant	
7	Coordination	9	%90	1	%10	6.4		Significant	
8	Balance	9	%90	1	%10	6.4		Significant	
9	Flexibility	4	%40	6	%60	0.4		3.84	Non-significant
10	Accuracy	10	%100	0	%0	10		3.84	Significant

#### Tests Used in the Research:

After reviewing numerous scientific sources, a set of physical and motor tests was identified to align with the study's objectives. These tests include thrust movement speed, armed arm speed, endurance of performance speed for both arms

and legs, coordination, balance, and accuracy, as outlined below:

#### 1. Physical Abilities Tests

**Thrust Movement Speed Test: Ahmad Sabah Qasim (7)**

- **Objective:** To measure the speed of the thrust movement.
- **Tools:** Fencing sword, target.
- **Performance Description:** The student stands at a specified position, at an appropriate distance from a suspended target. The target's height is adjusted to match the student's height. Upon the signal to start, the student performs three thrust movements, and the time taken to complete the thrusts is recorded by the judge.
- **Recording:** The time taken for the three thrusts on the suspended target is recorded. Each student is given two attempts, and the best attempt is recorded.

#### **Fencing Arm Speed Test: Abdul Karim Fadel (6)**

- **Objective:** To measure the speed of the armed arm.
- **Tools:** Fencing sword, target.
- **Performance Description:** The student stands in the ready position (on guard) at an appropriate distance from the target, which has 20 cm diameter circles drawn on it. The objective is to touch the circles on the suspended target by extending the elbow joint of the armed arm. The target's height should be adjusted so that the center of the circle is level with the student's chest in the ready position. The judge places their hand behind the student's elbow, ensuring it doesn't contact the waist, so the arm is correctly bent for subsequent attempts.
- **Recording:** The time is recorded for ten consecutive thrusts.

#### **Test of Endurance for Performance Speed of Arms and Legs Together: Fatimah Abd Malih (8)**

- **Test Name:** Execution of advancing, thrusting, and returning to the ready position.
- **Objective:** To measure the endurance of performance speed for both arms and legs.

- **Tools:** Stopwatch, fencing arena, fencing sword.
- **Performance Description:** From the ready position, the student advances one step, performs a thrust, and returns to the ready position. This sequence is repeated for 30 seconds on the fencing arena. The student is given two attempts, and the better attempt is recorded.
- **Recording Method:** The number of repetitions (advance – thrust – return to the ready position) completed within 30 seconds is recorded.

#### **2. Motor Abilities Tests**

##### **Balance Test: Bayan Ali Al-Khakani (1)**

- **Test Name:** Balance
- **Objective:** To measure static balance.
- **Tools Used:** A locally made balance device, consisting of a wooden board measuring 80 cm in length, 50 cm in width, and 45 cm in height, with a cube of 10×10×10 cm fixed in the middle, along with a stopwatch.
- **Performance Description:** The student stands in the ready position and then places one foot on the cube, with the front foot on the cube and the other foot on the board or the ground. Upon hearing the start signal, the student lifts the back foot that was on the board or ground, balancing on the cube with the ball of the front foot. The student should maintain balance on the cube for as long as possible.
- **Recording:** The longest possible duration of balance on the cube is recorded.

##### **Coordination Test: Ishraq Ghaleb Awdah (4)**

- **Test Name:** Coordination.
- **Objective:** To assess coordination through thrust movement.
- **Tools Used:** Two fencing swords, a measuring tape, and a stopwatch.
- **Performance Description:** The student stands facing forward, holding a fencing sword in each hand for thrusting forward and

to the side. The examiner sits on a chair and starts the stopwatch. The student performs thrusts forward and to the side.

- **Recording:** The number of repetitions per second is counted. When the student stops moving, the stopwatch is stopped, and the number of repetitions is recorded over a period of 15 seconds.

#### Accuracy Test: Munir Yaqoub (9)

- **Test Name:** Accuracy.
- **Objective:** To measure the accuracy of the thrust.
- **Tools Used:** A fencing target with six circles, each with a diameter of 5 cm, arranged irregularly and positioned at a suitable height for the student's reach.
- **Performance Description:** The student stands in the ready position, holding the sword at an appropriate distance from the target. Upon hearing the start signal from the judge, the student performs a thrust into the circles on the target as indicated by the judge, who announces the circle number. The student is given five attempts to perform the thrust.
- **Recording:** The number of accurate hits in the target circles from the five attempts is recorded. The test is repeated twice, and the best attempt is recorded.

The researchers conducted a pilot experiment on October 17<sup>th</sup>, 2023, at 10:00 AM in the fencing hall at the College of Physical Education and Sport Sciences for Women. The sample consisted of 5 students from Section B, who were selected by lottery. The objectives of the pilot experiment were as follows:

**A.** To assess the students' understanding of the test procedures.

**B.** To evaluate the suitability of the equipment and tools used for the tests.

**C.** To identify and address any errors or issues that arise during the implementation of the tests.

From the pilot experiment conducted by the researchers, they concluded:

- The suitability of the equipment and tools used.
- The team's understanding of how to conduct the tests and apply them correctly to the sample.
- The establishment of the scientific foundations for the tests (validity, reliability, objectivity)

Regarding the scientific foundations of the test, the researchers relied on scientific principles to determine the validity, reliability, and objectivity of the selected tests. The validity of a test varies depending on how closely it measures the attribute it is intended to assess. The researchers utilized content validity through face validity and verified this validity with a group of experts. They achieved more than 75% agreement among the experts' opinions and made adjustments based on their feedback.

Reliability to determine the reliability of the test, the researchers used the test-retest method, which involves re-administering the test to the same subjects to see if it yields the same or similar results. As confirmed by Abdul Majid (3:70), the tests were administered on October 19<sup>th</sup>, 2023, to a sample of 5 students and then re-administered on October 26<sup>th</sup>, 2023. Reliability was measured using the simple correlation coefficient, as shown in Table 2.

**Table .2** Reliability Coefficient and Significance of Correlation for the Tests

Sq.	Test items	Correlation coefficient	Significance
1	Thrust movement speed	0.960799	Significant
2	Speed of the armed arm	0.998489	Significant
3	Endurance of performance speed for both arms and legs together	0.958706	Significant

4	Balance	0.991357	Significant
5	Coordination	0.948387	Significant
6	Accuracy	0.943456	Significant

Significant at the 0.05 Level

Regarding the objectivity of the test, the researchers used clear and understandable tests for the participants. The tests were recorded using measurement units such as time and scores. Therefore, these tests have good objectivity, as "a test with good objectivity is one that minimizes doubt and disagreement from the participants during its application," as confirmed by Abdul Majid (3). The researchers conducted the main experiment, applying the research-specific tests from October 30<sup>th</sup>, 2023, to October 31<sup>st</sup>, 2023, following the sequence below:

**First Day:** The physical abilities tests were conducted on October 30<sup>th</sup>, 2023, in the fencing hall at the College of Physical Education and Sport Sciences for Women, University of Baghdad.

**Second Day:** The researchers conducted the motor abilities tests on October 31<sup>st</sup>, 2023, in the fencing hall at the College of Physical Education and Sport Sciences for Women, University of Baghdad.

Regarding the statistical methods, the researchers used the Statistical Package for the Social Sciences (SPSS).

### Presentation and Analysis of Results

**Table .3** It shows the means, standard deviations, and skewness of the variables under study.

Variables	Units of Measurement	Arithmetic Mean	Median	Standard Deviation	Skewness	Standard Error
Thrust Movement Speed	Second	4.38066	4.29	0.69140	0.322	0.473
Speed of the Armed Arm	Second	8.62733	7.385	2.59093	1.241	0.126
Endurance of Performance Speed for Arms and Legs Together	Number of repetitions	2.43333	2.000	1.30472	1.048	1.123
Balance	Second	23.0553	24.77	6.15363	-0.384	0.238
Coordination	Number of repetitions	10.2	10.000	2.17192	0.190	0.199
Accuracy	Number of repetitions	3.3333	3.000	1.09334	0.113	0.397
Practical Performance	Degree	3.533	4	0.899	-0.096	0.164

**Table .4** Shows the Correlations Between Certain Physical and Motor Abilities and Practical Performance outcomes

Seq.	Thrust Movement Speed	Speed of the Armed Arm	Endurance of Performance Speed for Arms and Legs	Balance	Coordination	Accuracy	Practical Performance Outcomes
Thrust Movement Speed	1						
Speed of the Armed Arm	-0.246	1					

Endurance of Performance Speed for Arms and Legs	-0.054	-0.131	1				
Balance	0.227	-0.072	0.045	1			
Coordination	0.171	-0.023	0.151	-0.496	1		
Accuracy	0.006	-0.092	-0.105	-0.004	-0.247	1	
Practical Performance Outcomes	-0.001	0.043	-0.057	0.149	-0.268	0.339	1

After reviewing Table 4, the following observations were made:

- A. There is no correlation between the kinetic speed of thrust and the practical performance outcomes, as the correlation coefficient is (-0.001) and the p-value is (0.998).
- B. There is no correlation between the kinetic speed of the armed arm and the practical performance outcomes, as the correlation coefficient is (0.043) and the p-value is (0.822).
- C. There is no correlation between the endurance of the performance speed of the arms and legs and the practical performance outcomes, as the correlation coefficient is (-0.057) and the p-value is (0.766).
- D. There is no correlation between balance and the practical performance outcomes, as the correlation coefficient is (0.149) and the p-value is (0.431).
- E. There is no correlation between coordination and the practical performance outcomes, as the correlation coefficient is (-0.268) and the p-value is (0.152).
- F. There is a correlation between accuracy and the practical performance outcomes, as the correlation coefficient is (0.339) and the p-value is (0.067).

**Presentation of the Prediction Equation Results for the Accuracy Test, its Analysis, and Discussion:**

**Table .5** The values of the correlation, analysis of variance, regression constant, independent variable (accuracy), significance levels of (T) and (F), and the parameter value for the dependent variable (practical performance outcomes).

Model	Correlation (R)	Contribution Ratio	Adjusted Ratio(S)	Standard Error of the Mean	
	0.339	0.115	0.083	0.861	
( Analysis of Variance) ANOVA <sup>a</sup>					
Variance	Sum of Squares (S.S.)	Degrees of Freedom (D.F.)	Mean Square (M.S.)	Calculated (T)	Critical F
Regression Between Groups	2.696	1	2.696	3.634	0.067
Regression Within Groups	20.771	28	0.742		
Total Squares Sum	23.467	29			
Confidence Limits for Regression					
Variables	Parameter Value	Standard Error	Calculated T	Probability	
Regression Constant	2.604	0.512	5.082	0.000	
Accuracy	0.279	0.146	1.906	0.067	

**Discussion of Results:**

In light of these results, it is clear that the study's hypothesis is partially validated, and a prediction equation for practical performance outcomes can be derived as follows: ( $Y = A + B \times X$ ).

- **Y:** represents the dependent variable to be predicted (practical performance outcomes).
- **A:** is the constant term.
- **B:** is the coefficient of the contributing variable.
- **X:** is the score of the independent variable.

Thus, the regression line equation is:  $Y = 2.604 + (0.279 \times \text{Accuracy})$ .

The researchers attribute the significance of the accuracy variable to the overall study results, where accuracy refers to skillful performance with high focus on the opponent's target (Awdah, I. G.) (11).

The researchers found that individuals with high accuracy in thrust movements and hitting the opponent's target are more likely to achieve higher scores in practical performance outcomes by the end of the first semester, as indicated by Aziz, R., & Al-Haddad, N. (13). On the other hand, the kinetic speed of the armed arm does not significantly impact the players' ability to achieve high scores in practical performance outcomes.

Most of the practical performance results were not satisfactory. This outcome can be explained by the physical abilities of the students: the higher their level of physical abilities, the better their performance level and, consequently, the higher their practical performance outcomes. Conversely, lower physical abilities lead to poorer performance results, as confirmed by Al-Yasser, Al-Taie, and Al-Haddad (10).

Students with high practical performance outcomes also possess good motor skills, including accuracy, which enables them to maintain high levels of focus. They exhibit coordination between the muscular and nervous systems through the organization and synchronization of movements to achieve the

desired goal with minimal effort, as confirmed by Awdah (12).

The researchers attribute high practical performance outcomes to the students having well-developed and integrated basic motor skills and physical abilities. The better the students' physical and motor skills, the higher their level of advancement in practical performance outcomes. Improvements in these skills led the researchers to predict future practical performance outcomes for the study sample. As students develop their motor skills, they enhance their ability to perceive and apply educational situations more quickly by understanding all aspects of the physical and motor skills involved. This is supported by Kadhim and Malih (14). The sport of fencing is characterized by unique physical and motor abilities that distinguish the player and play a crucial role in the success of their physical and motor performance. Since fencing is an individual sport, it requires specific skills from the fencer. Based on the previous review of **Tables 3 and 4** and guided by the extracted results, the researchers identified one significant motor skill (accuracy) affecting practical performance outcomes in fencing for the study sample. They also determined the nature of the correlational relationship between this skill and its contribution to the level of practical performance outcomes, as well as the predictive regression equation. Thus, the research hypotheses have been validated.

The main conclusions and recommendations obtained by the researchers through statistical analyses and results are as follows: There is a significant correlation between accuracy and the practical performance outcomes of the students, with a high contribution percentage of accuracy observed in the practical performance outcomes. In light of the results obtained by the researchers:

There is a need to focus on developing physical and motor abilities in sports in general, and in fencing specifically. This includes creating specialized training programs to enhance these



abilities and conducting further studies to predict practical performance outcomes in other sports and with different samples. Additionally, more research should be conducted on the contribution of physical and motor abilities to various factors influencing the level of practical performance in fencing.

**Author's declaration:**

**Conflicts of interest:** None

We confirm that all tables and figures in this article are ours and written by the researchers themselves.

**Ethical-Clearance:** this manuscript approved by local ethical committee of physical education and sport sciences college for women on (May /2024)

**Author's contributions:**

All contributions of this study were done by the researchers (N.A. and N.H.) who get the main idea and work on writing and concluding also with number of experts, the researchers themselves in Statistics, Oliver Stoll in revision, Ayman Sabah in translating, Manal Bayat in proofreading

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### Appendix No. (1)

Dear Respected Professor .....,

Greetings,

The researchers are conducting their study titled "**Predicting the Practical Performance outcomes in Fencing Based on Certain Physical and Motor Abilities Among Third-Year Female Students**" at the College of Physical Education and Sport Sciences for Women / University of Baghdad. In light of your expertise and scientific knowledge, the researchers kindly request your assistance in recommending the most important physical and motor abilities based on your experience in this field.

With utmost respect,

**Note:**

When recommending the physical and motor abilities that you consider necessary, please indicate a score between (0-5) in the designated box. Please be aware that the lowest score is (0) and the highest score is (5).

**With regards:**

Sequence	Physical and motor abilities	Score according to importance						Notes
		0	1	2	3	4	5	
1	Movement speed of thrusting							
2	Movement speed of the armed arm							
3	Endurance of arm performance speed							
4	Endurance of leg performance speed							
5	Speed-strength							

6	Speed of movement on the field							
7	Agility							
8	Flexibility							
9	Coordination							
10	Balance							
11	Flexibility							

- Expert's Name
- Academic Title
- Place of Work
- Signature
- Date

### التنبؤ بنتائج الاداء العملي للمبارزة بدلالة بعض القدرات البدنية والحركية لدى طالبات المرحلة الثالثة

نبراس عادل عوج 1 ، نور حاتم الحداد 2  
2&1 جامعة بغداد / كلية التربية البدنية و علوم الرياضة للبنات – العراق

تعد لعبة المبارزة من الألعاب التي تتطلب من ممارستها التنسيق العالي بين القدرات البدنية والحركية. وتكمن أهمية البحث في الوقوف على تفاصيل القدرات البدنية والحركية وعلاقتها بنتائج الاداء العملي من أجل التركيز عليها للوصول إلى أفضل النتائج. وتمثلت مشكلة البحث في عدم معرفة مدى التطور الذي يجب ان يحصل في المستقبل لدى العينة فأجريت الدراسة عن التنبؤ للتعرف على مدى نسب مشاركة بعض القدرات البدنية والحركية في نتائج الاداء العملي فستقوم الباحثتان بتحديد المشكلة ومعالجتها، من خلال الإجابة عن هذه التساؤلات: هل يمكن التنبؤ بنتائج الاداء العملي بدلالة بعض القدرات البدنية والحركية لدى عينة البحث؟ فهدفت الدراسة للتعرف على العلاقة بين القدرات البدنية والحركية ونتائج الاداء العملي لدى عينة البحث و ايجاد نسبة اسهام المتغيرات المبحوثة بنتائج الاداء العملي للمبارزة لدى عينة البحث والتنبؤ بنتائج الاداء العملي للمبارزة بدلالة بعض القدرات البدنية والحركية لدى عينة البحث. كانت فروض البحث هناك علاقة ذات دلالة احصائية بين المتغيرات المبحوثة ونتائج الاداء العملي لدى العينة وهناك تباين في نسبة مشاركة المتغيرات المبحوثة بنتائج الاداء العملي للمبارزة لدى العينة وكانت العينة متمثلة بطالبات المرحلة الثالثة لكلية التربية البدنية و علوم الرياضة للبنات / جامعة بغداد. وتم اجراء الاختبارات قيد دراسته وتم تبويبها ومعاملتها احصائياً ثم استنتج بوجود علاقة ارتباط معنوية بين الدقة ونتائج الاداء العملي. وتركز النتائج الاهتمام بالقدرات البدنية والحركية في المجال الرياضي مع وضع منهاج تدريبي خاص لتطوير تلك القدرات ومن التوصيات إجراء المزيد من الدراسات التي تتناول اثر القدرات في رياضات أخرى وعلى عينات مختلفة وأجراء المزيد من الدراسات حول نسبة مساهمة القدرات للمتغيرات المختلفة في مستوى الأداء المهاري في المبارزة. وهذا ما يحقق احد اهداف التنمية المستدامة للأمم المتحدة في العراق (التعليم الجيد).

التنبؤ بنتائج الاداء العملي, القدرات البدنية والحركية, المبارزة.

الكلمات المفتاحية