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Efficiency of a predictive model for assessing the performance of the simple direct attack in terms of physical and motor abilities of junior fencers

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ABSTRACT

The aim of this study was to identify the nature of the relationship between the performance of the skill of simple direct attack of the fencers and their physical and motor abilities, and also to build a predictive model for the performance of the skill of the simple direct attack of the fencers by knowing the efficiency of their physical and motor abilities for this performance. We used a descriptive, correlational, and survey approach to collect and analyze the data. The tests were applied on 40 fencers from the junior category (under 17 years old) in Diyala and Baghdad Clubs during the 2017-2018 season. The Statistical Package for the Social Sciences (SPSS) was used for statistical analysis. The majority of relationships between the results of the performance of the simple direct attack skill of the fencers and their physical and motor abilities were statistically significant ($p < 0.05$). So, most of the physical abilities and their various forms, as well as the motor abilities, have great contributions to the performance of the skill. We also have found the significance of the model's coefficients ($F = 12.672$, $p = 0.000$), thus showing that the morality of the model confirms its efficiency. In conclusion, the effective relationships of physical and motor abilities were limited to the performance of the simple direct attack skill (straight) of junior fencers in: strength characterized by speed for the two legs, running (20 meters), accuracy, kinetic response, transitional speed with progress, transitional speed by retreat, endurance speed with progress and retreat, and agility. The predictive model did not show an effect of the predictors, although they are good predictors for the performance of the skill of simple direct attack for the fencers.

KEYWORDS

Efficiency; Predictive Regression Model; Physical and Motor Abilities; Fencing.

1. INTRODUCTION

One of the important facts is that the sport of fencing is one of the individual sports, and it is of a competitive nature that requires its practitioners to possess special physical and motor abilities, which have a close relationship in skill performance These abilities include: speed of performance, speed of motor response, transitional speed, cyclic and respiratory endurance, strength characterized by speed, explosive ability, agility, endurance and elongation, flexibility, compatibility, accuracy and balance.

Winkley (2009) indicates that the strength characterized by speed is the "muscular strength or a group of muscle forces that the athlete reaches as a result of the development of the voluntary path in exchange for resistance and accuracy."

Accuracy requires the performance of fast movements, in which the movement time plays an important role in the performance and is also linked to the temporal accuracy and the previous concept (Al-Yasiri, 2011).

Agility is the ability to change the direction and position of the body without losing control. The faster you can complete these tasks, the greater the agility of the swordsman (the individual), for example: while moving forward on the field, then perform the stabbing movement and complete the direct attack on the opponent's goal.

These abilities are important and play a fundamental and influential role in the positive performance of fencing movements. Therefore, their presence in fencing players is a necessary condition to ensure excellence and reach high levels. It is acceptable for a fencing player to have high abilities that help him make a great effort during a specific time in line with his abilities to continue with this effort for a period that may reach two days when competing. The sport of fencing is one of the sports that requires the fencers to effectively demonstrate different abilities, whether physical, skill, tactical or psychological, because it is distinguished from other sports by continuous muscular work to achieve touches in different target places and the ability to act in the most difficult situations (Razzaq, 2018).

From this, we find that the abilities that fencing players have, are not insignificant, as they are related to the details of the skill performance and that any weakness or deficiency in any of these abilities, whether physical or motor, will inevitably weaken the performance of any of the skills, especially the simple direct attack skill in fencing. In this regard, it is necessary to conduct a continuous examination of these capabilities and then predict the performance of this skill by knowing the levels or estimates of these abilities, and the aim is to overcome any of the problems that

the trainers suffer from, which is reflected in the lack of knowledge and expectation of the performance of fencers during training or competitions.

Anshel (1991) states that achieving the technical aspect of fencing requires mastering its motor skills, such as touch movement, hitting and defense positions, mastering the movements of the two legs, holding the weapon with the forefinger, thumb and the rest of the fingers, and a position of readiness that helps to perform forward and backward movements.

The important thing is that studying the efficiency of the predictive model for the performance of the simple direct attack skill by knowing the reality of the level of physical and motor abilities associated with this performance of the fencers will gain great importance from which coaches and players alike will benefit to assess their situation, which will enable them to build their training programs to improve their condition and develop their abilities, and then achieve satisfactory results.

Those who engage in the sport of fencing need certain physical characteristics (abilities) that take precedence and preference over other usual physical factors, the importance of which comes next to varying degrees (Hussein & Nassif, 1987).

The sport of fencing needs physical effort and accuracy in performance, which requires the coach to develop good methods to prepare the player, morally and technically, to face the most difficult circumstances, with proper behavior during training and competitions, by following sound educational foundations and goals.

Some studies have indicated that the physical and motor abilities that the fencing player needs have an effective role in the numbers and construction stages, and that neglecting them (abilities), will lead to a decline in the training process, and this will negatively affect the performance of basic skills, including the attack in its various forms, which leads to the difficulty of reaching advanced levels (Anshel, 1991). It has become imperative for the trainers concerned with fencing, to take care of the fencers in terms of developing their abilities and improving their offensive performance, and by training them continuous and systematic training on a sound scientific basis, which qualifies them (here we mean the scientifically selected players) to participate in competitions with high-level preparations. This will undoubtedly help the coaches in choosing those who are capable of them (the players), bypassing the random selection and replacing it with the scientific choice based on the probability of prediction good and efficient, and thus the opportunity is available to prepare them adequately for the important competitions.

The objectives of this study were: 1) To identify the nature of the relationship between the performance of the skill of simple direct attack of the fencers and their physical and motor abilities. 2) To build a predictive model for the performance of the skill of the simple direct attack of the fencers by knowing the efficiency of their physical and motor abilities for this performance.

2. METHODS

2.1. Study Design and Participants

A descriptive, correlational and survey approach was used to collect and analyze the data, due its relevance to the research problem and its objectives. The study was conducted on a group of 40 young fencers (under 17 years old) from Diyala and Baghdad Clubs during the 2017-2018 sports season in the fencing hall (sports department).

2.2. Determination of the variables investigated

Firstly, the physical and motor abilities and tests for young fencers were determined by agreement of experts and specialists, although these tests are valid and circulated in the field by many researchers. Secondly, in order to determine the variables investigated, the researchers were based on the requirements of the process of solving the research problem contained in the title of this research from. The impact of the physical and motor abilities of the emerging fencers as independent variables (which represent the predictors), and the direct straight attack as a dependent variable (representing the predictor).

2.3. Application of the tests

The tests concerned with the abilities investigated were applied to the research sample during the period from 23/12/2017 to 24/3/2018, in the department of sports talent in fencing in Baghdad and Diyala with the help of members of the assistant work team. Then, the researchers conducted an exploratory experiment a week before the start of the tests, which included the implementation of the tests on some of the individuals included in the research, as well as depicting their performance of the simple direct attack skill. This experience has achieved its objectives in competition and the high rush to conduct examinations with taking measures and guarantees for the safety and honesty of implementation, and then a good close recording of the results.

The results of the main experiment have been statistically processed, so that they match and achieve the objectives of the research in terms of obtaining the real description of the kind

distribution of the members of the research community including all the tests of physical and motor abilities and the performance of the simple direct attack skill in fencing, and then building a predictive model for the performance of the skill with determining percentages contribution of abilities to performance.

2.4. Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) was used for statistical analysis. Descriptive analyses were used to find the distribution of the sample, Pearson's Correlation Coefficient was used to identify the relationship between the performance of the simple direct attack skill and the physical and motor abilities of the fencers, linear regression to measure the explanatory power of the model, F-test to measure the morale of the model, and t-test to determine the significance of the model parameters. For the statistical tests, a p-value of <0.05 was considered statistically significant.

3. RESULTS

In order to achieve the objectives of the research, researchers studied the result of the performance of the skill of the simple straight attack (direct) by the fencers, depending on their physical and motor abilities, which they enjoy, especially those that contribute effectively to that skill performance. This was done by building a reliable and efficient estimation (predictive) model.

We begin the presentation of the results by presenting the distribution of the results of the study sample who participated in the creation of the model in the variables investigated.

Table 1. The results of the aptitude tests, skill performance and the distribution of the sample

Abilities	Measuring unit	Mean	Std. deviation	Average	Skew ness	Flattening coefficient	Standard error	Kind Distribution
Direct attack	Degree	8.325	0.88	8.00	0.326	0.568	0.140	Moderate
Explosion ability	Cm	1.53	0.268	1.45	0.751	0.118	4.241	Moderate
Speed power	Cm	4.89	0.971	4.70	0.245	1.240	0.154	Moderate
20 meters run	Second	4.327	0.644	4.45	0.683	0.721	0.102	Moderate
Power Endure	Repetition	30.00	4.174	30.00	0.047	0.672	0.660	Moderate
Flexibility	Cm	0.289	0.078	0.300	0.437	0.193	0.012	Moderate
Coordination	Repetition	31.40	2.960	32.00	0.263	1.031	0.468	Moderate
Accuracy	Repetition	7.475	1.109	8.00	0.705	0.031	0.175	Moderate
Stabbing Speed (10 sec)	Repetition	10.22	1.232	10.16	0.156	0.913	0.195	Moderate
Motor response	Second	1.75	0.269	1.77	0.611	0.746	0.043	Moderate

Transitional speed in progress	Second	4.87	0.918	4.80	0.665	0.037	0.152	Moderate
Strength velocity	Second	4.39	1.11	5.00	0.899	0.245	0.176	Moderate
Endure Speed up and down	Second	9.55	0.951	9.36	0.599	1.01	0.150	Moderate
Agility	Second	18.26	1.651	18.02	0.014	0.617	0.261	Moderate

What we can conclude from Table 1, is the moderation of the distribution of the research group for all the variables investigated from the simple straight direct attack skill and the physical and motor abilities, the meaning of which is the zero values expressing the statistical indicators related to the distribution, such as the Skewness value, the coefficient of flatness and the standard error. For the variable "straight direct attack", the values came according to the order: skewness = 0.326, flattening coefficient = 0.568, standard error = 0.140. Furthermore, the variable "the force characteristic of the speed of the two legs" has similar values in smallness (the torsion coefficient = 0.245, flattening coefficient = 1.240, the standard error = 0.154). Small values were also obtained for kinetic ability (agility) (torsion coefficient = 0.014, the kurtosis coefficient = 0.617, the standard error = 0.261). The abilities are the basis for success in various sports activities, and players are selected in a specific sports activity according to these abilities. For example, neuromuscular compatibility is one of the most important motor abilities in individual battles. The important thing is that what this means is that the selection of this group of fencers and their size are suitable for building the predictive model in this study.

In order to build a model for predicting the performance of the skill of the direct attack of the research group in terms of their physical and motor abilities, the researchers derived the estimates of the interrelationship of the physical and motor abilities that the fencers enjoy from the research personnel and their performance of the skill of the simple straight direct attack, as the results obtained from the statement of these relationships are one of the foundations on which to measure the efficiency of the predictive model, especially if we know that the value of the correlation coefficient has an amount and degree that shows the strength of this relationship, as well as its direction. Also, the construction of the model depends on both indicators, as the strength of the relationship shows the extent of the impact and contribution of physical and motor abilities in the performance of the skill of direct attack of the fencers. Each of these variables is the largest and effective contributor to the statement of the model's power to predict the performance of the skill in question.

The significance level of the relationships, including the relationship between the results of the performance of the fencers' attack skills and their physical and kinetic abilities investigated, can be found in the following table (Table 2).

Table 2. The relationship between the performance of the simple direct attack skill and the physical and motor abilities of the fencers

Abilities kind	Ability shape	Correlation		Significance and decision
		Value	Error rate of t-test	
Physical	Explosion ability	0.222	0.1690	Non sig -unacceptable
	Speed power	-0.420(**)	0.007	Sig- acceptable
	20 meters run	0.325(*)	0.0410	Sig- acceptable
	Power Endure	-0.180	0.267	Non sig -unacceptable
	Stabbing Speed (10) sec	0.021	0.899	Non sig -unacceptable
	Motor response	-0.356(*)	0.0240	Sig- acceptable
	Transitional speed in progress	0.348(*)	0.0280	Sig- acceptable
	Strength velocity	0.393(*)	0.0120	Sig- acceptable
	Endure Speed up and down	0.431(**)	0.0060	Sig- acceptable
Motor	Flexibility	-0.180	0.265	Non sig -unacceptable
	Coordination	0.008	0.962	Non sig -unacceptable
	Accuracy	0.360(*)	0.023	Sig- acceptable
	Agility	0.312(*)	0.0500	Sig- acceptable

(*): the maximum random value of the correlation coefficient is 0.3.

Table 2 shows that the majority of relationships between the results of the performance of the simple direct attack skill of the fencers and their physical and motor abilities were statistically significant ($p < 0.05$). This, in the sense that most of the physical abilities and their various forms, as well as the motor abilities, have great contributions to the performance of the skill, its values are too much for what it is supposed to be. For example, the ability of the force characterized by the speed of the legs, running 20 meters, accuracy, kinetic response, transitional speed in progress, transitional speed in retreat, bearing speed with progression, regression, and agility, each achieved high correlation coefficients (0.420, 0.325, 0.360, -0.356, 0.348, 0.393, 0.431, 0.312), all of which are greater than the probability value of the t-test at the significance level of 0.05. Researchers believe that the physical abilities and skills are closely linked, as they represent the basic rule for good skill performance (technics), and thus the level of technique for those skills depends on what the player enjoys. The player has those abilities related to skill and sports activity.

Before we address the indicators of the linear regression equation model, it is necessary to define the criteria for the efficiency and suitability of the estimated (predictive) regression model in representing the phenomenon under analysis (performing the skill of direct direct attack in fencing) in terms of the predicted variables (independent, by which we mean the physical and motor abilities of the fencers) (Ahmed, 1995).

- The coefficient of determination (R^2) to measure the explanatory power of the model.
- Test (F) to measure the morale of the model.
- T-test to determine the significance of the model parameters.

The researchers resorted to the multiple correlation coefficient between the predictive abilities (predictors) of the physical and motor abilities contributing to the outcome (performance of the simple direct attack skill) (Table 3).

Table 3. The quality indicators of the linear regression coefficient model

Variables		Multiple correlation value (R)	coefficient of determination (R^2)	(R^2) corrected	Miscalculation
Subordinate	**Independent**				
Perform straight direct attack skill	Endurance speed by advancing and regressing + strength distinguished by speed + accuracy + agility	0.769	0.592	0.545	0.599

What we got from Table 3, is the estimated value of the coefficient of determination (R^2), which means the explanatory value of the model (0.592), as it expresses the percentage of the interpretation of changes in the dependent variable (performance of the simple direct attack skill), which is due the influence of independent variables (physical and motor abilities of the fencers)

In short, it represents the percentage of the regression equation's contribution to describe the overall variances and differences of the result (performance of the simple direct attack skill). As long as the regression equation is based on including a specific number of factors, which usually explain a large part of the variance in the result (0.592), the other part of the variance of the result could be due to other factors or errors in the measurement (Ahmed, 1995).

The percentage of interpretation of the variance of results of 0.592 is considered a high coefficient and shows that the relationship between the studied variables is strong. In addition, the obtained correlation coefficient of 0.769 is a strong coefficient according to the absolute standard of R^2, confined between the two range values (0.50 - 0.75).

We conclude from this that the explanatory power of the model determination coefficient is high, which confirms the accuracy of the predictive model and the possibility of its generalization. As for the corrected R^2 value of 0.545, which is less than the extracted R^2 value, one of the defects of the determination coefficient R^2 is that its value rises whenever another independent variable is added to the regression model, even if it is not statistically significant.

As for the model efficiency criterion, the F test is used to measure the morale of the model parameters at the same time. That is, to determine whether there is a statistically significant relationship between the result and the predictors (Table 4).

Table 4. The model test with analysis of variance and significance (F) to express the correctness of the expected result.

Contrast source	Sum of squares	Freedom degree	Contrast	Calculated F value	Error percentage
Regression	18.205	4	4.551	12.672	.0000
Error	12.570	35	0.359		

From Table 4 we can see that the significance of the model's coefficients in general and at the same time is of high magnitude (F = 12.672, p = 0.000), which means that there is a statistically significant effect of the independent variables (physical and motor abilities of the fencers) involved in the model (carrying speed with progression and regression, strength characterized by speed, accuracy and agility). So, the morality of the model confirms its efficiency, which makes it possible to use and generalize it.

Here, of the model's efficiency criteria, only the t-test remains to determine the morale of the model parameters. When it is intended to test the morale of a particular independent variable, the t-test depends on the null hypothesis, which states: there is no relationship between the dependent variable (the result) and the independent variable (the predictor). Whereas, the t- test values indicate that the calculated values of t, are greater than for all predictors (independent variables).

For the application, we used the values of the constants (parameters) in building the model and extracting its equation, since all these parameters are statistically significant (Table 5).

Table 5. The regression equation coefficients and the significance of the model parameters

Constants (parameters)	Processing value	t value (calculated)	p value
(A)	3.354	2.335	0.025
Endure Speed up and down	0.254	2.141	0.039
Strength velocity	-0.522	-5.020	0.000
Accuracy	0.343	3.297	0.002
Agility	0.139	2.291	0.028

What Table 5 shows is that the fixed amount of any of the variables concerned with physical and motor abilities is statistically significant in its relationship with the performance of the simple straight direct attack skill. It refers to direct relationships between the performance of this skill and each of the variables (endurance of speed with progress and regression, strength characteristic of speed, accuracy and agility). The second parameter (0.25), which represents a measurement test (speed endurance progress - regression) is offset by the lack of time in the performance of the simple straight direct attack skill, meaning that the measurement of time (0.254 minutes) in endurance of speed is accompanied by a decrease in the performance of the simple straight direct attack skill by 1 seconds. Regarding the parameter 0.52, which represents a measurement test (the speed characteristic of the two legs), the increase in this distance is offset by the lack of time in performing this skill, because the origin of the relationship between them is inverse. This means that the decrease in distance by -0.522 centimetres is accompanied by an increase in the speed of performing the skill by 1 second. As for the parameter A in this model, represents a fixed amount, as it expresses the value of the performance of the simple straight attack skill by 3.354 and the values of the physical and motor abilities related to this performance are zero.

4. DISCUSSION

Based on our study results, the majority of relationships between the results of the performance of the simple direct attack skill of the fencers and their physical and motor abilities were statistically significant ($p < 0.05$). Most of the physical abilities and their various forms, as well as the motor abilities, have great contributions to the performance of the skill. We also have found the significance of the model's coefficients ($F = 12.672$, $p = 0.000$). So, the morality of the model confirms its efficiency, which makes it possible to use and generalize. Since we know that the model is able to predict the value of the result (performance of the simple straight direct attack skill) in terms of the achieved values of the physical and motor abilities enjoyed by the emerging fencers (model building group), it is necessary to apply this model to know the expectations of skill performance of the fencers involved in the research, according to the following equation:

Skill performance value = 3.354 + (0.254 x strength endurance value) + (-0.522 x speed value) + (0.343 x accuracy value) + (0.139 x agility value).

For the purpose of ascertaining the validity of the model in achieving the result estimates (skill performance) in terms of the predictors (physical and motor abilities), we take an applied example from the reality of the research, as we will deal here with the arithmetic means of the

variables investigated and concerned with the equation (Table 1). Upon application, the result was identical to the skill performance value (8.33).

Performance value = 3.354 + (0.254 x 9.55) + (-0.522 x 4.89) + (0.343 x 7.475) + (0.139 x 18.28) = (8.33) which is the expected value, as it came in the amount of the achieved.

From here we can be certain that this predictive model is efficient with a high degree of accuracy and validity, as it can be generalized and used with similar or corresponding samples of the research group. The appearance of technical skills is related to the level of motor abilities (endurance of strength, strength, speed, accuracy and agility), although is difficult to determine whether one can separate in tests one's advanced movement technique from motor preparations.

The physical and motor abilities are the abilities that contributed to building the predictive model of the simple direct attack. Singer (1990) indicates that training physical abilities is one of the effective factors to improve the level of performance, and that motor skill is only achieved in the presence of physical abilities, the more these abilities improve for the type of activity practiced, the higher the level of performance.

5. CONCLUSIONS

In conclusion, the effective relationships of physical and motor abilities were limited to the performance of the simple direct attack skill (straight) for junior fencers in strength characterized by speed for the legs, running 20 meters, accuracy, kinetic response, transitional speed with progress, transitional speed by retreat, endurance speed with progress and retreat and agility. The results related to building the predictive model did not show an effect of the predictors (running 20 meters, kinetic response, endurance of speed with advance and retreat) although they are good predictors for the performance of the skill of simple direct attack (straight) for the fencers. Also, the extracted predictive model has proven its efficiency according to the statistically applicable standards.

6. RECOMMENDATIONS

Based on the results of our study, we recommend the following:

- It is necessary to conduct a similar study on a larger group of fencers, especially on the emerging fencers.
- It is important to generalize the equation of the predictive model to other samples and from the general fencing community in Iraq, preferably from the juniors.

- We suggest to apply the equation deduced from the predictive regression analysis to all members of the research group to ensure its validity with an indication of the percentage of error in it.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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