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Optimum selection using regression (Lasso) for the biomechanical variables affecting the performance of the dropped kick for the Iraqi national team badminton player

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Abstract---The tremendous and great development brought about by the technology revolution contributed to the dissemination of knowledge and development in various areas of life, an effective contribution to providing the best ways for daily life in general and sports life , specially, because of the strong desire of countries to progress and develop, and for those countries to reach or try to reach the ranks of developed countries, they have taken great interest in developing themselves in all fields, including the sports field, in an attempt to elevate the sporting reality and reach its athletes to the podiums and raise its flags in all sports forums and continental and international championships, so it paid great attention to studies and scientific research in this field. The Iraqi national team player achieved the highest level in the variable height of the feather from the ground at the moment of hitting among the biomechanical variables.

Keywords---biomechanical variables, dropped kick, national team, badminton player.

Introduction and research importance

The tremendous and great development brought about by the technology revolution contributed to the dissemination of knowledge and development in

various areas of life, an effective contribution to providing the best ways for daily life in general and sports life , specially, because of the strong desire of countries to progress and develop, and for those countries to reach or try to reach the ranks of developed countries, they have taken great interest in developing themselves in all fields, including the sports field, in an attempt to elevate the sporting reality and reach its athletes to the podiums and raise its flags in all sports forums and continental and international championships, so it paid great attention to studies and scientific research in this field. Badminton is one of the racquet games and one of the fun sports that has captivated the hearts of its fans in a way that created the atmosphere for it to own most of the pages and regional and international sports news, Badminton is played with special rackets that differ from other rackets, all of these things combined have made badminton the favorite game of many people because of its capabilities in providing its practitioners of both sexes with vitality and activity, maintaining their physical fitness, and bringing joy and pleasure to them and the audience.

Some studies indicate that badminton is one of the fastest racket games in the world and the most exciting and exciting due to its fast pace of play, where the maximum speed of the badminton reached (421) km / h, and badminton plays with high intensity and short periods of time and it is characterized by rapid responses and continuous interaction, as a result of these high speeds, they leave the player with little time in reaction to respond to those blows, and therefore the player must take the appropriate decision quickly and accurately during the match, and since badminton is one of the fast games, it requires quick thinking and reaction characterized by accurate performance. (Ahmed, Mahmoud: 2016:25-26).

The importance of the research lies in selecting the optimal biomechanical variables affecting the performance of the dropped strike skill in the badminton game using the regression (Lasso), as these variables help researchers and specialists in the sports field so that they can judge the level of achievement and obtain the results and circulate them to their members, as well as the possibility of returning to these variables, which helps in saving time, effort and money, as well as building a future vision (predictive) for any achievement based on the results of the model to predict the biomechanical variables taken from the actual performance of the national mourning player in badminton, as the biomechanical aspects, with their subdivisions of angles, distances, speeds, times and forces, give indications of all the variables involved in determining the level of performance (achievement), thus, the possibility of detecting the optimal achievement as well as strengths and weaknesses.

Research Problem

Since badminton is a fast-moving game, it depends on a series of kinetic rhythm and on the overlap of many biomechanical variables that work together to achieve the best performance (achievement), it requires many tests and with different variables to obtain the best technical performance, as the biomechanical variables are among the important and basic factors that play a role in determining the correct performance, discovering errors and developing the optimal method for them. The skill of the forehand drop kick, which is characterized by experienced

players, is one of the offensive skills that plays a fundamental and decisive role in the outcome of the match, through the researcher's review of the scientific sources and his follow-up to many local and international championship, he found that there is great uncertainty surrounding the scientific aspects of this skill, it highlights the cognitive problem, which in turn answers questions related to the skill aspects in general and the mechanical aspects in particular, through detection, evaluation, evaluation and prediction, and thus access to the most important biomechanical variables that have a contribution rate and through which it can be predicted with accuracy, and this is what the sports library lacked as a result of the survey in the available Iraqi and Arab libraries, and what was confirmed by personal interviews with many academics and trainers specialized in the game (Appendix No.1).

Research Objective

The research aims to select the optimal biomechanical variables affecting the performance of the dropped strike skill through the use of regression (Lasso) for the Iraqi national team player ranked first in badminton.

Imposing search

The biomechanical values vary in the percentage of their contribution to performance using the (Lasso) regression for the most important biomechanical variables that achieved a significant contribution.

Research Areas

- The human field: the players of the Iraqi national team for youth under the age of (17) ranked first in badminton for the year 2020-2021.
- Spatial field: the indoor sports hall - the academy's training center Specialized badminton of the directorate of youth and sports of Babylon.
- Time field : 12/31/2021 to 05/1/2022

Search procedures

Research Methodology

The researcher used the descriptive approach in the style of correlational relations to select a number of independent variables affecting the dependent variable (skill performance).

The community and the research sample

The problem identified the research community and they are the Iraqi national badminton team players who are good at performing the dropped kick skill , as for the sample of the research, the researcher deliberately took the first Iraqi classifier under the age of 17, the player (Mustafa Samer Salah), because of the importance of this player in achieving future achievements and raising the country's flag high, whether on the youth group under the age of 19 or the applicants, Thus, (70) observations were taken and their data was extracted for

the purpose of selecting the optimal variables affecting performance. These observations are considered samples if the samples are observations taken, whether from one individual or a group of individuals, the sample is considered "part of a community that it represents honestly and imposes on us a certain size commensurate with the community from which the samples were taken" (Hisham Hindawi: 7:2021). The specifications of the research sample can be clarified in Table (1) for the first-ranked Iraqi player, the youth category under the age of (17) years.

Table 1
Specifications of the research sample

Width (cm)	Length (cm)										Training age (year)	Actual biological age (years)	Weight (kgm)	length (cm)
	head and neck	trunk	foot	leg	thigh	foot	palm	Forearm	Brace	Arm				
47	27	53	8	43	43	94	18	31	30	79	4	16	75	174

Materials and Methods that used in data collection

The means, devices and tools used in the research

(Note - questionnaire form - Arab and foreign references and sources -Personal interviews - the support staff (see Annex-2) -International Information Network (Internet) - Data registration form No. (1) - Babolat play system -Laptop computer (Hp Pavilion G6: Core-i5) - 3 video cameras (Nikon D750), at a speed of (50) images per second - a video camera of (1) type (SONY HXR-NX200 4K), at a speed of (300) images per second - an iron holder for the installation of cameras (3).

The test used in the research

The stadium was divided into squares after taking the opinion of experts and specialists in the field of badminton and giving values for these squares from (5) according to the importance, i.e. the place where the badminton fell, meaning that the value (5) is more accurate than the value (1), which represents less accuracy, as the player stands at a certain fixed distance at the moment the shuttle starts, it was determined in the test according to the opinion of experts, the coach sends the feathers to the area that was determined to perform the skill, and leaves the player to answer the transmission in the manner he deems appropriate, taking into account the figure of the skill and understanding the areas of accuracy, after obtaining all the attempts, this data is unloaded on a special form prepared for that purpose by the researcher.

The researcher depended on the opinions of experts in the (Hudhaifa Ibrahim) test (Hudhaifa Ibrahim: 74:2011), which was modified and sent to them in an

electronic questionnaire form (1), (2), as it modified the method of calculating the degree and the form of parentheses for the following reasons:

- The number of accuracy areas in (Hudhayfa Ibrahim) is (3) areas, and since the required standard is accuracy, which means, in what it means, the possibility of the highest sorting among the players according to accuracy, and because the sample is a national team player and at a high level, so it is required to increase the number of divisions to increase sorting accuracy.
- The arc method used in (Hudhayfah Ibrahim) test generates the problem of falling into area (1) where the mathematically used area must be of the same value, but the test to be modified did not treated this problem, therefore, the researcher suggested to the experts to modify the arc to rectangles with uniform lateral dimensions and differing in the region (5) , the fact that there is a certain area in which it is difficult to drop the feather, so (48) cm was given more than the rest of the areas for this test, note that the test is treated as an open test in terms of the number of attempts due to the need to link each attempt with its biomechanical variables, and not only to evaluate individuals.

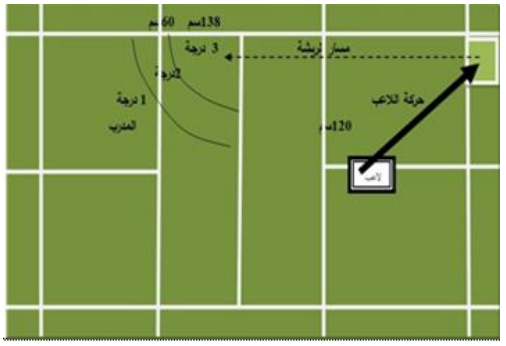

Figure 1. Explains the Hudhifa test before modification

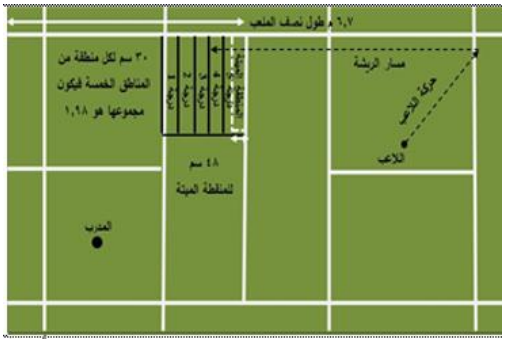

Figure 2. The average Hudhifa test shows

Below is a breakdown of the revised test:
Procedures: The badminton court was planned as shown in Figure (9). Zones (5-4-3-2-1) are numeric values that indicate areas of exclusion as follows:

- Area No. (5) refers to a rectangle of dimensions (78 cm x 150 cm).

- Zones No. (4-3-2-1), each of which refers to a rectangle of dimensions (30 cm x 150 cm).
- (48) cm has been added to area No. (5) in addition to the rest of the areas on the side of the net to get more accurate results as it is a semi-dead area in which the feather rarely falls.
- The same area numbers indicate the scores assigned to each area of the feather fall.

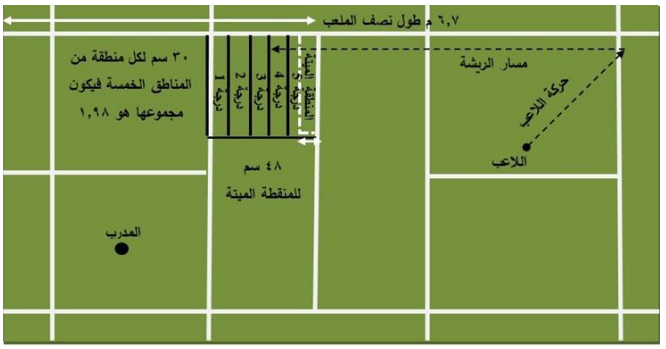

Figure 3. How to perform the accuracy test for the offensive front drop hit skill

Performance description

- The test is explained in theory and made a practical model for it before it is applied to the player.
- Before starting the application of the test, the player warms up for a period of no less than (10) minutes inside the field.
- After that, the player stands in the place that was predetermined in the test, then the coach sends the feathers towards him, and the player responds to that feather according to the technical performance of the skill to get the highest score, which is the feather falling in Zone No. (5).

Calculation of points method

- Feathers that touch the net or fall in front of it do not count as an attempt and are repeated.
- Feathers that exceed the specified precision areas shall not be counted as an attempt and shall be repeated.
- For each correct attempt, the value of the score is calculated for that area in which the feather falls, which is shown in Figure (9).
- The total value of the performance is calculated through the sum of the experts' evaluation of each attempt with its accuracy, i.e. the dependent variable = expert evaluation + performance accuracy,So that the player's score is the sum of the evaluation result for the skill performance of (5) with the result of the accuracy of the performance from (5), so the final result appears from (10) for each attempt, the scientific coefficients for this composite test were extracted.

The skill performance of the dropped kick

For the purpose of identifying the method of extracting the dependent variable (skillful performance), two indicators have been adopted for this variable, namely (performance evaluation by experts and the accuracy of player performance), If the two indicators can be counted as the most important, then the sum of the two results shows us the complete skill performance, as it is not possible to rely on only one indicator, and from this there was an external evaluation (experts) and an internal evaluation (the accuracy of the player's performance himself), and the details of each of them are described below.

Performance Evaluation

All data about the level of performance of the sample were collected through video imaging by cameras installed at the test site and presented to two experts and specialists in the field of the game (see Appendix - 9) Figure (8), to analyze and evaluate the skill performance by observing and observing what the player is doing and giving a value of (5) for each attempt, so that the value of (5) is for the best performance and the value of (1) is for the lowest performance, since the sports movements in badminton are characterized by the speed of performance, indirect qualitative analysis was used by the method of repeated visual observation (recording), it is more accurate than direct qualitative analysis, and this was confirmed by Yasser Najah (2015) by saying, "The person analyzed through direct qualitative analysis is not able to know the performance details with the increase in the speed of performance of sports movements, which depend on the type or requirements of skill performance, the higher the speed of performing movements or sports skills, the less the possibility of seeing the details of the performance, and therefore the accuracy of knowing the details of the movement or skill will decrease" (Yasser, Ahmed: 38: 2015), where the indirect analysis depends on the possibility of replaying the skill in several ways and more than once, which allows the analyst to look closely at the performance details of the movement or skill more accurately and give the correct judgment on it. After obtaining the results of the two experts, the statistical coefficient (Kappa) was conducted for the purpose of verifying the agreement of the experts (Hisham Hindawi: 176:2021), the calculated value of the (Kappa) test (0.87), which is significant, appeared at the level of significance (0.000), which indicates the possibility of relying on the experts' agreement and the adoption of their results.

Figure 4 shows the experts and specialists in the field of the game

Figure 4. Explains experts and specialists in performance appraisal

Scientific transactions to test the accuracy of performance

In order to ensure the validity of the performance accuracy test, the researcher proceeded to the following steps:

Validity: The honest test is the one that measures what it was developed for and does not measure any other characteristic. Therefore, the researcher deliberately made sure of the test's validity through two dimensions:

- Expert veracity: the test was presented to a group of experts to show its ability to measure what it was set for, which is (accuracy of performance), after obtaining the opinions of the experts in the test and measurement (see Appendix -3), the percentage of experts' agreement reached (100%), which indicates the highest degrees of sincerity.
- Discriminatory honesty: Some believe that there is a type of honesty called discriminatory honesty, i.e. it is possible through the fact that the paragraph is distinct, that we infer that it is honest in measuring what it was set for, However, this statement should not be taken into consideration until after the validity of the paragraph's content is verified before it enters into the discrimination process. Therefore, discriminatory honesty is considered to support the validity of the test and does not take the place of honesty alone (Hisham Hindawi: 49:2021).

The attempts scores were arranged in descending order, and accordingly a (T) test was conducted between the upper and lower (27%) percentage, the calculated (T) value of (13.99), which is significant, appeared at an error rate of (0.000), which indicates high discrimination and therefore high sincerity.

Test difficulty coefficient: The test should not be difficult so that most results show very low values, nor should it be easy so that the results show very high values, However, this indicator is considered one of the most important indicators in the scientific transactions of the test, as it gives a good picture of the suitability of the test to the sample, for this purpose, the skew coefficient is used, which shows that there is no skew in any direction, whether the value is high or low And that the absence of torsion is definitely indicative of a medium level of difficulty, as the value of torsion, which is (0.82), showed a non-inclination indication, and therefore it is possible to accept the torsion coefficient as it does not indicate the existence of difficulty or ease in the test.

Stability: It is "one of the attributes that a good measuring instrument must be characterized by, and it means stability (the stability of the measurement), that is, the test mark is not different from time to time (Ali Soumm and others: 217: 2015). And because the test is practical, many of the usual methods such as Facronbach and fragmentation of all kinds cannot be applied, but even repetition, since the nature of the test does not fit these methods, and therefore the researcher resorted to the method of equivalent images. As this type is resorted to when there is a need to know the compatibility between two images for the same purpose, meaning that there are two methods for extracting accuracy so that the results of measuring accuracy in the test set are correlated with another test that performs the same purpose, the (Wissam Salah Abdul-Hussein) test (Wissam

Salah: 73: 2013) was dealt with which divided the stadium into three sections, each with a distance of (1) m for each section, as shown in Figure (5), so that the researcher adopted the method of division by the camera to put hypothetical lines to show the results of the test (Wissam Salah Abdul-Hussein) after extracting its result for each attempt, the first is the subject test and the second is the equivalent test, a correlation was made between the results of the two tests, which showed a significant correlation with a value of (0.95), it is very significant at the error level (0.000), and therefore we judge the existence of high stability.

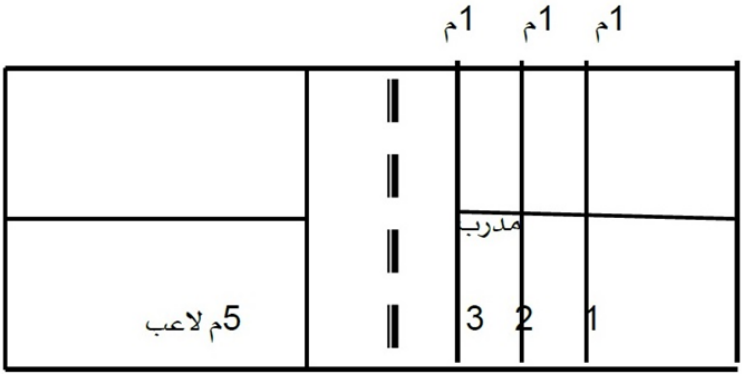

Figure 5. Shows the form of the equivalent drop-kick test

Study Variables

- The angle of inclination of the racket at the moment of striking:
  It is the angle between the wrist joint and the extension of the imaginary vertical line of the forearm bone on one side, and the wrist joint to the end of the racket on the other, as the manipulation of the angle of the racket with the forearm line works to change the area where the shuttlecock touches the racket, where the camouflage is, and it was extracted from the back camera and measured in degrees.
- The height of the feather from the ground at the moment of hitting:
  It is the distance between the point of contact of the blade with the racket on one side and the ground on the other, as the height is one of the important variables in the ballistics law, it was extracted from the side camera, and the ground point was determined by the mark of the foot contact with the ground before the player got up and installed to be a touchstone for measuring height, the unit of measurement (cm).
- The knee joint angle of the left leg at the moment of hitting:
  It is the angle between the thigh bone from the lateral knee joint point to the hip and the shin bone from the knee joint point to the ankle joint, it contributes to transmitting the force generated from the ground to the rest of the body, in addition to the imbalance in the air to provide a safe landing. It was extracted from the side camera and measured in degrees.
- The distance between the feet at the moment of hitting:
  It is the length of the straight line between the inner thighs, as it works to determine the rule of reliance that controls the moment of inertia according to Newton's first law. and it was extracted from the back camera, the measurement unit (cm).

- The wrist angle of the striking hand at the moment of hitting:
  It is the angle between the wrist joint on the lateral side and the extension of the thumb on one side, and between the wrist joint up to the elbow joint on the other side.
  It is an important factor in determining the direction of the shuttlecock, as through it the player controls the angle of his racket for the purposes of guidance and access to the mechanical target, and it was extracted from the rear camera, and it is measured in degrees.
- Feather launch angle:
  It is the angle between the vertical axis extending from the point of contact of the shuttlecock with the racket and the straight line from the same point to the first shot after the collision, It is one of the determinants of the law of ballistics, as increasing or decreasing this angle means the failure of the attack by moving the blade away or obstructing the network for its passage, for the purpose of avoiding the negative values formed as a result of the rise and fall from the horizon line, the vertical axis was taken, and it was extracted from the side camera and measured in degrees.
- Average racket speed:
  This variable was extracted using the Babolat Blay system, as it has an effect on the speed of the shuttlecock by the direct relationship between the racket and the speed of the shuttlecock (zepp:2017:6), the unit of measurement is (MPH) mile/hour and it has been converted to (m/s) to match the rest of the variables in terms of the unit of measurement.
- Impact time:
  This variable was extracted using the Babolat Blay system, as the impact time is the measurement, in seconds, of the time from the end of the back swing (that is, the lowest point when the head of the racket is facing down towards the ground), until the moment the racket affects the shuttlecock (zepp:2017:12), it is important in calculating the percentage of intensity in each stroke compared to the rest of the strokes of the same type.
- The rate of maximum pressure on the right foot :
  It is extracted from the (Dyanfoot3) system, and it means the rate of force that the weight of the body exerts on the area of the right foot, the unit of measurement (gram/cm2).
- Average pressure period for the right foot :
  It is extracted from the (Dyanfoot3) system, and it means the time rate of the force applied by the weight of the body on the area of the right foot, the unit of measurement (milli/s)

View the discussion and analysis of the results

Table 2
Descriptive Statistics

Variables	Mean	Std. Deviation	std. Error	Variation Coefficient
Accuracy result	7.90	0.73	0.60	0.16
racket tilt angle	31.14	5.00	1.64	0.05
Feather height off the	275.77	13.74	1.52	0.07

ground				
left knee joint angle	172.00	12.68	0.66	0.25
The distance between the feet	22.27	5.53	0.57	0.03
The wrist joint angle of the striking hand	165.07	4.78	0.74	0.06
starting angle	99.07	6.17	0.28	0.15
racket speed rate	15.75	2.36	0.01	0.13
Impact time	0.58	0.07	1.95	0.03
Pressure rate on the right foot	490.34	16.34	86.20	0.31
Period of pressure on the right foot	2320.54	721.20	0.09	0.09

Table (2) shows the values of the arithmetic means for each variable, which means the data center point, which suggests to the reader the level of performance initially, as the arithmetic mean is one of the most reliable measures of central tendency, demonstrating the orientation of the data towards its center, where this scale (arithmetic mean) is a partial expression of the form of the data, as it lacks the values' deviation from this concentration, so the description needs an appropriate measure of dispersion, which in its presence gives a clearer picture to the reader about the nature of the sample results (attempts), so that the lower the standard deviation (as a measure of dispersion relative to the arithmetic mean), the more this indicates the convergence of the values from their mean, so that the increase of the standard deviation from a quarter of the value of the arithmetic mean gives an indication of a high dispersion of the data (authoring and translation committee: 82: 1997), this is what we find clear in the variables (the period of pressure on the right foot - the distance between the feet) and, respectively. In terms of the high value of dispersion, while the lowest dispersion value was for the variables (wrist joint angle of the striking hand - rate of pressure on the right foot - height of the feather from the ground - launch angle - knee joint angle of the left leg - accuracy result - impact time - average speed of the racket - The angle of inclination of the racket) respectively, in terms of the lowest value, while the value of the variables varied in a range between them.

The standard error is one of the measures of dispersion as in the standard deviation, but it is characterized by taking the sample size into consideration, as the smaller the standard error, this indicates the validity of dealing with the data in a parameter way through the following equation (standard error = n \ √ n), increasing the sample has a clear effect in reducing the standard error, and since the sample size is equal for all variables, the standard deviation is considered the most important function in determining it, so we note that there is a strong correlation between the standard error and the standard deviation. The idea of a natural distribution stems from the idea that the values on both sides of the mean are arranged so that the two sides are equal (right and left of the center), and this is what is called the normal distribution, which is an important indicator in describing data and adopting the type of method used in statistical treatments, as the central limit theorem states that the distribution is considered normal whenever the number of the sample is more than (30) observations, where the

number of observations reached (70), the distribution is considered normal, but this matter is nothing more than making judgments without inference, so the skewness is one of the coefficients that gives an inference for the normal distribution, as the distribution is considered normal if its value was less than the value of (z) for large and large samples (± 1.96) at the significance level (0.05), but if you say less about this value, then the distribution will be skewed, either to the right or the left, and both cases are considered an indicator that is not dangerous in the scientific sense, but it gives an adequate picture of the nature of the data.

The philosophy of the coefficient of variation stems from our understanding of the measures of dispersion, especially the standard deviation, as it is the most important expression for the dispersion of data from its arithmetic mean, However, sometimes - the standard deviation - is not useful when comparing the dispersion of two groups that do not have the same mean (different means) as a result of the difference in data values between the two groups or the difference in units of measurement between the two groups, therefore, there is a need for a relative dispersion coefficient that is suitable for comparing the dispersions between the different variables in the measurement unit by dividing the standard deviation by its mean, the coefficient of variation is also a good alternative to the standard deviation, because it has no units of measurement, so it is judged by which any of the groups is more or less dispersed, in addition, it is a measure of the homogeneity of the sample in any variable, as it is judged by the value (30%). Exceeding this value means the heterogeneity of the data (Wadih, Hassan: 82:1999).

As shown in Table (2) that the variables (pressure period on the right foot - rate of pressure on the right foot - height of the feather from the ground - angle of the knee joint of the left leg - starting angle - distance between the feet - angle of inclination of the racket - angle of the wrist joint of the striking hand The average racket speed (accuracy result) has achieved the highest relative dispersion among all the variables.

Presenting the results of the correlational relationships of the matrix, analyzing and discussing them

Table 3
Shows the simple correlation matrix

		racket tilt angle	sig	Feather height off the ground	sig	Knee joint angle for leg support	sig	The distance between the feet	sig	The wrist joint angle of the striking hand	sig	starting angle	sig	racket speed rate	Sig	Impact time	sig	Pressure rate on the right foot	sig	Period of pressure on the right foot	sig
Pearson Correlation	Accuracy result	-.156-	0.099	0.403	0.000	0.162	0.090	0.025	0.419	0.207	0.043	0.306	0.005	0.241	0.022	-.070-	0.283	-.141-	0.122	0.305	0.005
	racket tilt angl			0.011	0.464	-.006-	0.481	0.253	0.017	-.434-	0	0.102	0.2	0.206	0.044	-.286-	0.008	-.278-	0.01	-.239-	0.023

	e																		
	Feather height off the ground					0.521	0.000	-.217-	0.036	-.079-	0.259	0.508	0	-.192-	0.056	-.068-	0.289	0.036	0.385	0.492	0
	Knee joint angle for leg support							-.035-	0.386	-.255-	0.017	0.244	0.021	-.337-	0.002	0.128	0.145	0.158	0.095	0.382	0.001
	The distance between the feet									-.018-	0.44	-.046-	0.353	0.142	0.12	0.018	0.442	-.082-	0.25	0.010	0.467
	The wrist joint angle of the striking hand											-.154-	0.102	0.014	0.455	0.220	0.034	-.132-	0.139	0.090	0.229
	starting angle													-.135-	0.133	-.117-	0.168	0.100	0.205	0.334	0.002
	racket speed rate															-.043-	0.363	-.056-	0.323	-.121-	0.159
	Impact time																	0.017	0.445	0.030	0.401
	Pressure rate on the right foot																			0.281	0.009
	Period of pressure on the right foot																				

It is evident from Table (3), the values of the calculated correlation relationships and the level of significance of each of them, as the values were distributed between the significant and the non-significant, as for the significant values, whose significance level was (0.05) or less, which are either direct or inverse relationships, in the first side (positive relationships), the relationships are (the angle of the knee joint of the supporting leg x the height of the feather from the ground), then (the starting angle × the height of the blade from the ground), then (the period of pressure on the right foot × the height of the blade from the ground) with calculated values (0.52), (0.50), (0.49), respectively, and this can be explained by the following:

With regard to the variable (the angle of the knee joint of the supporting leg), we note that it achieved the highest value of simple correlation calculated among the variables with the variable (the height of the feather from the ground), This means that the increase in it is accompanied by an increase in the height of the feather from the ground, and this is consistent with the anatomical logic, as the angle of the knee joint of the supporting leg diverges during the rise at the moment of striking means maintaining the extension of the entire body and achieving the highest height for the racket to reach the farthest meeting point with the shuttlecock, which helps in the ease of directing the feather and access to the target.

As can be seen from the other variable (the starting angle), we note that it achieved the second highest rate among the variables with the variable (the height of the feather from the ground),this also means that the increase in it is accompanied by an increase in the height of the feather from the ground, and as it is known, the angle of launch of the projectile is one of the most important things that affect the trajectory of its movement (Sareeh, Wahbi: 125: 2012), as the increase in the starting angle as a result of the increase in the height of the blade means revealing an area more than the opponent's area and thus directing the projectile to the closest possible point behind the net to achieve a point or force the opponent to respond weakly.

As for the third largest positive significant correlation value, it was for the variables (period of pressure on the right foot), and the variable (height of the feather from the ground), this may seem strange, except to explain that the projectile arriving from the opponent needs a mental map and a drawing of the synchronous jumping mechanism. So that the player reaches the racket at the moment when the projectile is at the highest point, that is, the shorter the period, the higher the height is achieved, because the goal is not the highest random height, but the highest height synchronized with the highest point of the projectile. This relationship can be considered a curvilinear relationship, meaning that a simple link may not give its value a full and clear explanation unless it is understood in a non-linear (curved) relationship, that is, the greater the height of the feather, the greater the pressure period to a certain extent, with which the increase in the pressure period becomes a negative matter, and this is what the researcher refers to the neural network, as it deals with linear and non-linear variables with the same efficiency, As for the second aspect (inverse relations), the relations are (the angle of inclination of the racket x the angle of the wrist joint of the striking hand), then (the average speed of the racket x the angle of the knee joint of the supporting leg),then (the angle of inclination of the racket x the time of impact), and with calculated values of (-0.43), (-0.33), (-0.29), respectively, and this can be explained by the following:

As for the variable (the angle of inclination of the racket), we note that it achieved the highest rate among the variables with the variable (the angle of the wrist joint of the striking hand),This means that the increase in it is accompanied by a decrease in the angle of the wrist joint of the striking hand, and this is consistent with the anatomical logic and the technical performance of the skill. Since the decrease in the angle of inclination of the racket means an increase in the angle in the wrist joint because it allows a wider range of motion than the angle of

inclination of the racket with the abduction movement is better than with the adduction movement according to the anatomical situation, As the position of the approximation hinders the movement of the wrist joint forward and backward and acts as a lock of the angle for it. It is worth mentioning that this increase in the wrist joint, which is achieved from the lack of angle of inclination of the racket, in turn affects the starting angle (This was confirmed by the value of the positive direct correlation between them, which is (0.21)) between them, which is one of the most important things that affect the trajectory of the projectile (Sareeh, Wehbe: 125: 2012), in the positive direction, meaning the moral, and therefore dropping the shuttlecock at the nearest point behind the net in the opponent's area, and this is the goal intended in this skill to gain a point from the opponent, as can be seen from the other variable (the rate of the racquet speed), we note that it achieved the second highest rate among the variables with the variable (the angle of the knee joint of the supporting leg), this means that the increase in it is accompanied by a decrease in the angle of the knee joint of the supporting leg, and this is consistent with the anatomical logic and the technical performance of the skill.

As the increase in the speed of the racquet results from returning the arm to the farthest distance back and thus the tilt of the torso back and a decrease in the angle of the supporting leg to maintain the balance of the body in the air, and since the nature of the skill requires extending the supporting leg, and this is what the arithmetic mean of the player's attempts in the table ( ) achieved and since the nature of the relationship is inverse with the speed of the racket, the player resorts to reducing the speed of the racket to achieve a direct fall of the projectile after the net, which is the optimal mechanical goal for the skill , which means that the relationship was very logical, as for the variable (the angle of inclination of the racket), we note that it achieved the lowest rate among the two aforementioned variables with the variable (impact time), this means that the increase in it is accompanied by a decrease in the time of effect, and this is consistent with the anatomical logic and the technical performance of the skill , as the increase in the inclination of the racket results from bringing the arm back to the nearest distance, and thus a decrease in the impact time, which is the lowest point when the racket head is facing down towards the ground.

Until the moment the racket affects the shuttlecock (zepp:2017:12), this means an increase in the length of the arc that the racket cuts on its way to the shuttlecock, and thus an increase in the speed of the racket , which results in the feather reaching the farthest point in the opponent's area, which has the least degree of accuracy and is not the object of the test. It is worth noting that there are many non-significant computed correlations, if the relations (angle of inclination of the racket x angle of the knee joint of the supporting leg), then (the distance between the feet × the average period of pressure on the right foot), with calculated values (0.006), (0.001), respectively.

Presenting the results of selecting variables using LASSO, analyzing and discussing them

As an introduction to dealing with neural networks, the independent variables must be configured in terms of not being extravagant in including a large number

of variables, because this negatively affects the desired result of the network, therefore, a mechanism must be employed to select variables as a necessary step to get rid of the problem of multiple correlation between variables and to represent each number of variables with a variable that represents them. Lasso Regression is a common type of regular linear regression that is used to reduce data towards central points determined by equations that fit each case of the variables (Ali, Marwa: 289: 2020), it also works to organize linear models (Padraig, bahavathy, sarah: 2020:11), which is an acronym for (Least absolute shrinkage and selection operator), which uses a function or parameter penalty (Penalty Parameter) It is used to select the variable (Variable Selection) (beran,feng,hebbel:2015:64-64), its idea is summarized as "it works on the principle of minimizing the squares of values in relation to the error according to a certain constraint that is imposed, which represents the absolute sum of the parameters, through the nature of the constraint, the estimator (Lasso) works to make the number of transactions equal to zero, and reducing the other by a certain amount, and thus it works to select the important variables in the model, that is, it performs the process of estimating and selecting the variables at the same time" (Saghiri, Seghiri:213:2002).

Table 4
Shows the values of the coefficients after the reduction

No.	Variables	coefficient	Standard parameter
1.	The angle of inclination of the trunk at the moment of striking	0.000	0.000
2.	Shoulder angle of the striking arm at the moment of striking	0.000	0.000
3.	Shoulder angle of the supporting arm at the moment of striking	0.000	0.000
4.	The height of the center of mass of the body from the ground at the moment of striking	0.000	0.000
5.	The time of ascent and descent on the ground	0.000	0.000
6.	The angle of inclination of the racket with the crank line at the moment of striking	-0.025	-0.072
7.	The height of the feather from the ground at the moment of hitting	0.014	0.074
8.	The knee joint angle of the right leg at the moment of hitting	0.000	0.000
9.	Knee joint angle of the left leg at the moment of hitting	0.046	0.322
10.	Right foot joint angle at the moment of hitting	0.000	0.000
11.	The distance between the feet at the moment of striking	-0.093	-0.455
12.	The elbow joint angle of the striking arm at the moment of striking	0.000	0.000
13.	The angle of the wrist joint of the striking hand at the moment of striking	0.048	0.134
14.	starting angle	0.014	0.050
15.	Average blade speed after impact m/s	0.000	0.000

16.	average racket speed m/sec	0.023	0.080
17.	Strength Percentage	0.000	0.000
18.	Severity Percentage	0.000	0.000
19.	Impact time	0.116	0.005
20.	The rate of maximum pressure on the right foot	0.016	0.147
21.	Average pressure period for the right foot	0.000	0.000
22.	Force distribution ratio for the right foot	0.000	0.000
23.	Right foot contact duration	0.000	0.005
	Intercept	-17.058	

Table (4) shows the values of the transactions after the reduction process is performed on them, as through a set of equations it reduces some transactions to zero to be excluded from the selection process, while leaving other transactions with real values that cannot be reduced to zero, which represent the variables' transactions after filtering , it shows the values of the non-standard and normative parameters, both of which are indicative of the accepted variables, which are the variables that have coefficient values higher than zero. Consequently, the values of the 23 variables were reduced so that thirteen variables were deleted. These variables vary in terms of the importance of their survival according to the absolute value of the parameters, starting with the variable (impact time) as the highest variable - according to the absolute coefficients - resisting the reduction to a variable (the duration of the right foot contact) who was on the brink of unrestricted transactions.

It is worth noting that the table has shown standard values of the coefficients so that we can compare the coefficients in terms of their degree of acceptance. We also note that the variable (the duration of the right foot connection) is the only variable that has non-standard coefficient values equal to (0.000), while we note that the standard value of the same variable is (0.005) that is, it is acceptable and the reason for that is due to the fact that the value of non-standard is not an absolute zero, but rather occupies a rank after the fifth zero, i.e. (1×10-5), therefore, it did not appear in the table in contrast to the rest of the transactions that obtained a value of zero, which means non-existence as shown in the figure ( ), the presence of non-zero values of the coefficients does not necessarily mean that the final selection process has been carried out, as this selection process is followed according to the least error of the square of the means in addition to the appropriate principle criterion.

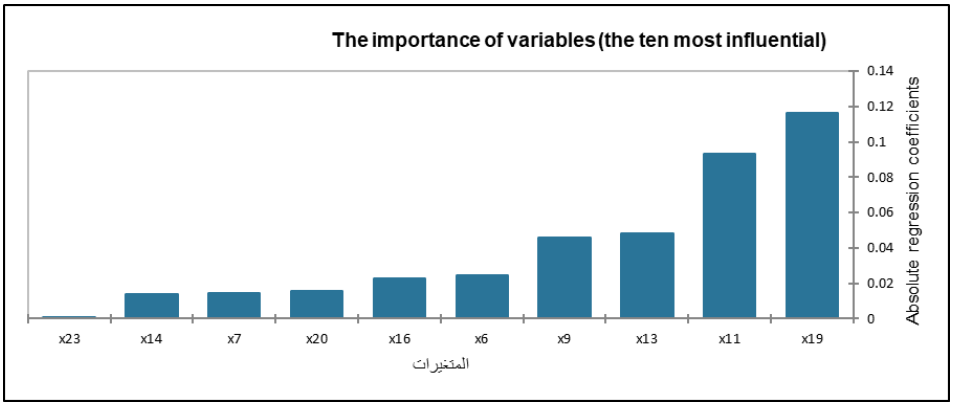

Figure 6. Describe the importance of the ten influencing variables

Figure (6) shows the importance of the variables according to the non-standard value, which are ten variables representing each of (impact time - distance between the feet - wrist joint angle of the striking hand - knee joint angle of the left leg - racket inclination angle - rate of racket speed - rate of maximum pressure On the right foot - height of the blade from the ground - launch angle - duration of contact of the right foot).

Table 5
Shows the numbers of error values and lambda values

Number of active variables	value less error	Lambda value
0.000	3.008	1.008
1.000	2.992	0.962
1.000	2.952	0.918
1.000	2.912	0.876
1.000	2.870	0.836
1.000	2.837	0.798
1.000	2.801	0.762
2.000	2.730	0.727
2.000	2.652	0.694
2.000	2.573	0.663
2.000	2.490	0.632
2.000	2.412	0.604
2.000	2.341	0.576
3.000	2.278	0.550
3.000	2.222	0.525
4.000	2.174	0.501
4.000	2.129	0.478
4.000	2.090	0.456
4.000	2.052	0.436
4.000	2.011	0.416
4.000	1.976	0.397
5.000	1.946	0.379

5.000	1.918	0.362
5.000	1.891	0.345
6.000	1.867	0.329
6.000	1.846	0.314
6.000	1.830	0.300
6.000	1.819	0.286
7.000	1.808	0.273
7.000	1.803	0.261
7.000	1.796	0.249
7.000	1.792	0.238
7.000	1.788	0.227
8.000	1.783	0.217
8.000	1.778	0.207
9.000	1.776	0.197
9.000	1.773	0.188
9.000	1.770	0.180
9.000	1.770	0.172
9.000	1.771	0.164
9.000	1.771	0.156
9.000	1.770	0.149
10.000	1.770	0.142
10.000	1.770	0.136
10.000	1.768	0.130
10.000	1.771	0.124
11.000	1.776	0.118
10.000	1.783	0.113
10.000	1.791	0.108
11.000	1.802	0.103
11.000	1.812	0.098
12.000	1.820	0.094
14.000	1.828	0.089
14.000	1.837	0.085
15.000	1.844	0.081
15.000	1.848	0.078
15.000	1.853	0.074
15.000	1.860	0.071
15.000	1.872	0.068
15.000	1.881	0.064
16.000	1.890	0.062
17.000	1.890	0.059
17.000	1.896	0.056
18.000	1.905	0.054
18.000	1.912	0.051
18.000	1.911	0.049
18.000	1.911	0.047
17.000	1.911	0.044
17.000	1.911	0.042
17.000	1.911	0.040

17.000	1.910	0.039
18.000	1.911	0.037
18.000	1.911	0.035
17.000	1.912	0.034
17.000	1.913	0.032
17.000	1.915	0.031
17.000	1.917	0.029
17.000	1.914	0.028
17.000	1.913	0.027
17.000	1.912	0.025
17.000	1.910	0.024
17.000	1.907	0.023
17.000	1.906	0.022
17.000	1.910	0.021
17.000	1.916	0.020
17.000	1.922	0.019
17.000	1.930	0.018
17.000	1.937	0.017
17.000	1.945	0.017
17.000	1.951	0.016
17.000	1.968	0.015
17.000	1.979	0.015
17.000	1.986	0.014
18.000	2.019	0.013
18.000	2.059	0.013
18.000	2.137	0.012
18.000	2.174	0.012
18.000	2.201	0.011
18.000	2.226	0.010
18.000	2.249	0.010
	1.768	

Table (5) shows the number of error values and lambda values, and the corresponding number of variables that fit each of them, as the largest error value was (3.008) at a lambda value (1.008), which provides only one variable to be selected in this case, the origin in the selection process is the case in which the square error of the means is at its lowest, which is formed with the appropriate lambda value for it, which is not necessarily the least value, but rather the most appropriate value proportional to the error through it, the best selection process for the variables is known. Through the above table, it is clear that the lowest error value was (1.768), and thus we can identify the most appropriate value for the principle, which is a function added to the regression equation to reduce the error to its lowest levels , since in this case the value is (0.130), and therefore we can be assured of choosing the row that represents the least number of variables, which in our case is (10) variables, that is, this table gives a complete inference that the ten variables that have been reduced are suitable for the final selection, and thus entered into the artificial neural network as final variables through which an ideal network can be built.

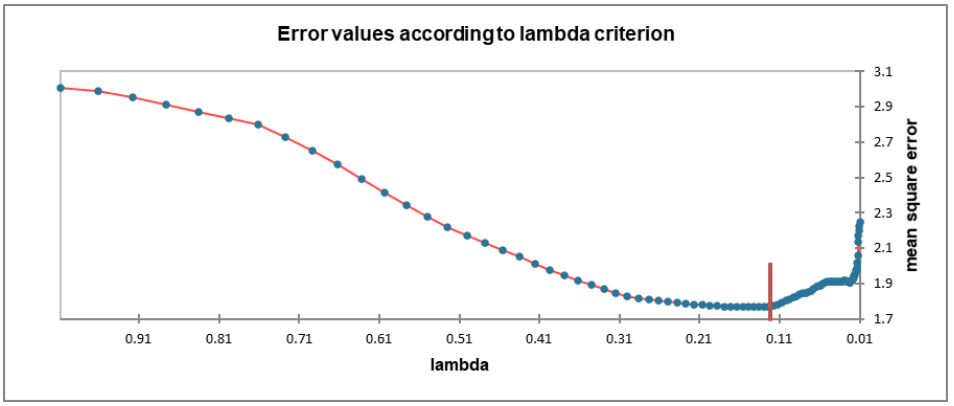

Figure 7. It shows the error values according to the lambda criterion

Figure (7) shows the lambda values, which are sequenced from the value (0.01 - 1.008), as well as the error value for each of the lambda values, as the decrease in the value of the error appears to reach the value of the lambda (0.13) to be in its highest state, then the refraction occurs towards the top so that the value of the error rises again, since what is required is the lowest error value, the breaking point is a function of the lowest value.

Conclusions

- The Iraqi national team player achieved the highest level in the variable height of the feather from the ground at the moment of hitting among the biomechanical variables.
- The calculated values of the mechanical variables varied between significant and insignificant in their impact on the dependent variable.
- The highest direct effect on the performance of the dropped strike skill was recorded by the starting angle variable through the results.
- The biomechanical variables affecting the level of performance of the dropped strike skill were determined by using (Lasso) regression.

Recommendations

- The need to focus on the training process in developing the biomechanical variables that achieved the highest impact on the performance of the dropped strike skill.
- Using regression (Lasso) to select the biomechanical variables that affect the level of performance of the dropped strike skill.

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Index 1
Names of specialists and experts in the field of badminton

No.	name	specialization	work
1.	Prof. Dr. Maher Abdel Hamza Hardan	Badminton training	Faculty of Physical Education and Sports Sciences
2.	Prof.Dr. Wissam Salah Abdel Hussein	Learn to move racket games	University of Babylon
3.	Prof.Dr. Huzaifa Ibrahim Khalil	biomechanics badminton	Faculty of Physical Education and Sports Sciences

Index 2
Names of work team

No.	name	specialization	work
1.	Prof. Dr.Wissam Salah Abdel Hussein	Learn to move racket games	College of Physical Education and Sports

			Sciences, University of Karbala
2.	Samer Salah Abdel Hussein	Coach	National badminton coach
3.	Assi.T Muntadher Najah Hassan	biomechanics racket games	Diwaniyah Directorate of Education
4.	Zaid Ali Saleh	Master student	Diwaniyah Youth and Sports Directorate
5.	Salam Hassan Abdullah	Master student	Diwaniyah Directorate of Education

Index 3
Names of experts and specialists in testing and measurement

No.	name	specialization	work
1.	Prof. Dr. Mai Aziz Ali	Tests and Measurement	College of Education for Girls
2.	Prof. Dr. Sabhan Mahmoud Al-Zuhairi	measuring and evaluating	Al-Qadisiyah University
3.	Prof.Dr. Salam Jabbar	racket games	College of Physical Education and Sports Sciences, University of Mosul