LINEAR KINETIC VARIABLES AND THEIR RELATIONSHIP IN THE MOTOR ASSIGNMENT FOR THE ARABIC JUMP SKILL FOR GYMNASTICS STUDENTS

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ABSTRACT
The study focused on the importance of the Arabic jump skill in gymnastics for second-stage students, as it is a basic skill in the curriculum. It also addressed the importance of using modern laboratory equipment (the Biosyn system) in detecting the values of linear kinetic variables and their effective impact in training and benefiting from them in developing skills, It also aimed to identify the characteristics of linear kinetics and the extent of their impact on implementing the skill effectively, which makes the process of development or motor learning more effective and positive. Because using these digital values in the training process has many benefits and functions, the most important of which is determining the correct movement paths and other important benefits that work to achieve the greatest possible training and educational efficiency. In addition to saving the effort and time spent on the training unit, the researchers used the descriptive approach and identified the research population, which is the students of the second stage in the College of Physical Education and Sports Sciences, and randomly selected the students of Division C, numbering (30) students. As for the most important conclusions, the results showed the importance of providing information about the series of forces during performance in the main stage and then benefiting from it in interpreting the movement. The results of the linear kinetic curve characteristics of the power series variables showed a consistent shape in the main phase (Striking the ground and flying) with gymnastics for the parts of the body, each according to the amount of its mass and its contribution to the striking stage.

1. INTRODUCTION TO THE RESEARCH

1-1 Introduction and the Importance of research
Gymnastics is considered one of the important sports at present, as it is a multi-event Olympic game in individuals and teams, which makes it one of the most important sports for winning medals and rankings, and it plays a major role in achieving the best high sporting achievements and raising the name of their countries in international forums. Scientific research and studies have proven the benefit of this sport in improving balance and the nervous sense of the body's position, as well as the development of the neuromuscular strength component and its

development, especially in the muscles of the trunk, shoulders, and limbs, especially in a game such as gymnastics, in addition to the fact that the skill studied is a basic skill in the curriculum of the second stage, and this is what led the researcher to become interested in this sport. Thus, this research was an attempt to develop this effectiveness through the use of biomechanical analysis and extracting the mechanical values of this sample and the latest laboratory equipment (Biosyn system), which takes the most important biomechanical variables of the selected sample by dealing with the variables of the Arab jump skill in gymnastics, floor movements. Through reviewing several researches and studies, researchers noticed the lack of mechanical values for this skill based on which scientific curricula are built and formulated and exercises and training for gymnasts are prepared, despite their importance. Therefore, the study is directed toward knowing and discovering the values of linear kinetics (strength) and skill variables, and thus the following information will be known:

▪ Is there a possibility of providing digital values using advanced devices for gymnastics players for floor movements and the extent of their impact on the performance of the Arab jump skill?

The researchers seeks to answer this question by recording these values using the latest laboratory equipment (biosyn systems).

2-1 Purpose of the study

Researchers are trying to identify the linear kinetic variables (strength) of the Arabian jump skill in floor movement gymnastics and their relationship to the performance of the skill.

3- RESEARCH METHODOLOGY AND FIELD PROCEDURES:

1-3 Research Methodology:

The researchers used the descriptive approach in the style of correlational and reciprocal relationships to solve the research problem. The term method refers to "the strategies, procedures, or approach that are used in research to collect data through which results, interpretations, explanations, or predictions related to the research topic are obtained3(169:3) "

3-2 Population and research sample:

The research population was identified as students of the second stage in the College of Physical Education and Sports Sciences at Al-Qadisiya University for the academic year (2022-2023), and a sample numbering (30) students was selected. The researchers gave three attempts to each student, and the best attempt was chosen.

3-3 Method of Collecting Information: -

3-3-1 Scientific Research Tools: -

- Scientific sources and references (Arabic and foreign).
- Personal interviews with specialists.
- Measurements and tests used in research.
- International Information Network (Internet).
- Observation and experimentation.
- Software and applications used in computers.
- Assistant work team.

3-3-2 Devices and Methods Used in the Research: -

The researcher used the tools that helped him to collect data, which are as follows:

- Ground gymnastics hall in the college.
- Performance rug.
- Biosyn system.
- A laptop computer.
- Fast CASIO (EXILIM) cameras with a frequency of 300 images/second.
- Papers to record students' names and measurements.
- A device to measure weight and height.
- Japanese-made CASIO manual calculator.
- Casio electronic stopwatch.

3-4 Specifications of the Used Measurements and Tests:

3-4-1 Measurement Specifications

Body mass measurement:

The player sits on the scale, and his body mass is measured to the nearest half kilogram, which can be measured by dividing the weight in kilograms by the square of the height in meters (112:7).

Age:

The ages of the students were recorded to give a complete notion of the sample characteristics.

Length measurement:

From a standing position, the length is measured from the bottom of the foot to the highest point of the skull (51:1), and the unit of measurement is the centimeter.

Table (1) shows the Arithmetic Means of the Sample Specifications

NO.	Name Player	Height	Player block	Age
1	Sample	173	86KG	19

2-4-3 Performance description of the Arabic jump skill (Randaf): (76:6).

The Arab jump or (randaf) is one of the most important floor mat movements (a side somersault with a quarter turn). The movement begins with a short jog, hopscotch, or standing, and its biomechanical structure is like a wheel with a difference in rotation at the end of the movement. The rotation begins with a quarter turn, moving down to place the first hand on the ground, and when placing the second hand, and upon leaving the ground, the second quarter rotation is made, and then the two legs are joined to stand on the hands, the hands are then pushed to the mat, with the body descending quickly to reach a standing position.

- As for placing the fingers of the hands on the rug, it is as follows:

The first hand is in the direction of movement with an outward tilt, That is, at an angle of 45 degrees outward, and the second hand is facing downwards, that is, it is rotated at an angle of 90 degrees. When the second-hand reaches the mat, push with the hands and snatch the legs inward quickly, raising the torso up and returning the arms to the side of the body. Where the

feet reach the ground first on the insteps, trying to straighten the knees as much as possible (the more the athlete lands with a center of gravity high off the ground, the more this will lead to a rise in the next air flip, and raising the center of gravity will be done by reaching towards the ground with the knees straight).

- The position of the feet in relation to the hands in the Arabian jump (randaf) The athlete and his center of gravity must fall back at the time of landing. The athlete takes a horizontal distance and pushes forward horizontally. The feet are placed horizontally away from the hands during the landing. During the landing, the head is inward and looking forward and down, and the chest is inward so that the back is convex. The hands are parallel and extended straight forward and high. The hip is tight and the legs are as straight as possible.

Figure (1) presents the performance of the Arabian jump skill

- The performance of three attempts for each student is evaluated by the performance evaluators, who are subject educators, to choose the best attempt or the highest-rated attempt.

3-5 Exploratory experience:
The researchers conducted the exploratory experiment on Tuesday, February 26, 2022, at (10 am) in the gymnastics hall at the College of Physical Education and Sports Sciences / Al-Qadisiya University.

A sample of one student in the second stage was the sample from the research community
Its aim was the following:
- ❖ Locating video cameras.
- ❖ Photographing the research sample to determine the variables required by performance.
- ❖ Ensure the working capacity of the system, the cameras, and their supports.
- ❖ Ensure that the time for conducting the entire experiment is appropriate.
- ❖ Preparing a sufficient number of assistant work staff and guiding them in the tasks assigned to them.
- ❖ Knowing the time required to conduct the experiment and the suitability of the devices used.
- ❖ Knowing the obstacles that researchers may face in the main experiment.

Figure No. 2
Presents the Conduct of the Reconnaissance Experiment

3-6 Biomechanical Variables:

To identify the most important biomechanical variables that affect the skill of the Arabian jump, it is necessary to review sources and previous studies, and through personal interviews with the opinions of experts and specialists in the field of biomechanics and gymnastics, the researchers arrived at the most important variables affecting the skill of the Arab jump, which are extracted through the Biosyn system. It is important to mention that there is a great ability of the device to simulate movement and performance after placing the system's sensors on all parts of the body

3-6-1 Biomechanical variables extracted by (Biosyn system)
Linear kinetic series variables:
• Strength:

It is studied when its effect is linear according to its mechanical law (force = mass x acceleration) and it was extracted via the Biosyn system directly for all ten parts of the body after calculating the mass of the part multiplied by its acceleration through sensors and its unit of measurement (Newton). After transferring their values from the device to Excel and extracting the values of the ten parts in three stages (preparatory, main, and final), sensors were placed on the parts concerned with the movement, and the results were extracted for them. The parts are:

1)   Cervical Force(N)
2)   Left Shoulder Force(N)
3)   Right Shoulder Force(N)
4)   Left Hip Force(N)
5)   Right Hip Force(N)
6)   Left leg Force(N)
7)   Right leg Force(N)

Figure 3 Explains how to connect the system's sensors to extract variables

3-6-2 Biomechanical variables of the Arabic jump skill extracted by videotaping:

This means extracting biomechanical variables for skill performance, which are as follows

• Approximate sprint: It is the distance that the athlete travels to reach the performance of the main stage. The athlete needs to gain kinetic speed, as it converts kinetic energy from horizontal to vertical, and its unit of measurement is the meter.

• The distance between the feet: It is the distance between the player's feet while performing the main stage of the skill and its unit of measurement is (cm).

• Movement time: It is the time it takes from the moment of starting the approximate run until the end of performing the skill and its unit of measurement (the second).

• The distance between the hands: It is the distance between the hands at the moment they touch the ground while performing the skill, and its unit of measurement is (cm)

• Departure angle: It is the angle between the imaginary horizontal plane parallel to the surface of the ground and the path of the player's body after leaving the ground, and it is calculated directly in degrees.

• Height of the center of gravity: It is measured from the point of the body's center of gravity at the moment of hitting the ground and rising, and its unit of measurement is (cm).
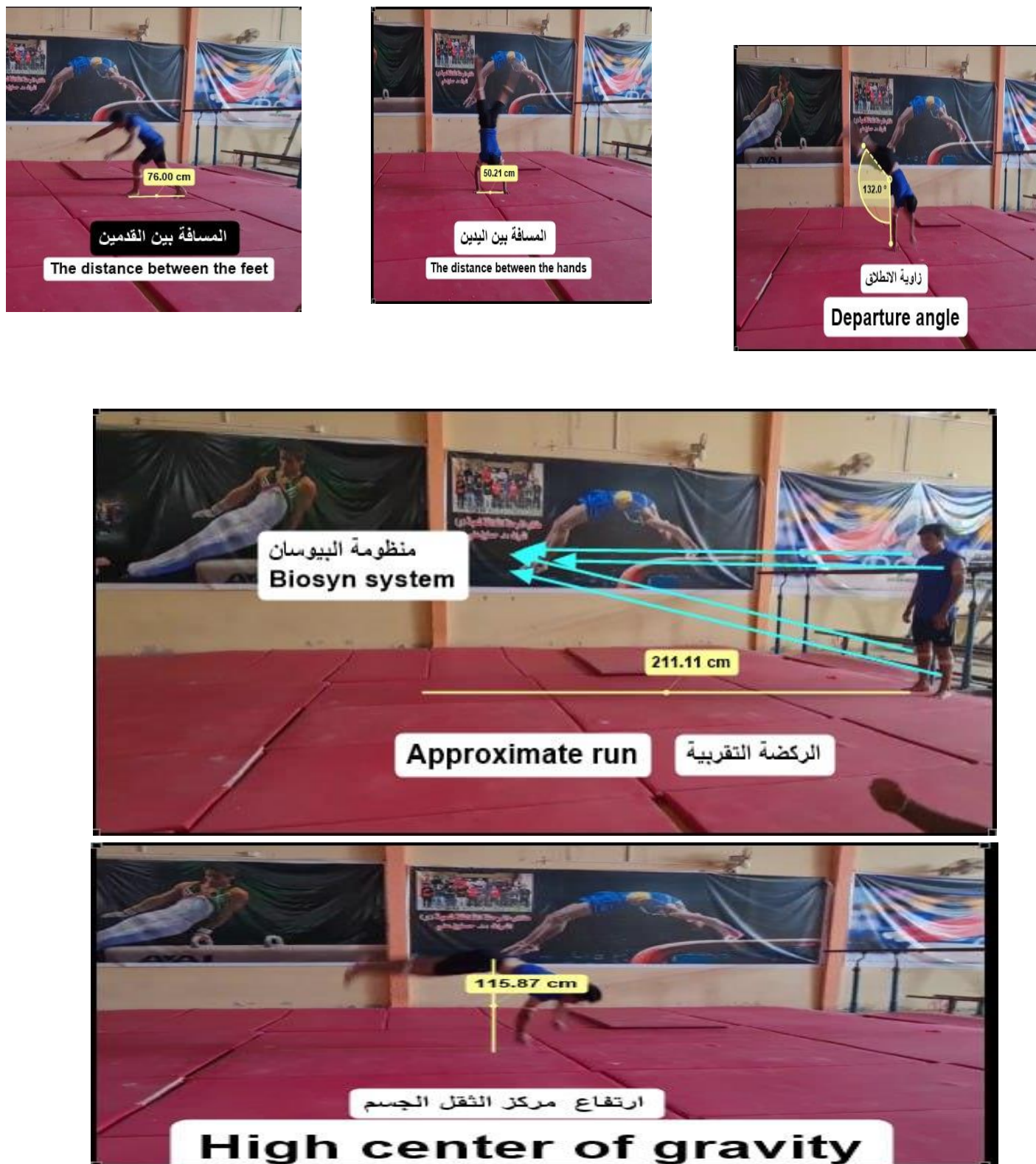
Figure No. (4) Presents the variables of the Arabic jump skill extracted by video analysis using the Kinovea program

3-7 Videography:

The best means of motion analysis (obtaining information) is an analysis using video photography, through which movement, its paths, and biomechanical changes are studied, and then mathematical and physical sciences are applied to provide us with the final results. It also

provides us with curves of the characteristics to be studied to compare them with the ideal curves for those characteristics. In this study, to determine the studied biomechanical variables that affect the skill of the Arabian jump in floor gymnastics, the researchers resorted to videotaping, as it was used to extract the skill variables and show the results, as videotaping is one of the important means of discovering errors and controlling the closeness or distance of performance levels. Thus, researchers can describe the movement and analyze it to find out the closeness of the levels of a particular group, as analysis in its general sense is "the key to dividing the complete movement into parts and studying the relationship between them, to obtain a comprehensive understanding of all these parts and identify their shortcomings while increasing knowledge of its precise details and monitoring the defect in its performance (285:8). On this basis, the research sample was filmed with (2) video cameras with a frequency speed of (300 images/second) to determine the path of movement. Video cameras were set up on a tripod, and a camera was placed on the side of the rug on which the Arabic jump skill was performed so that the camera covered the entire performance from the approach run to the end of the performance. The process was filmed in the gymnastics hall of the College of Physical Education and Sports Sciences at Al-Qadisiya University.

8-3 Computer analysis:

Studying sports movement scientifically requires knowledge of the laws, meanings, and mechanical factors affecting the motor performance of sports events analytically to raise and develop sports achievement for the better. Kinetic analysis using a computer represents a qualitative leap in the field of sports biomechanics. The more modern programs and devices are used, the more accurate the analysis results are and the easier the analysis process is. Therefore, the researcher used a laptop calculator with high specifications. The video film analysis process was carried out using the Kinovea program and the software included in the Biosyn System, which is a program dedicated to analyzing sports movements to extract values and data (linear and circular biomechanical functions) where the values are taken from the program as they are. After completing the main testing process and saving the files that were recorded in the device's software, the results were then analyzed after ensuring that the variables under study were extracted according to the performance that the researchers were interested in. After that, he exported the data to Excel to be processed statistically.

3-9 Main experience:

Given the importance of connecting sensors to the biosyn system device, researchers are keen to pay attention to the periods for connecting sensors between one student and another, so the researchers completed all attempts for each student separately and then moved on to the other student, taking into account the scientific instructions for the test and the device:
The researchers conducted the main experiment on Sunday (9/5/2022) at 10 a.m. in the gymnasium hall at the College of Physical Education and Sports Sciences/Al-Qadisiya University.
 This is done by fixing the locations of the cameras and marking them with significant points. The experiment was conducted on 30 students in the second stage in the College of Physical Education, and each player was given 3 attempts. The players were photographed with the side

camera of the student performing the extraction of skill variables and a front camera. For each attempt separately, and using the biosyn system for each player as a means of extracting the biomechanical variables that will be studied

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Figure No. (5)
Presents the main experiment procedure

10-3Statistical Methods

The data obtained was processed using the statistical package (SPSS) and the program (Excel), including:

1. Arithmetic mean.
2. Standard deviation.
3. Sprain.
4. Coefficient of variation.
5. The mediator.
6. Analysis of variance.
7. Correlation coefficient.
8. Regression coefficient.
9. Correct connection (canonical analysis).

4- Presentation, Analysis, and Discussion of the Results:

This chapter deals with the presentation, analysis, and discussion of the research results after the researchers completed collecting the data resulting from the tests used, which were placed in tables because they represent ease in extracting scientific evidence. Because it is an appropriate explanatory tool for research, it enables the research hypotheses and objectives to be achieved in light of the field procedures carried out by the researchers. These results for

the studied variables are taken at the moment of hitting the ground and flying in the Arab gymnastics jump skill.

4-1 Present the results of the (linear) kinetic functions for the Arabian Jump skill extracted from the Biosyn system:

4-1-1 Representing the strength results of the Arabian Jump skill extracted from the Biosyn system:

Table (2) Shows the results of the properties extracted from the Biosyn system

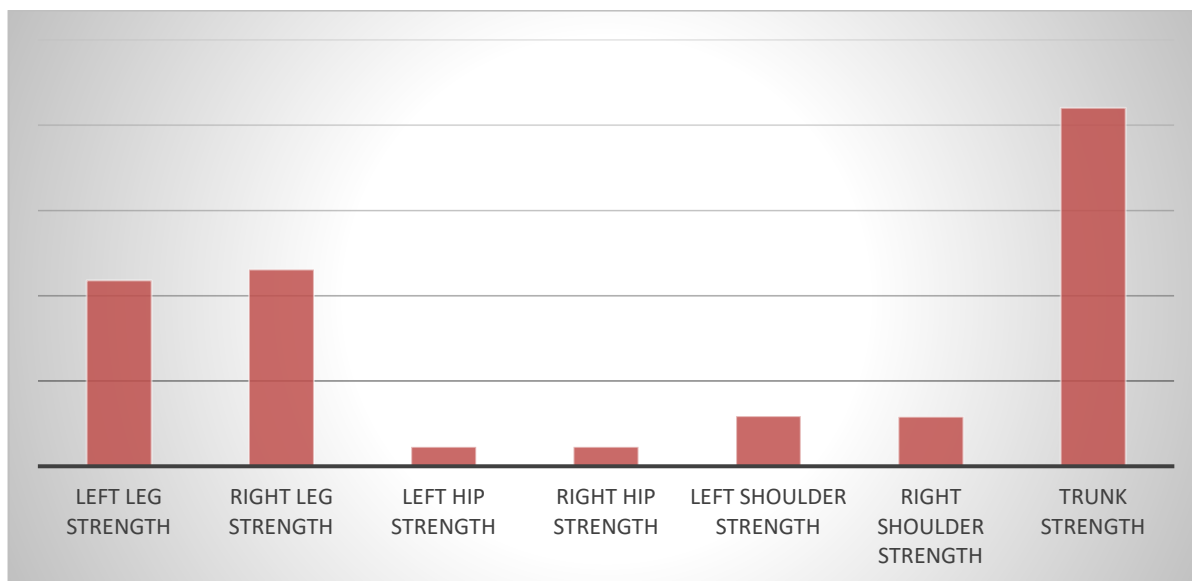| NO.	Variables	Unit	Arithmetic mean	standard deviation	Mediator	skewness	the difference	highest value	less value
1	Trunk strength	N	210.21	38.41	203.97	0.72	9.38	253.24	181.12
2	Right shoulder strength	N	29.02	0.49	28.02	-0.21	2.01	30.11	27.01
3	Left shoulder strength	N	29.41	1.22	29.00	-0.82	4.02	31.34	26.16
4	Right hip strength	N	11.46	0.27	11.38	0.23	2.29	13.12	10.90
5	Left hip strength	N	11.35	1.12	11.23	-0.13	7.89	13.26	9.37
6	Right leg strength	N	115.33	12.11	102.21	0.66	10.39	124.13	111.72
7	Left leg strength	N	109.01	2.11	101.69	-0.28	1.21	113.51	104.63

Figure No. (6) Shows the arithmetic means of the force variable

4-2-1 Presentation of the results of the motor assignment variables for the Arabic jump skill
Table (2) Shows the results of the motor assignment for the Arabic jump skill

| NO.	Variables	Unit	Arithmetic mean	standard deviation	Mediator	skewness	the difference	highest value	less value
1	Approximate run	cm	212	6.26	202	0.64	214.90	234	188
2	The distance between the feet	cm	84	7.27	91	0.87	78	92	77
3	The distance between the hands	m/s	14.89	3.10	14.85	0.71	20.84	22.60	11.00
4	Departure angle	degree	7.95	2.06	8.00	-0.68	25.96	11.00	3.00
5	Starting point height	m	156.25	16.65	151.32	0.47	9.39	166.00	144.70
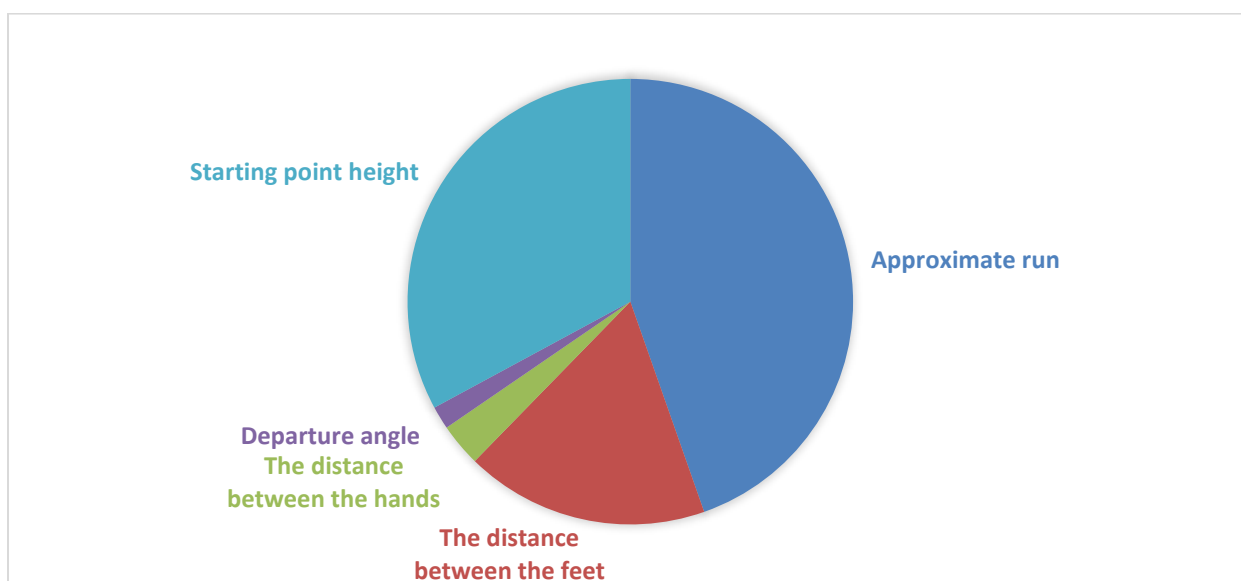
Figure (7)

It shows the distribution of the values of the arithmetic means for the variables of the motor task of the Arab jump skill

3-4 Presentation, analysis and interpretation of the results of the intercorrelations matrix

Table (3) Shows the correlation matrix for the variables of strength and motor activity for the Arabic jump skill

Variables	Approximate Run	Distance Between The Feet	Distance Between The Hands	, Starting Angle,	Starting Point Height
Trunk strength	0.640	0.633	0.656	0.770	0.840
indication	0.000	0.000	0.000	0.000	0.000
Right shoulder strength	0.406	0.402	0.543	0.753	0.777
indication	0.000	0.000	0.000	0.000	0.000
Left shoulder strength	0.332	0.321	0.587	0.754	0.789
indication	0.000	0.000	0.000	0.000	0.000
Right elbow strength	0.765	0.342	0.734	0.642	0.564
indication	0.000	0.000	0.000	0.000	0.000
Left elbow strength	0.769	0.357	0.742	0.632	0.555
indication	0.000	0.000	0.000	0.000	0.000
Right hip strength	0.971	0.950	0.524	0.331	0.567
indication	0.000	0.000	0.000	0.000	0.000
Left hip strength	0.933	0.915	0.521	0.313	0.536
indication	0.000	0.000	0.000	0.000	0.000

Figure (8) Shows the correlation matrix for the variables of strength and motor duty

The process of obtaining the canonical correlation values, which represents the value that indicates the relationship between two groups of variables, each group containing two or more variables, begins by finding the correlation matrices for each of the variables of the first group, strength (trunk strength, right shoulder strength, left shoulder strength, right elbow strength). , left elbow strength, right hip strength, left hip strength) with each other and the correlation matrix for each of the motor duty variables and the accuracy index (accuracy index, movement time, launch speed, launch angle, starting point height) with each other. Then find the intercorrelations matrix for each of the variables of the first group and the variables of the second group, and from here, Table (9) shows these matrices together, as these matrices must be extracted through which we can arrive at the values of the latent root, which by squaring (the latent root) we get Canonical correlation. In general, there are two ways to obtain these latent roots, which are the covariance matrix and the correlation matrix. It is not hidden that these two statistical terms share in showing one result, as the correlation necessarily gives the percentage of explained variance between any two variables, as the value (0.895) can be interpreted, which is the correlation value between A variable (trunk strength) and a variable (accuracy index), with (0.895) of the variance of a variable (trunk strength) being explained by the variance of a variable (accuracy index) or vice versa. Hence, all the correlations in Table (10) reflect cases of explained variance.

The idea of deriving latent roots from intercorrelations can be simplified by understanding the correlation matrix stage in factor analysis, as the correlation matrix is first found through which the acceptable factors are determined through the latent root criterion, which represents the sum of the squares of the saturations of the tests on the factor, and the researcher does not find an easier simplification than this. The canonical correlation is one of the most complex statistical operations.

5- CONCLUSIONS AND RECOMMENDATIONS

1-5 Conclusions-:

1- The results showed the importance of providing information about the series of forces during performance in the main stage and then benefiting from it in interpreting the movement.

2- The results of the characteristics of the kinetic curve (linear) for the variables of the force series showed a consistent shape in the main phase (jumping and rotation) of the Arabic jump skill for the body parts, each according to the amount of its mass and its contribution to the jumping and rotation phase.

3- The results of the characteristics of the kinetic (linear) curve of the force series showed a variable progression of the height of the starting point (the center of gravity of the body) on the other variables, the motor duty is by the concept of using optimal correlation, as any increase or decrease in this force necessarily means an increase or decrease in the level of skill performance in terms of the aesthetics of performance and coordination of movement.

2-5 Recommendations-:

1. It is necessary to conduct similar studies on other categories to identify the values and benefit from them in an attempt to raise the skill level of players.

2. It is necessary to conduct further studies for the rest of the gymnastics skills, through which performance can be reached to the highest level.

3. The necessity of using the latest laboratory equipment in performance experiments to determine the highest-rated results.

4. Through what the results showed of the importance of benefiting from the extracted values of forces in building training curricula and exercises for skill performance.

5. The necessity of studying the parts of the body's mass according to the proportion of its movement when performing the skill and in a manner compatible with the rest of the movement parts.

6. In light of the results of the kinetic (linear) series of forces, it is necessary to pay attention to the parts of the body studied according to their importance in achieving the path of movement according to the realization of the forces and their values based on the details of those parts.

7. The necessity of paying attention to the parts of the body that are mainly involved in movement to achieve high skill values.

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