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The effectiveness of using exercises directed to transfer kinetic energy in developing the skill of peaceful shooting in basketball

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ABSTRACT

The research included five chapters, where the first chapter contained the introduction and the importance of the research, where its importance was summarized in Development Peaceful shooting skill At the players basketball class Applicants from During the preparation of exercises Directed according to Some biomechanical variables of the energy transfer index that the player must apply while performing Basic skills in basketball, as for the research problem, it is through The researcher's experience, and through his follow-up of the applicants' teams, he noticed that there is a weakness in the basic skills Especially the skill of peaceful shooting in basketball The researcher attributes this to several reasons, one of which is the lack of use of diversity in applications and training methods, and accordingly this study came as an attempt to develop guided exercises in some biomechanical variables and reveal their impact on the energy transmission index for the skill of peaceful shooting and The importance of the energy transmission index in achieving the best possible performance and thus obtaining the required and ideal achievement for its importance in winning the match The most important objectives of the research are Preparation of guided exercises on some biomechanical variables of the energy transmission index For the skill of shooting from peaceful basketball to applicants as well as Identify the effect of guided physical exercise on some biomechanical variables of the energy transfer index For the skill of peaceful correction Basketball for applicants While the third chapter dealt with the research methodology and field procedures, where the researcher chose the experimental approach with two control and experimental groups and chose the community and the research sample, which are the players of Nasiriyah Basketball Club, while the fourth chapter included the presentation, analysis and discussion of the results, and after the completion of the presentation of the results, analysis and discussion, the researcher concluded a set of conclusions and recommendations, which was included in the fifth semester and the most important of them was The results showed that exercises designed according to biomechanical variables clearly contributed to improving the accuracy of peaceful shooting in advanced basketball players. The focus on energy transfer from the lower limbs to the upper limbs helped to increase the effectiveness of movement and reduce motor losses during shooting.

1- Introduction to the research and its importance:

Basketball is one of the fast team games that require the availability of a set of high physical, skill and technical abilities, and peaceful shooting is one of the most important basic skills crucial in deciding the results of matches, due to its direct link to the process of scoring points, especially in offensive cases close to the basket. This type of shooting is characterized by the fact that it depends on speed, accuracy, and the ability to control movement and balance during jumping or movement.

With the continuous development of sports sciences, it has become necessary to integrate modern scientific concepts, such as biomechanics, into the preparation and development of training programs. Biomechanics of energy transfer is a vital topic in this field, as it contributes to improving the efficiency of athletic performance by understanding how kinetic energy is transferred from different parts of the body during the execution of the skill, from the feet, through the torso, to the upper limbs.

In light of this, the importance of building training exercises based on biomechanical variables, which aim to improve energy transfer within the body during the implementation of peaceful aiming appears, leading to increased accuracy and reduced effort, while improving balance and neuromuscular coordination.

From this standpoint, this study came to shed light on the impact of using guided exercises designed according to the principles of biomechanical energy transfer, and to study their effectiveness in developing the accuracy of the skill of peaceful shooting among advanced basketball players, in an effort to contribute to the development of modern training programs and enhance the practical aspect of skill performance in the game.

The importance of this research in providing training exercises based on biomechanical variables for energy transfer, with the aim of developing the accuracy of peaceful shooting among advanced basketball players, which contributes to raising the efficiency of skill performance and achieving better results in competitions. This research can also benefit trainers in designing modern scientific training programs based on precise motor mechanical foundations.

2- Research problem

The skill of peaceful shooting is one of the basic and crucial skills in the game of basketball, as it is used repeatedly during the course of the game, directed in situations close to the basket, and requires a high degree of accuracy and kinetic coordination to achieve the highest possible scoring percentage. Despite the development of training methods, many advanced basketball players still suffer from fluctuations in the accuracy of peaceful aiming, which negatively affects the results of collective and individual performance..

Field observations and previous studies indicate that the cause may be a weakness in the efficiency of the transfer of kinetic energy within the body during skill performance, starting from the lower limbs, passing through the trunk, and ending with the arms, which leads to the loss of part of the force directed towards the basket, thus reducing the accuracy of aiming .

1.3 Research objectives

1- Design guided training exercises based on biomechanical variables for energy transfer.
2- Identify the effect of guided exercises on some biomechanical variables of the energy transfer index of the shooting skill of basketball for applicants.

3- 1-4 hypothetical research:

1- The guided exercises have a statistically significant effect on some biomechanical variables of the transfer index of the skill of peaceful basketball correction for applicants.

1-5 Research Areas:

1.5.1 The human field:

Al-Nasriya Basketball Club Players

1.5.2 Temporal domain:

20/1/2024 – 10/2/2025

1-5-3Spatial Domain:

Haider Kamel Burhan Hall.

3- Research Methodology and Field Procedures:

3.1 Research Methodology:

The researcher adopted the experimental approach by designing the two equivalent groups (experimental and control) in this method two groups are used, provided that parity is achieved between them in all variables that can affect the dependent variable in the experiment.

3.2 Research community and sample:

The research community was determined in a deliberate way, as the research community included the players of the Nasiriyah Basketball Club for the applicants, who numbered (10) players for the season (2024-2025), who represent the category of applicants, numbering (10) players, and by(100%) of the original community, and the sample was divided into the control and experimental groups in a deliberate way, and each group contains (5) players, as shown in Table (1).

Table (1)

Shows the distribution of the research population and the percentage

Number of players	Research Community	t
5	Control group	2
5	Experimental Group	3
10	Total	4

3.2.1 Sample homogeneity:

The researcher conducted the homogenization process for some morphological specifications and measurements that may have an impact on the experimental variable (chronological age, training age, mass, height,) and it was performed on the sample together before dividing it into two experimental and control groups.

Therefore, statistical methods were used by arithmetic mean, standard deviation and coefficient of variation for morphological measurements to know the reality of difference or not, and Table (2) shows that.

Table (2)

Shows the homogeneity of the research sample for specifications andmorphological measurements using the coefficient of variation, which shows values less than 30%

Coefficient of variation	Standard deviation	Arithmetic mean	Unit of measurement	Measurements	t
1.066%	2.22	208.122	month	Chronological age	1
6.542%	3.15	48.150	month	Training age	2
4.18%	3.055	73.05	kg	Mass	3
2.24%	3.936	175.65	poison	Length	4

3.2.2 Equivalence of the two research groups:

One of the important things that the researcher must follow is to return the differences to the experimental factor, on this basis, the control and experimental groups must be equivalent in all variables and indicators completely.

Therefore, statistical methods were used by arithmetic mean, standard deviation, t-test for independent samples and significance level (sig) (between the experimental and control groups) in the pre-test and before applying the method, as shown in Table (3).

Table (3)

Shows the arithmetic media, standard deviations, calculated (T) value and (Sig)

The Result	Sig	t-test	Pre-test For the experimental group		Pre-test For the control group		Measruring Unit	Processors Variables
Immoral	0.493	0.312	7.361	205.973	8.469	210.168	Month	Chronological age
Immoral	0.739	0.113	5.712	38.493	6.125	39.460	Month	Training age
Immoral	0.535	0.150	8.439	67.813	4.642	68.405	Kg	Mass
Immoral	0.671	0.721	7.159	181.439	5.991	180.371	Cm	Length

value for the control and experimental groups in the pre-test

3.3.1 Tools and devices used:

⦿ Tape measure .
⦿Stationery (papers, pens).
⦿ Japanese-made whistle.
⦿Medical scale type (Chinese) number (1).
⦿Japanese-made SONY video camera with a frequency speed of 300 images / second.
⦿Japanese-made SONY video camera with a frequency speed of 25 images / second.
⦿Japanese-made electronic calculator (CLTON).
⦿ Two (2) Camera Footers
⦿A Irish-made Dell Ci7 laptop.
⦿Electronic handheld stopwatch type (KENKO).

3.4 Field research procedures:

These procedures aim to identify all the procedures accomplished by the researcher in order to prepare for the collection of data necessary to answer the objectives of the research and verify the validity of hypotheses.

3.4.1 Tests and variables used in the research:

3.4.1.1 Lay-up Test

📍 **Objective of the test:**
Measure the accuracy and speed of performing the skill of peaceful aiming (Lay-up) during movement.

✅ Test Description:

- The player stands behind the three-point line or the middle of the field, depending on the sample level
- At the point, the player starts running towards the basket and performs a lay-up attempt using the preferred hand.
- 10 consecutive attempts are executed, 5 from the right side, 5 from the left side
- The number of successful attempts counts the balls that enter the basket correctly.

3.4.2 Study variables:

3.4.2.1 Energy transmission index variables and method of measurement :

1- Distance traveled: - It is the linear distance of the center of gravity of the mass of the body, which starts from the position of the body to the aiming stage at the maximum backward inclination to the position of the body at the moment of the start of the ball.
2- Time of movement: - It is the period of time for the launch of the body in the stage of aiming from the maximum slope back to the position of the body at the moment of the start of the ball.
3- Speed: - It is the quotient of dividing the first variable (distance traveled) by the second variable movement time .
4- Kinetic energy at the moment of support and thrust: - It is the product of half the mass multiplied by the square of speed.

3.4.2 Determining the performance phase guided by research variables:

Because the nature of the research is concerned with studying and improving the energy transfer index for its importance in performing the skill of peaceful correction with basketball, the research variables were determined during the correction stage and start from the maximum inclination of the body at this stage to the moment of correcting the ball.

3.5 Main Experience:

3.5.1 Testing and pre-imaging of the research sample:

The researcher conducted the test and pre-measurement of the experimental and control groups before starting the implementation of the training curriculum on 10/ 11/2024 at three in the afternoon (in Haider Burhan Hall), and all the members of the research sample numbered (20) players attended, the researcher and the assistant team tested the peaceful shooting with basketball .

3.5.2 Post-test : -

The post-test of the research sample was conducted on 10/2/2025 (in Haider Burhan Hall) after the completion of the period of application of the curriculum, which took (8) weeks, and the researcher was keen to provide the conditions of the pre-test and its procedures followed to test the accuracy of peaceful correction in basketball for applicants.

3.6 Statistical means:

The researcher used statistical methods that helped in processing the results and testing of research hypotheses through the use of the statistical bag (IBM SPSS Statistics 24)

Chapter Four

4- Presentation, analysis and discussion of the results:

4-1 Presentation and analysis of the results of the control group for the energy transfer index and aiming accuracy and their discussion:

4.1.1: shows the arithmetic mean, standard deviation, calculated value (T) of the energy transfer index and accuracy of correction skill peaceful correction basketball

Statistical significance	Value (v)		Post		Tribal		Unit of measurement	Data / Variables
			on	Going to	on	Going to		
Immoral	0.07	3.88	0.19	0.41	0.15	0.40	M	Distance
Immoral	0.07	4.35	0.33	4.22	0.4	3.22	m/s	Speed
Immoral	0.08	3.25	0.25	0.15	0.10	0.18	Tha	Time
Immoral	0.09	3.22	2.55	5.77	2.05	6.92	Grade/joules/kg	Power Transmission Indicator
Immoral	0.07	7.22	1.22	10.87	1.88	8.25	degree	Aiming accuracy

*** Significance level (0.05)**

Through the results fixed in Table (4), it was found that the arithmetic mean of the energy transfer index in the pre-tests of the control group was (6.92) with a standard deviation of (2.05), while the calculated t-value was (3.22) under the significance level (0.09), while the arithmetic mean of the correction accuracy was (8.25) and a standard

deviation was (1.88) and the value of t Calculated (7.22) and with a significance level (0.07).

These results showed that there are no significant differences and development in statistical terms, and this indicates that there is no development in statistical terms, but there are differences at the level of arithmetic circles have happened to the energy transfer index and the accuracy of basketball correction for applicants for the pre- and post-tests of the control group, and the researcher attributes this to the nature of the exercises used by the control group and the lack of attention to the mechanical aspects during exercises and training units and the lack of resort to managers to methods and exercises Modern.

4-1 Presentation and analysis of the results of the training package forEnergy Transfer Index and Aiming Accuracy and their discussion:

4.1.1: shows the arithmetic mean, standard deviation, calculated value (T) of the energy transfer index and accuracy of correction skill peaceful correction basketball

Statistical significance	Value (v)		Post		Tribal		Unit of measurement	Data / Variables
			on	Going to	on	Going to		
Immoral	0.08	4.45	0.25	0.43	0.20	0.42	M	Distance
Moral	0.05	6.35	0.33	3.32	0.6	2.23	m/s	Speed
Immoral	0.07	2.58	0.33	0.14	0.9	0.16	Tha	Time
Moral	0.04	3.22	1.18	2.12	1.05	4.21	Grade/joules/kg	Power Transmission Indicator

Moral	**0.01**	**7.25**	**0.98**	**14.67**	**1.22**	**10.25**	**degree**	**Aiming accuracy**

- Significance level (0.05)

Through the results proven in Table (5), it was found that the arithmetic mean of the energy transfer index in the pre-tests of the control group was (5.92) with a standard deviation of (2.05), while the calculated t-value was (4.22) under the significance level (0.09), while the arithmetic mean of the correction accuracy was (9.25) and a standard deviation of (1.88), and the calculated t-value was (8.25) and the significance level was (0.07).

Through the results that appeared in the table, it was found that there is a significant development that has occurred for the energy transfer index for the skill of peaceful correction between the pre- and post-tests of the experimental group, which confirms the effective positive impact of the exercises used in the training units, which serves the energy transfer index of the players under research.

He mentions (Frank Abdul Karim) (1) that "the energy transfer index depends on the type of transfer accomplished in the moments of elevation, through the relationship of the starting angle and mechanical energy (kinetic and potential energy group) accomplished in the moments of support and push, the more the energy decreasing the lowest value, the index will increase and that leads us to the fact that the force push was ideal, and the moments of force and resistance were appropriate and the angles of the body position moments of absorption and push were the best values to ensure the body's access On the ideal situation during the rise, as well as the speed achieved during the approach and the amount of speed lost at the moment of getting up and the consequent push of an ideal force consistent with the mechanical conditions of the body during this moment, and with what is achieved from the moments of force and resistance moments during this stage, which must be commensurate with

(1) Sareeh Abdul Karim, Biomechanical Applications in Sports Training and Motor Performance, 1st Edition: Amman, Dar Dijla, 0102, pp. 171-173 .

a small loss of energy (total energy) during this stage will achieve the best kinetic transfer of the player, and then achieve the best achievement.

And confirms (Wajih Mahjoub and Ahmed Al-Badri) (1) that "the motor transfer in its concept expresses the gradual transition and continuity through the parts of the body when performing the skill as well as the transfer of force within the body from one part to another through the joints to generate a large force."

From the above presentation, analysis and discussion of the results and graphs, the research hypothesis was verified that there are significant differences between the pre- and post-tests in the energy transfer index of advanced basketball players. And that there are statistically significant differences between the pre- and post-tests in the skill of peaceful correction of jumping basketball for applicants.

Therefore, the objective of the research was achieved in knowing the effect of the guided exercises under research, which were prepared according to some biomechanical variables on the energy transfer index in the skill of peaceful basketball shooting for applicants.

5. Conclusions and recommendations:

5.1 Conclusions:

1. The results showed that exercises designed according to biomechanical variables significantly contributed to improving the accuracy of peaceful shooting in advanced basketball players.
2. Focusing on energy transfer from the lower limbs to the upper extremities helped increase movement effectiveness and reduce motor loss during aiming.
3. The training program proved effective in improving motor coordination and balance during skill performance, which reflected positively on the scoring rate.
4. A statistically significant difference appeared between the results of the pre- and post-test in favor of the post-test, which indicates the effect of exercise on skill development.

(1) Wajih Mahjoub, Ahmed Badri, the origins of kinetic education:(University of Baghdad, Higher Education Press, 2002), p. 90.

5. Recommendations:

1- Adopting exercises based on biomechanical analysis as an essential part of skill training programs in basketball.
2- Train players on how to transfer energy within the body efficiently, guided in dynamic skills such as peaceful aiming.

3- Conduct further studies on other skills (such as jumping or triple shooting) using the same methodology.
4- Use video and kinetic analysis as a way to enhance players' awareness of their body movements and correct mistakes.

Kinetic energy transfer exercises model to develop the skill of peaceful shooting in basketball

1- Vertical jump exercise with an emphasis on pushing the legs:

- **Objective:** Enhance the thrust of the legs to improve the transfer of energy to the upper body during aiming.
- **Directions:**
    1. Stand ready with feet shoulder-width apart.
    2. Jump up as hard as possible, focusing on pushing from the legs.
    3. When landing, be sure to bend the knees to minimize shock and repeat the exercise for 3 sets of 10 repetitions.

2- Front lunge exercise with arms rotated:

- **Objective:** To improve coordination between leg and arm movement to increase the effectiveness of energy transfer during aiming.
- **Directions:**
    1. Start with standby with your feet on the floor in parallel.
    2. Make a forward burst with the left or right leg, turning the arms forward synchronously with the movement.
    3. Return to the starting position, then repeat with the other leg.
    4. The exercise was carried out by 3 sets of 12 repetitions per leg.

3- Front lift exercise with the ball:

- **Objective:** Train the player to use the energy generated by the legs to transfer it to the hands during aiming.
- **Directions:**
    1. Stand with the ball in the hands in front of the body.
    2. Lift the ball upwards similarly to the aiming motion, focusing on using the legs to push while lifting.

3. When you reach the top point, pause for a moment, then return to the starting position.
4. Repeat the exercise 3 sets of 10 repetitions.

4- Jumping exercise with mock aims:

- **Objective:** To improve coordination between the lower and upper limbs during peaceful ailing.
- **Directions:**
  1. Stand ready with the ball prepared.
  2. Jump quickly with arms shooting motion simulators, focusing on the rapid transfer of energy from legs to hands while jumping.
  3. Repeat hops 3 sets of 15 repetitions.

5- Lateral navigation exercise with aiming

- **Objective:** Enhance lateral thrust of the legs to develop stability during aiming.
- **Directions:**
  1. Make a lateral transition from left to right using short, quick steps.
  2. During each step, simulate the peaceful aiming movement, focusing on fast navigation and good balance.
  3. Repeat the exercise 3 sets of 10 repetitions for each side.

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