The Effect of Exercises with a Proposed Device to Improving Some Bio-Kinematic Variables and the Performance of the Arab Round off Skill on Floor Movement Mat Device of the Artistic Gymnastics for Women

Zahraa Salah Abd Ali[1], Bushra Kazem Abdel Reda[2]

[1]PhD. Student, [2]Prof. Dr., Faculty of Physical Education and Sports Sciences for Women / University of Baghdad, Iraq

Abstract

The importance of the research lies in preparing exercises using a proposed device to learn the skill of the human wheel on a machine rug of ground movements of the artistic gymnastics. As for the research problem: Through the presence of the two researchers as teachers and observers of this sport in the gymnastics hall, they noticed that there is difficulty in the students' performance of the skill of the round off on the machine of the mat of ground movements, according to the researchers' opinion, the reason for this is that skills are taught with the limited availability of assistive devices, as well as the lack of use of these devices in exercises according to biomechanical variables, although they facilitate the learning process for these skills and work to shorten the time and effort in the learning process and enable the removal of the difficulties encountered before. As for the objectives of the research : Design and manufacture of a device that teaches the skill of the round off and helps in overcoming the difficulty of performing that skill for female students and preparing exercises with a proposed device to learn the skill of the human wheel on the machine of the ground movements mat in the artistic gymnastics of the students.

Keywords: *bio-kinematic, performance, skill, artistic gymnastics for women*

Introduction

The field of sports in general is considered one of the most important areas to express the extent of the development and advancement of peoples, so the pursuit of the best in terms of education was continuous, through research, study and work to solve the problems facing students, and because the learner is the focus of the educational process and that developing his abilities and abilities is the primary goal of the educational process [1], it was necessary to pay careful attention to providing requirements, conditions and opportunities to achieve better performance that reflects the ability to understand the parts of the motor duty, its path and requirements. Gymnastics is one of these sports that have received the attention of researchers and workers in the sports field, which requires a high degree of understanding and mastery of motor duty in all movements performed by students, including ground movements, among the basic skills that are performed on the mat of ground movements are (front and back steps, the Arab round off - the Arab jump, standing on the head, standing on the hands) , and which consists of several technical stages, however, the proper performance of these skills requires a high physical capacity and skill [2], and this does not come from pure chance. Rather, exercises play an effective role in learning and refining these skills as they work to develop the capabilities of students and raise their levels and thus reflect positively on the performance, Therefore, through the experience of the researchers, they identified the problem that there is a difficulty in the students' performance of the skill of the human wheel on the ground movement mat device, and according to the researchers 'opinion, the reason for this is that the skills are taught with the lack of auxiliary devices, as well as the lack of use of these devices in exercises according to bio-kinematic variables, although they facilitate the learning process for these skills and

work to shorten the time and effort in the learning process and enable the removal of the difficulties encountered by students during performance, it helps in the process of diagnosing that performance, as well as the use of devices increases the learner's desire and acceptance of learning and enjoyment during the performance. Therefore, the two researchers decided to study this problem by preparing exercises [3] using a proposed device to work on overcoming these difficulties and eliminating weaknesses of the students while saving time and effort. The researchers have set the objectives of the research, which are (designing and manufacturing a device that teaches the skill of the Arab round off and helps in overcoming the difficulty of performing that skill among female students, and preparing exercises with a proposed device to learn the skill of the Arab round off on the device of the ground movements mat in the technical gymnastics of the students). They also assumed that there is a positive effect of exercises with a proposed device in improving some biochemical variables and the performance of the skill of the Arab round off on the mat of ground movements in the technical gymnastics of the research sample. As for the fields of research, the human field was represented by the third stage students in the Faculty of Physical Education and Sports Sciences at the University of Kufa 2019-2020, and their number was (35) students, and the temporal field was from 18/12/2019 to 16/3/2020, and the spatial field was represented by the Gymnastics hall in the College Physical Education and Sports Sciences / University of Kufa.

Research methodology and field procedures:

Research Methodology

The researchers used the experimental approach for its suitability in solving this problem, as empirical research aims to "effect an intentional and controlled change of the specific conditions of an event, while observing the realistic changes of that event." Likewise, the experimental method is the only research method that can truly test the hypotheses of relationships of cause or effect [(1)].

Community and sample research:

The research community was represented by the third stage students in the College of Physical Education and Sports Sciences, and it represented the entire community of origin and their number was (30) students. As for the research sample, the sample is "a part of the total community that is represented by an appropriate representation and must be defined precisely" [(2)]. The research sample was chosen randomly and by lot from the original research community consisting of (20) students, where it was divided into two groups (control and experimental) by lottery and by (10) students in each group, and thus the percentage of the research sample is (66%), which is an appropriate percentage to truly and honestly represent the research community.

Devices, tools and means used in the research:

Means of data collection:

- The questionnaire.
- Observation and analysis.
- Personal interviews.
- Grading transcript form.
- Computer software.
- Arab and foreign sources and the internet.

Tools and devices used:

- The indoor gymnastics hall in the College of Physical Education and Sports Sciences / University of Kufa.
- Two cameras (casio exilim), speed (120) images per second, (Canon) count (1).
- (3) PRINCO CDs.
- (Toshiba) laptop calculator, count (1).
- Sports stopwatch.
- Bubbles of different heights.
- Rubber cords.
- Drawing scale (1 meter).
- Whistle number (1).
- Tripod to install the cameras, count (3).

- San Disk information memory (16 GB), count (2).

- Analysis software (Kinovea setup.25).

Field research procedures:

Determine search variables:

Research variables (biochemical variables) were determined by relying on sources and references for similar scientific studies, as well as the experience of the two researchers in the field of specialization.

Bio kinematic variables:

- **The distance between the hands:** It is the real distance traveled from a point (the first hand) to another specific point (the second hand), and it is measured as (cm).

- **The distance between the feet**: It is the real distance traveled from a point (the first foot) to another specific point (the second foot), and it is measured as (cm).

- **The angular velocity of the driving leg**: It is the angular transmission rate of a man during a given time, and it is measured in (sector / s).

- **The angle of inclination of the body**: It is the angle between the line connecting from the midpoint of the foot to the point of the body's center of gravity with the horizontal line[3].

Measurement of bio kinematic variables: The kinematic variables of skill (human acceleration) were measured by using the kinematic analysis program (kinovea v.8.25), based on video imaging of skills, as the skill variables were measured, which were previously determined, and as follows:

- The distance between the hands.

- The distance between the feet.

- The angular velocity of the driving leg.

- The angle of inclination of the body.

Measuring the skill performance of the skill (the Arab round off):

The skill performance of the research skill (human acceleration) was measured by evaluating the performance of students by (4) experts and specialists in the field of gymnastics, where the degree of evaluation is according to a form prepared by the researcher for the degree of evaluation that ranges from (0-10) degree, through the students 'performance of the two skills and by (3) attempts, and the best evaluation is through videography, which was presented to the evaluation experts.

Suggested device:

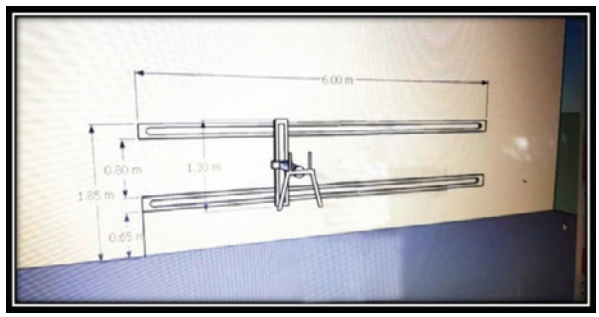

Figure (1) shows the device from the front.

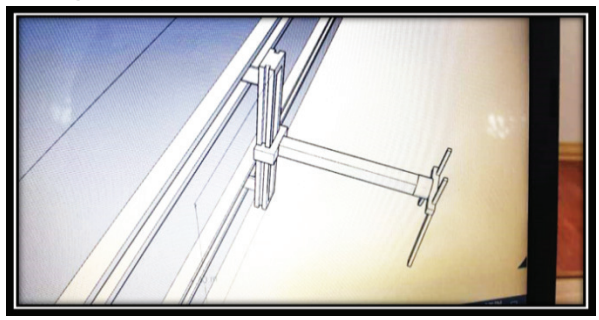

Figure (2) shows the device from the top.

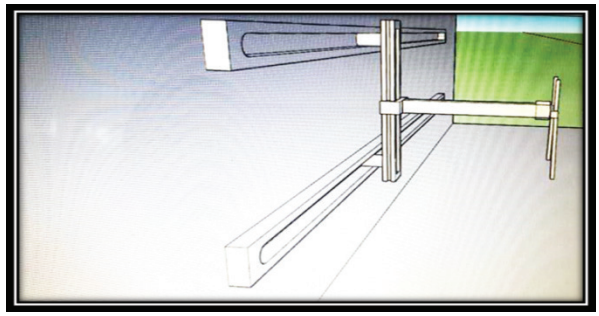

Figure (3) Shows the device from the side.

Device details:

The proposed device consists of:

- Two iron rails: the two iron rails are fixed on the wall so that they are parallel, and both rails are (6) meters long and 30 cm wide, and each one is 1.30 cm away from the other.

- Iron plate: It is installed on both rails so that it connects them and it is 1.30 cm long and 50 cm wide, and it is mobile on the two rails.

- Iron arm: fixed on an iron sheet, with a length of (15) cm.

- Ball bearing: Two (2) to be installed on each other in a way that allows movement on three axes.

- Belt: works to stabilize the body when moving.

- Mechanism of action of the device: The student stands so that her back is facing the device and she wears the belt that works to stabilize the body and provide safety so that it prevents a fall when the student begins to perform one of the two skills. Porphyry will help to rotate through the mechanism of its rotation to the side, while the iron plate will move on both rails to the side. For the student to continue performing and repeating the skill.

Exploratory experience:

The researcher carried out the exploratory experiment on Tuesday (1/12/2020) in the gymnastics hall in the College of Physical Education and Sports Sciences on a sample of (5) students, the purpose of which is to identify the validity and efficiency of the tools and devices used in the test, as well as the overall difficulties that the researcher faces in During the implementation of the main experiment, how to avoid it, find optimal solutions for it, know the amount of time needed to conduct the main experiment, as well as distribute the tasks of the assistant work team, as well as determine the appropriate location for the cameras, which were set as follows:

- The first camera: Type (casio), at speed (1200 images / s) installed on a tripod from the side opposite the place designated for performing search skills (ground movement mat), at a height of (1.50) m from the ground and installed at a distance of (4) m measured from the focus of a lens the camera is in the middle of the mat in the place where students perform the skill.

- The second camera: Type (casio), at speed (1200 images / s) installed on a tripod in the front (facing) for students while performing on (ground movement mat), at a height of (1.50) m from the ground and installed at a distance of (5) m measured from the focus of the lens the camera is in the middle of the mat in the place where the skill is performed.

The main experience:

Pre-tests:

The researcher conducted the pre-tests for the control and experimental groups of (20) students on Monday (7/12/2020) in the gymnastics hall at the College of Physical Education and Sports Sciences / University of Kufa, and the researcher conducted the tests for measuring the skill performance of research skill and biomechanical variables through videotapes that were presented to experts and specialists in the field of gymnastics and biomechanics, as previously mentioned, to obtain the results of the pre-test to evaluate the skill performance as well as the kinematic analysis to extract the biomechanical variables, using the kinovea program (kinovea v.8.25).

The research sample is equivalent:

With regard to the parity of the two research groups, the researcher benefited from the pre-test attempts to verify the parity of the level of performance as well as in comparison with the values of the most important biochemical variables for the two research groups. Which means that all levels of the two groups (experimental and control) were equivalent, which means placing the two groups on a single initiation line, as shown in table (1).

Table (1) shows equivalence in the pre-test of technical performance and some bio-kinematic variables for the control and experimental groups.

Variable	Unit	Control		Experimental		Value (T) calculated	Level sig	Type sig
		Mean	Std. Deviation	Mean	Std. Deviation			
Technical performance	Degree	3	2.47	2.70	1.25	1.76	0.09	Non sig
Distance between the hands	Cm	34.15	3.95	36.12	3.79	1.13	0.57	Non sig
Distance between the feet	Cm	44.49	0.81	44.93	0.58	1.37	0.14	Non sig
Angular velocity of the driving leg	Sector / s	6.84	0.39	7.92	0.81	0.76	1.10	Non sig
Angle of inclination of the body	Degree	55.80	5.13	57.50	4.47	0.78	0.44	Non sig

Post-test:

The researchers conducted the post-tests for the control and experimental research groups on Thursday 7/1/2021 in the gymnastics hall at the College of Physical Education and Sports Sciences / University of Kufa, where the researchers applied the tests for the technical performance of the skill of the human wheel and extracted the biomechanical variables through videotaping and analyzed them using the kinovea v.8.25 program to obtain the results of the post test, and the researchers were keen to provide the same conditions surrounding the pre-tests in terms of time, place and methods execution and sequence of tests and control of extraneous factors.

Statistical means: The researchers used the statistical bag (SPSS) to treat the results.

Presenting, analyzing and discussing results:

Presenting and discussing the results of the pre and post tests for the control and experimental groups for the variables under discussion:

Presenting the results of the pre and post tests for the experimental and control group for the studied variables:

Table (2).

Group	Number	Variables	Unit	Pre test		Post test		Value (T) calculated	Level sig	Type sig
				Mean	Std. Deviation	Mean	Std. Deviation			
Experimental	1	Technical performance	Degree	2.75	0.26	6.25	0.67	15.65	0.00	Sig
	2	Distance between the hands	Cm	36.12	3.79	44.86	0.68	7.46	0.00	Sig
	3	Distance between the feet	Cm	44.93	0.58	82.31	0.83	148.87	0.00	Sig
	4	Angular velocity of the driving leg	Sector / s	7.92	0.81	10.11	0.59	6.49	0.00	Sig
	5	Angle of inclination of the body	Degree	57.50	4.47	75.40	0.69	12.10	0.00	Sig

Cont... **Table (2).**

Control	1	Technical performance	Degree	3.10	0.51	4.80	0.25	10.02	0.00	Sig
	2	Distance between the hands	Cm	34.15	3.95	35.93	0.46	1.49	0.16	Non sig
	3	Distance between the feet	Cm	44.49	0.81	54.87	0.56	33.34	0.00	Sig
	4	Angular velocity of the driving leg	Sector / s	6.84	0.39	8.07	0.62	13.83	0.00	Sig
	5	Angle of inclination of the body	Degree	55.80	5.13	58.70	0.67	1.68	0.12	Non sig

Presentation of the results of (post-test) tests for the control and experimental groups of the studied variables.

Table (3).

Number	Variables	Unit	Control		Experimental		Value (T) calculated	Level sig	Type sig
			Mean	Std. Deviation	Mean	Std. Deviation			
1	Technical performance	Degree	4.80	0.25	6.25	0.67	6.32	0.00	Sig
2	Distance between the hands	Cm	35.93	0.46	44.86	0.68	34.13	0.00	Sig
3	Distance between the feet	Cm	54.87	0.56	82.31	0.83	86.34	0.00	Sig
4	Angular velocity of the driving leg	Sector / s	8.07	0.62	10.11	0.59	7.49	0.00	Sig
5	Angle of inclination of the body	Degree	58.70	0.67	75.40	0.69	54.34	0.00	Sig

Discuss the Results

The results presented in tables (2) and (3) for the technical performance tests and bio-kinematic variables showed that there are significant differences between the pre and post tests and in favor of the post tests for the control and experimental groups, the researchers attribute the reason for this significant difference for members of the control group in the variables (technical performance, distance between the feet, and the angular velocity of the lead man) in the pre and post- test to the exercises that were applied by the skill teacher, as it contributed to the development of technical performance and bio-kinematic variables (the distance between feet, angular velocity of the driving man), while the difference was not significant for each variable (the distance between the hands and the angle of inclination of the body), as for the significant difference that appeared in the table above for the members of the experimental group, the researchers attribute the reason for this difference as a result of the use of exercises in the proposed device where the use of exercises with the help of devices contributes effectively to raising the level of technical performance as well as improving the bio-kinematic variables. These exercises

have been performed with the device according to scientific foundations and educational principles aimed at building the body and formation to reach the learner and the player to the best possible performance in games and various activities(4). including the skills of gymnastics and in particular the skill of (Arab round off). The exercises in the proposed device included multiple attempts performed by the student in a regular sequence of difficulty in order to acquire the skill or represent it [(5)], the exercises in the proposed device also contributed to an improvement in the biomechanical variable (the distance between the hands). There will be no angles in it, and the field of motion will appear in the form of arcs or rotations without any angle [(6)], as well as an improvement in the variable (the distance between the feet) and the researchers attribute the reason for that improvement to the exercises with the proposed device and its applications and the accompanying of these applications of kinematic feedback in which it was emphasized that the legs were raised and opened to the sides without bending the knee joint, which led to the flow of movement and its aesthetics, which was reflected. Turn positive on the results of the dimensional tests of the experimental group, and also the improvement in the variable (the angular velocity of the leading man) and the two researchers attribute the reasons to the exercises in the proposed device that were applied to the members of the experimental group in addition to the kinematic feedback accompanying the performance of these exercises and their repetitions that worked on the flow of movement and continuity of performance in harmony and avoiding hesitation in it, which increased the likelihood. Conservation of kinetic energy, which was positively reflected on the increase in angular velocity, not for the experimental group, and also a variable (the angle of inclination of the body) and the researchers attribute the reason for this improvement and the significant difference to the exercises with the proposed device and its accompanying kinematic feedback, as this feedback gives information about the kinematic aspects of performance when applied as it is the best in producing information about the form of performance [(7)].

As for the results presented in table (3) that show the preference of the differences in favor of the experimental group in the post-tests, both researchers see that the exercises in the proposed device prepared by the researchers for the members of the experimental group are distinguished by their progression in terms of difficulty and forget their home and their compatibility with the skill path and their distribution based on scientific foundations and principles on educational units, as well as performing these exercises with the proposed device and containing these exercises on the auxiliary means and tools that have a great role in learning and acquiring mathematical skills in various practical lessons as well as being safety means that help learners to perform difficult and dangerous movements, which contributed greatly to the development of both technical performance and the variables. Biomechanics in the skill of the Arab round off.

Conclusions

- The possibility of using the exercises in the proposed device within the applications of physical education curricula as they are necessary in learning all stages of the technical performance of the skill of the Arab round off.

- The use of mechanical perspective helped as a basic factor in explaining artistic performance.

- The kinematical feedback had a great effect in correcting many errors in the stages of technical performance.

Recommendations:

- The necessity of conducting research in the field of learning skills using educational curricula that include special exercises in their applications.

- The exercises with the proposed device can be used in the teaching units to improve technique.

- The necessity to take into account the kinematic variables affecting the type of skill performed because of its great role in explaining and raising the level of performance.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved and all experiments were carried out accordance with approved guidelines.

17. Joseph H. Coaching.u.s.A.Trakand Field Rogers Project Coordinator: Human Kinetics. 2000.
18. Al-Khakani S, Al-Jubouri S. The guide in writing letters and scholarly dissertations, B.A., Najaf, AD. 2016.
19. Al-Shawk NI, Al-Kubaisi RS. A Researcher's Guide to Writing Research in Physical Education, Baghdad. 2004.
20. Al-Dulaimi NA. Selections in Kinetic Learning, 1st Edition, Najaf Al-Ashraf, Dar Al-Diya for Printing and Design, 2011.
21. Shalash NM, Sobhi AM. Kinetic Learning, 2nd Edition, Basra University, P.O. AD, 2000.
22. Shalash NM, Abdel-Hadi M. The Principles of Kinetic Learning, Dar Al-Diya for Printing, Najaf. 2010.
23. Hussein YN, Mohsen AT. Kinetic-Mathematical Analysis, 1st Edition. 2015.