

The effect of Qualitative Drills In terms of Bio-Dynamic Analysis on Technical performance level to Front Somersault Tuck in gymnastics

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Abstract

The research aims to study the effect of Qualitative Drills In terms of Bio-Dynamic Analysis on Technical performance level to Front Somersault Tuck in gymnastics.

Five amateur players at the local level, they performed the Front Somersault Tuck three times. The researchers used Kianovea for Biomechanics analysis Front Somersault Tuck in tow axes (horizontal x, vertical y) and (Absolute resulting R) to get biomechanical variables in three phases (Vertical Upgrade- Torque Duplex - Landing stage). Within the limits of the research objectives, the research hypotheses and the results the researchers concluded the Tables of specifications that The results showed a significant improvement in the technical performance level of the skill under study (Front Somersault Tuck for the experimental group, where the results indicate a significant improvement between the pre and post measurements in favor of telemetry for the experimental group, and The results of the use of specific exercises under study (using biodynamic analysis) showed a positive effect on some of the biodynamic variables under study for the experimental group.

Keywords: Qualitative Drills, Biomechanics, gymnastics

Introduction:

The Biomechanics sports performance reach s to participate in to develop and optimum performance which enhance sports motor and make

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the coach aims to, in perfect plan depend on sports sciences. According to Garykamen, D, Gordon E, Rbertson, Graham E, Caldwell, Joseph Hamill, and Saunders N, Whittlesey (2004) that sports sciences duty in reach the latest ways to analyze sports motion to knows the best performance and enhance the level of performance. (3: 17)

Ehab & Adel Abdul Basser (2005) report that every part of motion chain has a force which can lock the joint and change chain parts and change the degree of freedom. (1: 110)

As Hani Abdul Aziz (2016) points to dynamic motion needs many special skills and every skill included some of the performances and the most effective ways to enhance the performance in the motion analysis. (6: 134)

Hertz et al. (2003) emphasize that the athlete's performance should be developed through the diversity of the exercises themselves or the diversity of the motor performance requirements (training under pressure of time or distance) during which the player can control his body,

dimensions and movement of his members, where teaching and training skills Technique relies on a set of key principles emanating from the laws of science associated with the activity of the human body that must be employed in a manner that explains the movement of the body technically. (8: 315)

Joseph, W. (2005) adds that it is necessary to know the causes of the movement of the player's body and organs in a vacuum without the use of the five senses, sometimes due to muscular sensation by controlling the muscle contraction and intensity of a particular muscle group. (9: 291)

Mohamed Lotfy El Sayed (2016) points out that optimal performance is the ultimate goal for both the player and the coach. To achieve this, the player must have the ability to control the movements and technical skills and therefore increased interest in studying the performance of the gymnast to determine the factors affecting him directly or indirectly. Whether these factors are biological, anatomical or mechanical, to find the relationship between these factors and how they

relate to the level of technical performance to reach instructions that can guide the process of sports training to develop motor performance to achieve the best results during competitions (14: 105).

Mustafa Bahy and Samir Gad (2016) also believe that movement time is one of the most important variables in movement control because of its obvious impact on the level of motor performance. Biomechanics is interested in studying the art of movement carried out by the player through the analysis of motor skill to stand on Mechanical and biological conditions that must be observed in order for the skill to perform the correct technical performance, and then can master the technical skills to reach the level of the championship by applying mechanical principles and laws, and helps the gymnastics instructor to be able to analyze the skills to identify weaknesses and then repair. (15: 17,18).

Research importance and problem:

Through training of the gymnastics team in the Qassim region in Saudi Arabia, the researchers noted that there is a

lack of technical performance of the skill of the frontal circulation, which may adversely affect the player's degree in the kinetic sentence on the ground movements device, and the researchers assume that this failure due to lack of optimization. The biodynamic variables under study that may affect the level of technical performance of the players in the technical skill in question.

Therefore, the researchers resorted to the design of a set of qualitative exercises in terms of biodynamic analysis to treat technical deficiencies in order to develop the performance of the players, and thus improve the degree of players on the device of ground movements, and perhaps serve as a standardized scientific reference that can be relied upon by workers in the field of sports training and gymnastics.

The importance of the research lies in the attempt of researchers to identify the biomechanical indicators associated with the technical performance of the skill of the frontal air circulation skill, and extract these biomechanical indicators, which leads to the

availability of a lot of information to help evaluate the technical performance of the players, to identify deficiencies and detect errors in a scientific way in order to develop performance for the better.

Research Goals:

This study aims to develop the technical performance level of the foreground air circulation skill through:

- Biodynamic analysis of the performance of the anterior cyclic air skill and to identify the strengths and weaknesses of the skill performance of the study sample.
- Develop specific exercises to develop the skill of the foreground air circulation based on the results of biodynamic analysis and to know the impact of these exercises on the level of technical performance of the skill under study.
- Identify the percentage of improvement in the skill of the anterior cyclic air circulation as a function of the dynamic parameters under study

Research Hypothesis:

Research symbols:

1- there are statistically significant differences between the pre and post measurements of the experimental group in the level of technical performance of the skill under study in favor of telemetry.

2- there are statistically significant differences between the pre and post measurements of the experimental group in the biodynamic variables of the skill performance under study in favor of telemetry.

Research Terms:

Qualitative drills:

Exercises similar to technical performance to develop and develop skills related to the type of sports activity in line with the performance requirements

Front Somersault Tuck:

One of the movements of the aerodynamic group in the forward direction, where the player to double up and circulation in the air around the transverse axis and join the knees to the chest and hold the legs with hands and head on the knees (balling) and then rotate and spread all parts of the body to land on the feet and stability

Measurement Unit	Symbol	Term
Sec	t	Time
Cm	Dx	Horizontal displacement Component
Cm	Dy	Vertical displacement Component
Cm/sec	Vx	Horizontal Velocity
Cm/sec	Vy	Vertical Velocity
Cm/sec	VR	Absolute resulting Velocity
Cm/sec ²	Ax	Horizontal Acceleration
Cm/sec ²	Ay	Vertical Acceleration
Cm/sec ²	AR	Absolute resulting Acceleration
Kg. Cm/sec	Mx	Horizontal Moment of momentum
Kg. Cm/sec	My	Vertical Moment of momentum
Kg. Cm/sec	Mr	Absolute resulting Moment of momentum
N	Fx	Horizontal Force
N	Fy	Vertical Force
N	Fr	Absolute resulting Force

**Research Procedures:
Research Methodology**

The researchers used the experimental method using the experimental design of one group using pre-telemetry to suit the nature of the study.

Research Simple:

The sample of the basic study was chosen deliberately from the students of the Department of Sports Science and Physical Activity at Qassim University.

**Table (1)
The Description of research sample (n=5)**

			Measurement Unit	Mean	standard deviation	median	torsion coefficient
Growth rates	1	Tall	Cm	172	5.329	173	-1.53
	2	Wight	Kg	57.5	5.683	56.5	1.41
	3	Age	month	20	0.632	20	0.00

From Table (1) it is clear that the values of the torsion coefficient for each of these variables (understudy) have been limited to (± 3), which indicates the moderation of the iterative curve of the

study sample in these variables.

**Data collection tools:
Biomechanics Data collection tools:**

Capture, 2D Video By Gopro hero4 black Camera (240fps)



Figure (1) Gopro hero4 black

Biomechanics analysis by “Kinonea” software: segments (Upper arm – forearm-hand - thigh – leg – foot) in two axes (horizontal x, vertical y) to get Kinematical variables in three phases.

The researcher used “Kinonea” for kinematics analysis of running to four points represents three




The first stage (Vertical Upgrade) This stage starts from touching the jumping ladder and ends at the highest height of the player	The second phase (Torque Duplex) This phase starts at the highest height of the player and ends at the end of the spin	third level (Landing stage) This stage starts from the end of the rotation and ends with the arms standing off
		
Time t	Time t	Time t
Displacement $x y$	Displacement $x y$	Displacement $x y$
Velocity $x y r$	Velocity $x y r$	Velocity $x y r$
Acceleration $x y r$	Acceleration $x y r$	Acceleration $x y r$
Impulse $x y r$	Impulse $x y r$	Impulse $x y r$
Force $x y r$	Force $x y r$	Force $x y r$
Momentum $x y r$	Momentum $x y r$	Momentum $x y r$

Figure (2) analyzing the model

Anthropometric Data The methods and tools for data collection that are

collection tools

appropriate to the nature of the study were identified by looking at the scientific references, researches and previous studies in the field of gymnastics training and some other games.

Data collection of the technical performance level of the skill under study:







The technical skill understudy was filmed using the "video camera" twice the first time before the start of the training program and the second time after the completion of the training program. Ten grades of technical skill on the ground movements of each player, and the highest and lowest score has been omitted to become the

player's average is the average of two degrees.

In this regard, Mohamed El-Sayed Khalil (2019) points out that the subjective evaluation is a kind of evaluation that does not depend on the standards, levels and the parameters, but depends on the expertise of the measurers. Uniform conditions to be agreed upon in advance between the arbitrators shall be established so that a high degree of objectivity can be achieved in the assessment of the degree. (13: 5)

Results:
Present the results:
Present the results of the Bio-Dynamics variables:

Table (2)
Mean of Bio-Dynamics variables to Pre and Post measurement to CG

Variables	Pre			Post		
	Mean of phase 1	Mean of phase 2	Mean of phase 3	Mean of phase 1	Mean of phase 2	Mean of phase 3
						
t	0.42	0.3825	0.2835	0.3435	0.075	0.3225
Dx	1.155	1.59	2.37	10.32	12.06	14.4
Dy	1.8	0.675	0.735	-0.15	2.25	2.25
Dz	6.15	1.11	1.605	1.53	5.55	6.15
Vx	-1.644	7.8	2.655	3.9	19.05	16.32

Follow Table (2)
Mean of Bio-Dynamics variables to Pre and Post measurement to CG

Variables	Pre			Post		
	Mean of phase 1	Mean of phase 2	Mean of phase 3	Mean of phase 1	Mean of phase 2	Mean of phase 3
Vy	-1.05	8.1	-6.3	4.2	12.9	-5.37
Vr	11.4	2.205	8.175	21.75	23.85	22.62
Ax	109.95	-29.43	-130.65	278.4	88.05	13.17
Ay	-31.2	-154.2	-74.55	-165	-174.9	-255.15
Ar	-20.25	-79.665	-135.105	1413.15	410.25	726.03
Ix	92.85	-21.405	-296.25	75.78	136.2	24.9
Iy	92.25	-273.15	-188.4	92.7	-242.1	-102.6
Ir	64.95	-140.13	-309.9	777.75	598.2	1436.7
Fx	608.7	-167.25	-745.35	1570.8	502.95	78.99
Fy	-174.9	-489.45	-455.1	-956.4	-996.6	-1453.05
Fr	-126.75	-442.2	-749.85	8040.6	2326.8	4107.9
Mx	-7.8	46.125	19.2	24.75	112.29	97.65
My	-6.15	46.74	-43.68	27.75	75.33	-34.35
Mr	66.9	98.235	37.785	86.58	142.56	135.525

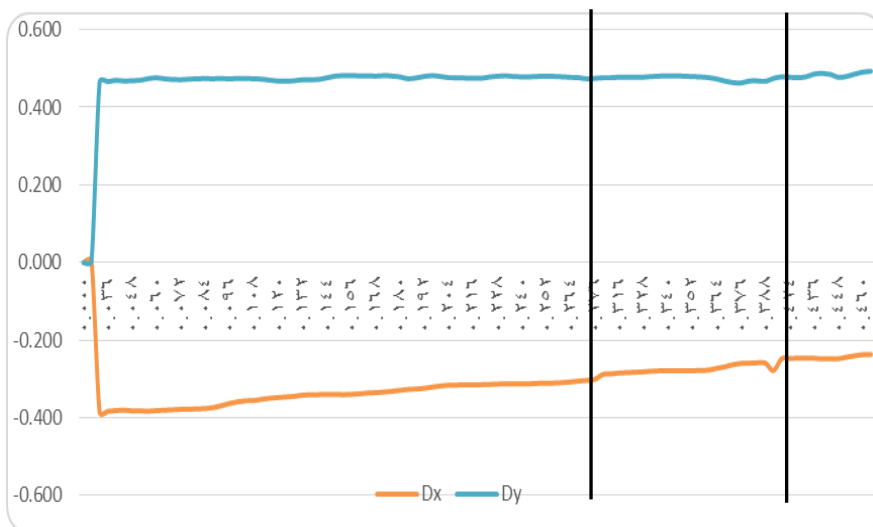
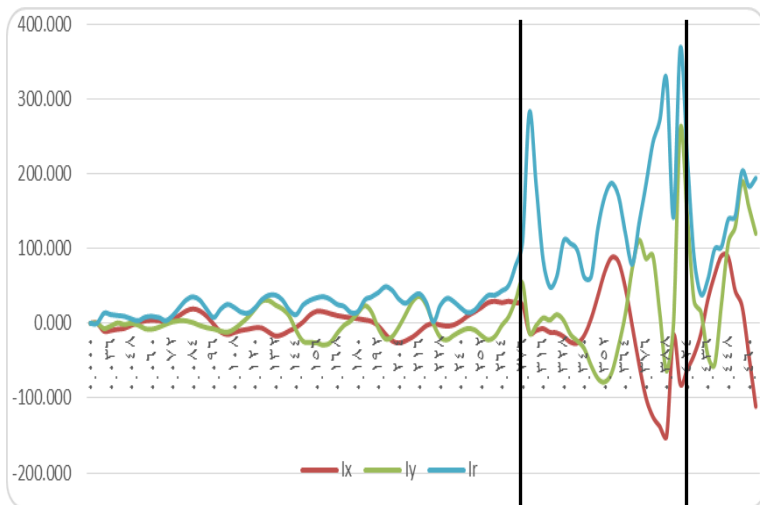


Figure (3) Bio-kinematics Variable of CG (Pre)



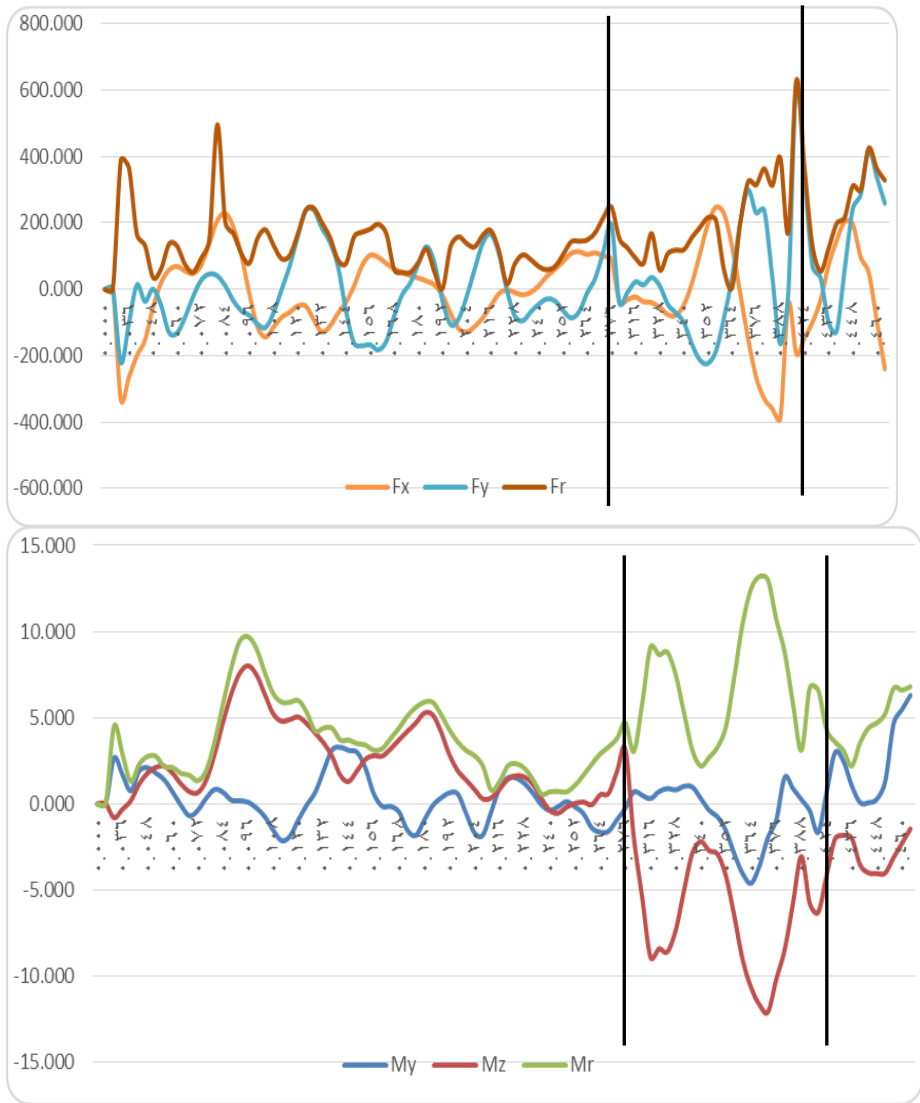


Figure (4) Bio-kinetics Variable of CG (Pre)

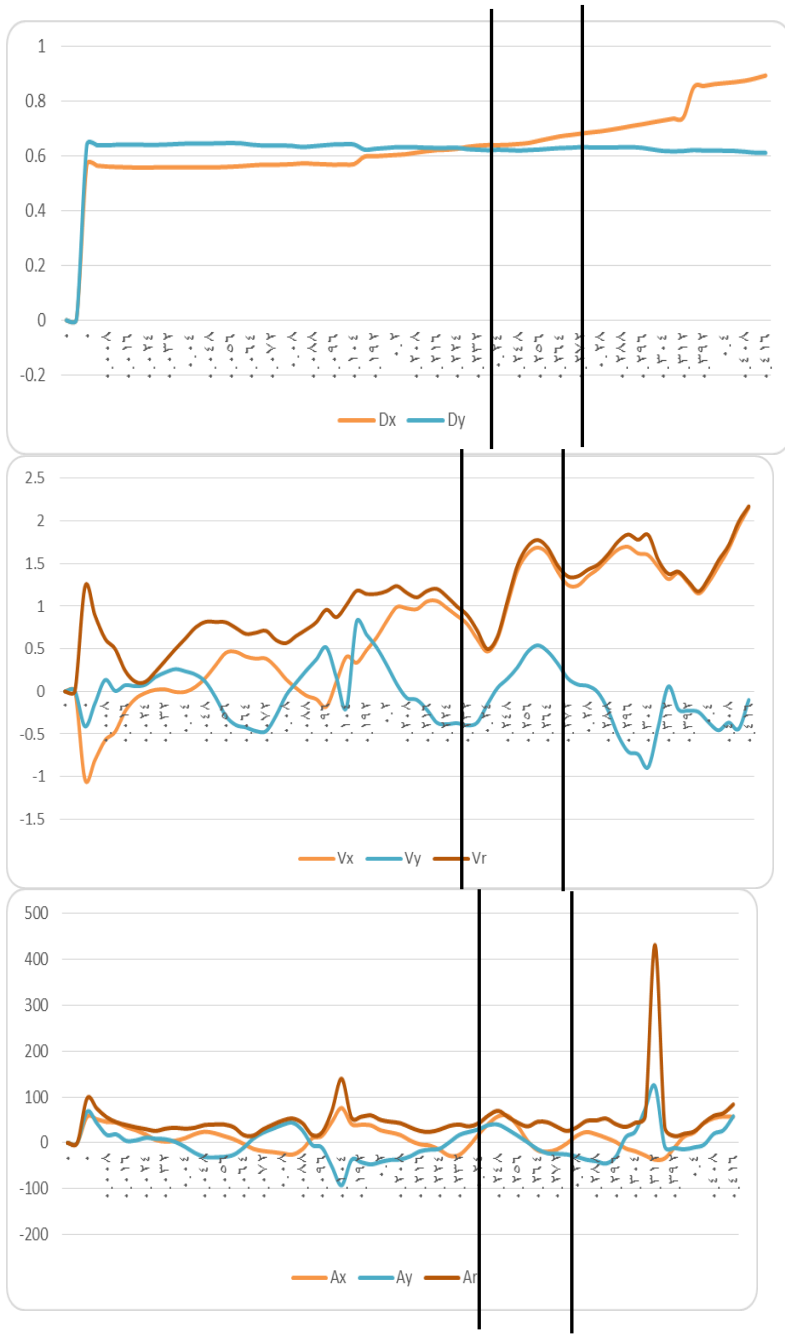


Figure (5) Bio-kinematics Variable of CG (Post)

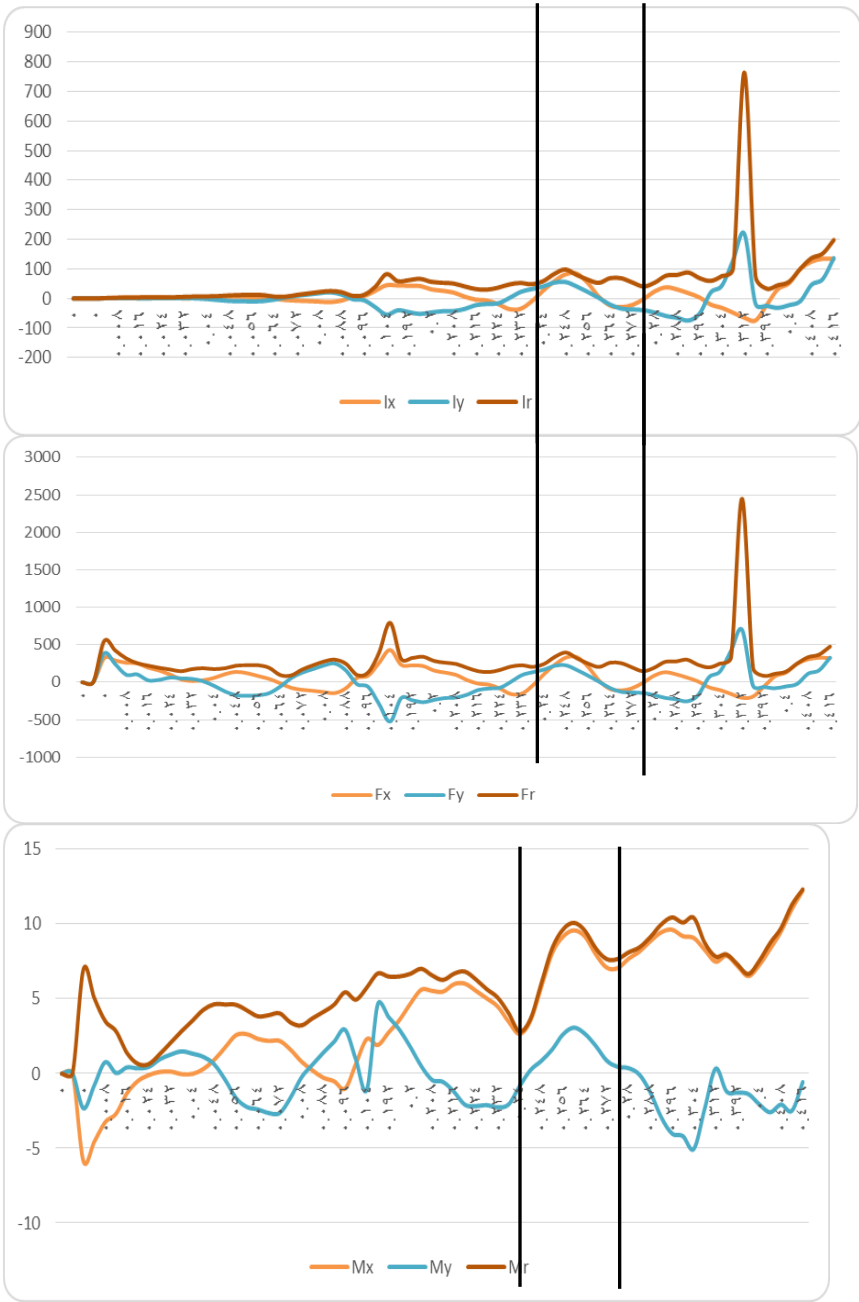


Figure (6) Bio-kinetics Variable of CG (Post)

Present the results of Technical performance level: Mean of Technical performance level to Pre and Post measurement to CG:

Table (3)
Mean of Technical performance level to Pre and Post measurement to CG:

Mean	First player		Second player		Third player		Forth player		Fifth player	
	Before	After	Before	After	Before	After	Before	After	Before	After
	4.2	9.2	4.8	9.4	3.5	8.5	4.2	8.6	3.6	8.7

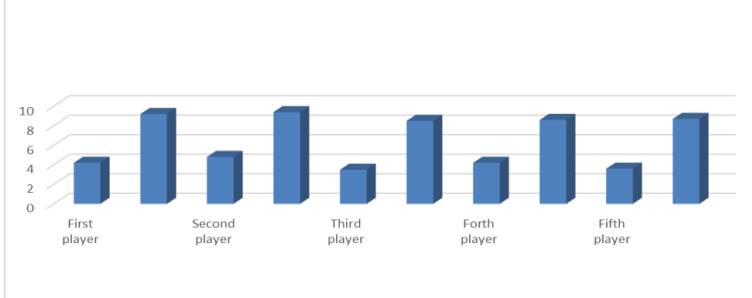


Figure (7) Mean of Technical performance level to before and after measurement to CG)

The percentage of technical performance level of improvement between the pre and post measurements in the study sample:

Table (4)
The percentage of improvement

Mean of measurements in the technical performance level	Pre measurements Mean	Post measurements Mean	The difference between the two Means	The percentage of improvement
	4.06	8.88	4.82	45.27%

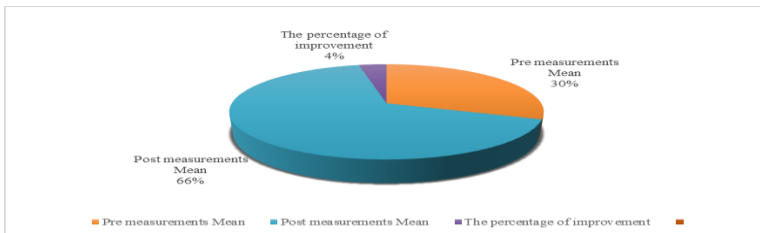


Figure (8) the percentage of improvement

**Discussion of the results:
Discussion of the results of
the first hypothesis:**

Which states that "there are statistically significant differences between the pre and post measurements of the experimental group in the level of technical performance of the skill under study in favor of telemetry."

Table (4) indicates that there was a significant improvement in the technical performance level of the skill under study (Front Somersault Tuck for the experimental group, where the results indicate a significant improvement between the pre and post measurements in favor of telemetry for the experimental group. These results are consistent with the results of Shereen Ahmed Youssef 2001 (18), Nisreen Mahmoud Nabih 2004 (16), Nevine Hussein Mahmoud 2004 (17), Heba Abdel Azim Hassan 2005 (7), Khaled Farid Ziadeh, 2007 (10), Eid Isma'i 2014 (4), All the results of these studies were statistically significant in favor of the use of qualitative exercises in the progress of the technical performance of various sports

in general and in gymnastics in particular.

The two researchers attributed a significant improvement in the technical performance variable under consideration (Front Somersault Tuck) to the high level of biodynamic variables for the performance of the skill under study.

Thus, the first hypothesis which provides for the following is achieved (there are statistically significant differences between the pre and post measurements of the experimental group in the level of technical performance of the skill being studied in favor of telemetry).

**Discussion of the results of
the second hypothesis:**

It states that "there are statistically significant differences between the pre and post measurements of the experimental group in the biodynamic variables of the skill performance under study in favor of telemetry."

Comment on Time:

It is clear from tables (6), (7) and (8) that there are statistical differences between the pre and post measurements of the research group in the time variable during the three

stages of performance, where the average time in the pre-measurement in the first stage was (0.42 s) and became in the second stage the average performance time in the pre-measurement (0.38s) and in the telemetry became (0.075s), and in the third stage the average performance time in the pre-measurement (0.28s) and in the telemetry (0.322s).

The statistical comparison found that this difference is statistically significant between the two measurements during the three stages of performance. The researchers attribute this to the fact that increasing the player's speed in the performance of the skill has led to the reduction of the performance time of the skill during the three performance stages. The researchers also explained that the player's ability to take advantage of the amount of movement gained from each stage and utilized in the performance of the next stage, attributed to the increased flexibility of the thigh joints, knee and wrist, in addition to improving the technique of playing performance skill.

It is also found that the first stage of the pre-and post-

performance is the most time-consuming for the total time to perform the skill as it took in the pre-measurement between 39% and in the telemetry 47% of the total time to perform the skill, and the researchers attribute this to the first stage includes the end of approach and the beginning of payment. The jumping ladder, as the researchers note that this movement involved a large number of muscles of the body, the motor coordination between these muscles may take longer than the charge of movement of fewer muscles. Hani Abdul Aziz (2019) (5) also emphasize that there is a time for each muscle to complete the stimulation of the muscle, so increasing these muscles increases the time required to alert them all.

It turns out that the second stage in the pre-measurement took more than the third stage, where it took about 35% of the total time to perform the skill, due to the torque phase, the second stage requires the work of rapid circulation in the air, which did not occur in the pre-measurement, and the researchers attribute Increase the time of the second stage to

the pre-measurement to the relative weakness in the muscles responsible for the torque in the air and this is what the researchers realized in the design of the program and showed its effect on the telemetry.

It was found that the second stage in the measurement after me is the least time spent on the total time to perform the skill as it took only between 10% of the total time to perform the skill, and the researchers attribute that this is the most important stage of the performance of the skill and must be done very quickly to ensure The completion of the full circulation in the air before the beginning of the third stage, which is where the beginning of landing and therefore any slowdown in this stage will work to end the second stage (torque) without completion, which is working to disturb the balance during the landing of this skill and that may prevent the achievement of the goal Of which. Performance at this stage also requires that the radius of the spin around the center of gravity of the body be minimal to ensure a small angular displacement of the

limbs of the body (arms and legs) and thus increase the angular velocity of the player, and this is consistent with Krzysztof Mackala (2013) (12) and Kim Maing. Kim, Maeng-kyu et al. (2016) (11) argued that the development and improvement of mechanical-based performance in turn improves the form of motor performance and modifies the motion path.

It also shows that the third stage in the telemetry stages of the performance of the skill is the second most phased stages of the total time of the performance of the skill, as it takes between 43% of the total time to perform the skill. The stage is more accurate and cautious when performing than at any other stage. As evidenced by the average overall.

It is also clear that the average total skill time under study in the pre-measurement was (1.08s) while in the post-measurement about (0.737s), the researchers attribute this to the integration of the relay performance reduction and the ability of the player to save effort during the performance of the skill has worked to reduce The total time in the

performance of the skill during its three phases, as the researchers attribute that the speed training used in the training program has led to its role in improving the speed of the player's performance during the performance of the skill, especially in the second phase (torque), in addition to the player's understanding of the mechanical foundations. And rectify the technical errors for his performance in the trial measurement has led to the improvement of the player's performance and thus its ability to be reduced times of skill performance.

Comment on the center of gravity of the body:

Table (6) shows that there are statistically significant differences between the pre and post measurements in the biomechanical variables of the center of gravity of the body during the first stage of the performance of the skill under study.

This is due to the fact that the proposed training program was focused on the physical abilities of the performance of the skill under study and that the research exercises focused mainly on the mechanical link to perform

the skill under study, which consists of the muscles of the legs, trunk and arms. Consider mechanical because the player makes the maximum push for the jumping ladder in order to reach the maximum height possible.

Therefore, it was normal to have statistically significant differences for the mechanical variables under study between the pre- and post-measurements of the performance of Front Somersault Tuck.

The qualitative exercises used to increase the player's ability to control his body and increase his ability to perform skill in a narrower spatial field with the ability to reduce this time which is indicative of increasing the speed of the center of gravity of the body, as confirmed in Table (6), (7), (8) Thus all mechanical variables in terms of wheel, force, propulsion and amount of movement.

From the equations of the last mechanical variables it is clear that the change in displacement often has an effect on the rest of the variables, as illustrated by the following rates:

	Mechanical Variable	Symbol	Equation
1	time	T	
2	displacement	d	
3	mass	m	
4	Velocity	V	$v=d/t$
5	Acceleration	A	$a=v/t$
6	Impulse	I	$I=f*t$
7	Force	F	$F=a*m$
8	Moment of momentum	M	$M=v*m$

This explains the increase of the mechanical variables in Table (6) in terms of wheel, force, propulsion and the amount of movement.

The researchers believe that this increase is a positive increase.

As shown in Table (7) that there is a statistically significant between the pre and post measurements in the biomechanical variables of the center of gravity of the body during the second stage to perform the skill under study.

This is due to the fact that the proposed training program was focused on the physical abilities of the performance of the skill under study and that the research exercises focused mainly on the mechanical link to perform the skill under study, which consists of the muscles of the legs, torso and arms, and the first stage of the performance of the skill is the most

important stage Consider mechanical because the player makes the maximum push for the jumping ladder in order to reach the maximum height possible.

Therefore, it was normal to have statistically significant differences for the mechanical variables under study between the pre- and post-measurements of the performance of Front Somersault Tuck.

It is clear from Table (4) that the displacement on the three axes has increased the center of gravity of the body in all three phases, and the researchers attribute this to the increase of elasticity of the trunk, which had a statistical significance, which in turn has improved performance, which is shown in tables (6), (7) (8) indicated that there are statistically significant differences in the biodynamic variables under study. In line with. V. Boloban,

et al (2013) (19), and Ehab and Adel Abdel Basir (2019) (2)
Adel & Ehab Abdel Baser

Conclusions and recommendations:

Conclusions

Based on the results of the research and in the light of the objective and hypotheses of the research, the researchers reached the following conclusions:

The results showed a significant improvement in the technical performance level of the skill under study (Front Somersault Tuck) for the experimental group, where the results indicate a significant improvement between the pre and post measurements in favor of telemetry for the experimental group.

The results of the use of specific exercises under study (using biodynamic analysis) showed a positive effect on some of the biodynamic variables under study for the experimental group.

The results showed that the player's speed in the performance of the skill increased (the reduction of the performance time of the skill during the three stages of performance). This reflects the improved ability of the player

to take advantage of the amount of movement gained from each stage and exploited in the performance of the next stage, and the researchers attribute this to the increased flexibility of the thigh joints, knee and wrist, in addition to improved technical skill.

The results showed that there were statistically significant differences between the pre and post measurements in the biomechanical variables (center of gravity of the body) during the first stage of the performance of the skill under study, because the qualitative exercises under study were directed to develop and develop the physical abilities of the performance of the skill under study. The first stage of performing the skill is the most important stage from the mechanical point of view, because the player makes the maximum vertical push in order to reach the maximum lift. Memkn.lma it was natural and there are statistically significant differences in the mechanical variables under study between the two measurements pre and post for the performance of the skill of Front Somersault Tuck.

The results showed that the use of qualitative exercises increased the player's ability to control his body and increased his ability to perform skill in a narrower spatial field with his ability to reduce time, which is indicative of increasing the speed of the center of gravity of the body and therefore all mechanical variables. Where the wheel, force, propulsion and the amount of movement. Through the equations of the last mechanical variables it is clear that the change in displacement often have an impact on the rest of the variables.

The results showed differences between the pre and post measurements of improvement in the technical performance level of the skill being studied (Front Somersault Tuck) for the experimental group, as well as the biodynamic variables under study for the experimental group in favor of telemetry.

The results showed that there was a statistically significant correlation between the level of biomechanical variables under consideration and the technical performance level of the skill being

researched (Front Somersault Tuck).

recommendations

Based on the Conclusions of the research and the conclusions reached, the researchers recommend the following:

- Use of specific exercises under research (using biomechanical variables) to develop and improve the level of technical performance in gymnastics.
- The need to the design of qualitative exercises to be based on the biomechanical variables for the performance of gymnastic skill, because of its positive impact on raising the level of technical performance.
- the diversity of tools and assistant devices used within special training programs aimed at developing the technical and physical performance of gymnasts.

10/2/4 The use of bio-dynamic analysis of all gymnastic skills on all equipment in gymnastics, to determine the level of achievement.

10/2/6 Educate trainers on the importance and how to apply biodynamic analysis, to analyze the technical performance of gymnastics

skills, because of its significant impact in the selection of qualitative exercises commensurate with the technical performance requirements for each skill of gymnastics.

Conducting further studies similar to the nature of the current research on various gymnastics systems and other dental stages.

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sequence front handspring-
front somersault in tucked
position, Science in Olympic
Sport. 1. 76-79