

## **Studying the Motor Rhythm of Some Pommel Horse Skills Using Qualitative and Video Analysis as the Basis for Developing Performance Level of Players in Training Center of the Saudi Arabia Gymnastics Federation**

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**Abstract:** This research aims to identify faults in motor performance of anchoring on both hands of the investigated motor skills on the pommel horse apparatus for junior gymnastics under ten years in the training center of the Saudi Arabia Gymnastics Federation in Riyadh using the motor qualitative and video analysis as the basis for developing a training program through the following:

- Ⓒ To identify faults in performance of the studied skills through the motor qualitative analysis.
- Ⓒ To identify the impact of the training program to improve components level of physical fitness of the studied skills.
- Ⓒ To identify the impact of the training program to improve the level of performance of the studied skills.

The sample of the research included a sample of eight players represent the research community of junior gymnastics under ten years old from the training center of the Saudi Arabia Gymnastics Federation in Riyadh and registered in the federation. The researchers used the experimental method for conducting this research.

The steps of the research were represented as follow:

First: qualitative analysis of the studied skills according to Gangstead and Beverides [1].

Second: faults classification Form.

Third: Developing the proposed physical and skill exercises specific to the studied skills and associated to motor rhythm.

The results indicated the following:

- Ⓒ There are significant differences between pre and post measurements of the research sample in the physical level in favor of the post measurement.
- Ⓒ There are significant differences between pre and post measurements in the performance level of the studied skills (Magyar- Sivado – Thomas American scissor) in favor of the post measurement.
- Ⓒ Integrating between the prepared physical program and the skill program is considered the best way to develop perform skills accurately in the least time possible.
- Ⓒ Developing the motor rhythm of motor the studied skills and for gymnastics in general helps to develop and link between the motor skills.

**Key words:** Motor rhythm % Pommel horse skills % Qualitative analysis % Developing performance level %  
Gymnastics

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### **INTRODUCTION**

The sport of artistic gymnastics is considered as a sport activity characterized by a unique type of competition, as competition between players takes the form of combination, where the player depends on his physical and skills abilities in achieving the

motor duty on the apparatuses, so it is necessary for workers in the field of research and training in the sport of gymnastics to study all variables related to motor skills with high difficulty Whether in terms of anatomical or mechanical or training sides in order to design training programs that contribute to the development of skills performance [1].

Through the numerical analysis of difficulty levels of the elements of the motor skills groups of Pommel horse, it is indicated that the motor skills are divided into five groups including 18 skills in the first group, 17 skills in the second group, 32 skills in the third group, 34 skills in the fourth group and 12 skills in the fifth group with total of 113 skills on the apparatus [3].

Through the interview with the responsible coaches for training the players and discussing the reasons of low level performance on this apparatus and the inability to master these motor skills, their views were as follows:

- C The skills training needs a long time with the importance of codifying the stages and adjusting the transition from one phase to another that represents a burden on the player and requires highly experienced coaches.
- C The combination feature of the studied motor skills.
- C There is no specific or determined exercises program of the skills where the coach's individual efforts and personal experiences are left behind where learning depends on trial and fault.

Therefore, the researchers find that the low performance level of motor skills is due to the cadets, coaches lack of knowledge and information relating to the skills groups and therefore their training contents do not include the skill preparation program leaning on the agreement with some specialized references that skills preparation is the program that aims to teach sports motor skills used by the individual within competitions and tries to reach perfection and fixation [4-6].

On the basis that the coach conducts the planning process to keep the player's form in competitions year-round training, the researchers noted the inability of players to perform motor skills on the pommel horse in a good performance level, which exposes them to discounts in skill performance of the studied motor skills that may start from 0.30 and up to one degree when falling of the apparatus in a single skill, which exposes that the player is not awarded the motor skill with the D difficulty level of 0.4 for each of Magyar and Sivado skills where the loss value becomes 0.8 for both skills and losing the degree value of the American scissor (A)- (Thomas) by 0.1, in addition to exposure to performance discounts and losing requirement value by 0.5 degree, Therefore the player became vulnerable to lose 4.4 and more as follows, the value of motor skills (0.9) + the value of performance

requirement (05.0) + The value of the complete falling (1) degree of each skill of the three skills on the apparatus, where the research problem revealed as a serious practical scientific attempt aimed at developing the performance level of the studied motor skills as one of the main skills for developing the players overall skills through the reality of analyzing world elite players combinations on the pommel horse, through studying motor rhythm of some pommel horse skills using qualitative and video analysis as basis for developing the performance level, physically and skillfully, of the training center players of the Saudi Arabia Gymnastics Federation in the studied skills to accelerate learning and to reach the stage of perfection and fixation in the least possible time, where they were the basis and standard of skills performance in gymnastics. So, when the player reaches that, it will be an indicator of progress in gymnastics.

## MATERIALS AND METHODS

The experimental method was used by pre- and post measurements for one experimental group as it suits the nature of the research. The research was applied on a sample of eight players represents the research community of junior gymnastics under ten years old in the training center of the Saudi Arabia Gymnastics Federation in Riyadh and registered in the Federation, the sample was intentionally chosen and homogeneity among subjects of the sample was conducted through the following variables as shown in Table 1:

Table 1 illustrates that all variables coefficients values of the research sample ranges from 0.336 to -1.34 indicating values normality and homogeneity of the sample of the research. The selection of this sample is due to the following reasons:

- C The availability of the appropriate number as a sample for this research.
- C Convergence of age stages and skills performance of the sample members.
- C The availability of equipment and facilities necessary to implement the experiment of the research.

### Data Was Collected Using the Following Tools:

**Qualitative Analysis of the Research Skills, According to Gangstead - Beverides Model:** That is through designing a technical aspects form using the Gangstead - Beverides Model:

Table 1: Statistical indications of the basic variables of the research group in (Length - Age - weight) n = 8

Basic variables	Statistical treatments				
	less value	highest value	Arithmetic mean	Standard deviation	skeweness coefficient
Life time (year)	9	10	9.2	0.542	0.709
Height (cm)	122	126	124.1	1.36	0.165
Weight (Kg)	23	28	25.55	1.98	0.334
Arm sideways	122	129	126.6	2.39	-1.34

By reviewing the specialized scientific references of gymnastics, technical performance of the studied skills was described according to the determinants of Gangstead - Beveridges Model, to determine the three performance phases (preliminary-basic-final) which considered as the temporal performance of performance and the direction of body parts involved in the performance of the studied skills, where each of Hossam El-Din *et al.* [7], Knudson and Morrison [8] agreed that the qualitative analysis of sports movements performance come through four main tasks which are the preparation, observation, diagnosis and therapeutic intervention. So, to have an effective qualitative analysis, theoretical basis (knowledge) should be strong and coherent hence, the importance of the preparation task.

**Faults Classification Form:** The researchers pointed an experts poll to identify performance faults of the technical points of the body parts during performing of the studied skills and used the gymnastics international arbitration regulations in classifying performance faults, moreover the players (sample of the research) were filmed and their performance of the studied skills were recorded on video cassette to analyze their performance to detect the performance faults that appear during performing.

**The Used Tests:** The researchers determined the most important tests that measure the physical fitness and skill elements related to skill performance of the studied skills (Magyar, Sivado and Thomas American scissors) on the pommel horse by analyzing references and scientific researches and previous studies.

**Evaluation of Skill Performance:** The studied skills were evaluated through a rating scale designed by the researchers through an approved arbitrators committee from the Saudi Gymnastics Federation, where the evaluation process was conducted as follows:

The researchers divided the studied skills into three phases (preliminary, basic and final) where degrees were distributed on the three phases on the basis that the final

degree of each motor phase is 10 degrees that's by taking opinions of experts in the field of gymnastics to the reality of the actual degree out of 10 degrees, taking into account the apportionment of the result on three which is the number of performance phases.

**Procedure and Measurements**

**The Proposed Training Program for the Studied Skills**

**The Program Objective:** This program aims to develop the player's performance of the studied skills (Magyar, Sivado and Thomas American scissors) on the pommel horse, where the researchers designed the training program and developed skills and physical exercises related to the chosen skills through the following:

- ⊆ Analyzing the muscular work related to skills performance.
- ⊆ Scouting expert's views.
- ⊆ Analyzing some educational films developed by the International Gymnastics Federation.

When choosing and developing these exercises, the researchers took into account dividing the studied skills technically as follows:

Dividing the skill performance on low pommel horse (without rings) to three equal parts (front, middle and back) for both Magyar and Sivado skills.

Dividing the skill performance on the mushroom apparatus (one of the compete apparatus for the age group) to three equal parts (rear back start position- front rest position with the right foot high and left foot down-back rest position with the right foot high and left foot down) concerning the Thomas American scissors skill.

Taking into account not to transfer into a higher level in difficulty of skill performance until reaching perfection of the lesser difficult level.

- Gradual difficulties.
- Exercises contain the main part of the skill.
- Exercises are easier than the skill performing itself.
- Determining the type of the used muscular contraction.

Identifying the physical level of the players subjected to the study.

The pilot study, measurements of the research and implementing the proposed program has been applied during season 2009/2010 where the basic experiment was applied for 12 consecutive weeks in the period from 1/02/2010 to 1/05/2010 as three training units per week in a total of thirty-six training units, each unit period is 120 minutes at 5 Pm on Saturday, Monday and Wednesday to apply the basic experiment on the research group.

**Statistical Analysis:** Statistical analysis was conducted, using the arithmetic mean, standard deviation., skewenes coefficient, Wilkoxson test and percentage of calculating the significant differences and improvement rates between the pre and post measurements of the research sample, on results of the physical characteristics tests of the studied skills; skill efficiency tests; the skill performance levels of Magyar, Sivado and Thomas skills and linking between Magyar and Sivado skills.

### RESULTS AND DISCUSSION

Table 2 answered the first question that reads:what are the performance faults relating to the studied skills (Magyar, Sivado and Thomas American scissors), where each of Abd El- Rahman [9], Chidac [10], Roethisberger

[11] agreed that the responsibility of amending and developing the player's level of achievement is located on the coach as he is responsible of planning and developing the player's achievement level course through developing the performance level to format the motor combinations, which is the base of competition in gymnastics and that executes according to framework plan established by the coach aiming to identify the physical and skill elements and what are performance faults (technical) characteristic of the skill performance for each skill separately and attempting to exercise them so that the motor rhythm will fit with the performance nature on the apparatus where the mechanical applications in several methods showed that analyzing the technical defects of the sports performance can help the coach to determine the training type required to improve and develop the performance level. Deficiency in one of the physical demands like power or endurance of certain muscle group, may demonstrate the difficulty in performing the technique, or by the appearance of a particular manifestation of the movement where is difficult for the player to achieve.

Table 3 and Figure 1 illustrate that there are significant differences between pre and post measurements of the sample of the research in the physical elements in favor of the post measurements and z value (Welkokson test) ranged between -2.58 and -2.53 which is significant at the level of 0.05.

Table 2: Estimated degree and percentage of performance faults of Magyar, Sivado and Thomas skills

Skill Performance Fault	Fault Degree			Approval Percentage	Estimated Degree	Fault State
	Simple 1	Medium 3	Sever 5			
<b>Magyar and Sivado skills</b>						
The right hand forward during forward transition if a right hand player.	--	--	40	40	100%	Accepted
Body oblique transfer forward and the player body does not parallel to the body of the pommel horse.	--	6	30	36	90%	Accepted
Faults in the performance time distribution in the legs entry and exit.	--	9	25	34	85%	Accepted
Fall of shoulders with bending elbows during performing single leg circle, leading to closing hips and thus change support time.	2	9	15	26	65%	Accepted
Bending the knees.	--	--	40	40	100%	Accepted
wrong head movement with shoulders	2	9	15	26	65%	Accepted
<b>Thomas skill</b>						
Bending elbows.	--	9	25	34	85%	Accepted
Not to put hands on one line	2	9	15	26	65%	Accepted
Not to open and lift up the entry leg high either the left or right legs.	2	12	10	24	60%	Accepted
Non-extension of the hip forward.	--	9	25	34	85%	Accepted
Non-extension of the bottom exit leg to the fullest range, which leads to touch the apparatus.	--	9	25	34	85%	Accepted
Not to open the legs in the rear back.	--	9	25	34	85%	Accepted

Table 3: Significant differences and improvements percentages between pre and post measurements of the research sample in physical elements tests specific for the studied skills. (n = 8)

Statistical treatments	Post-measurements		Pre-measurements		Wilkokson test	"Z" indication
	A	S	A	S		
Physical elements tests						
(Horizontal leaning) bend arms fully in (15) s.	10.7	1.7	15.8	1.55	-2.55	Significant
(Hanging) bend arms fully in (15) s.	9.5	1.0	14.0	0.75	-2.58	Significant
Measuring explosive power of abdominal superior muscles in (15) s.	9.38	1.7	14.3	1.51	-2.63	Significant
Measuring explosive power of abdominal inferior muscles in (15) s.	12.2	0.7	15.7	0.89	-2.58	Significant
Measuring explosive power of back superior muscles in (15) s.	11.2	0.46	15.2	0.45	-2.82	Significant
Measuring explosive power of back inferior muscles in (15) s.	12.3	0.92	16.7	1.49	-2.55	Significant
(Wall bars hanging) Raise the trunk High in (15) s.	11.5	0.53	16.1	1.12	-2.56	Significant
(Standing) straddle to perform side split	5.8	0.44	8.38	0.51	-2.53	Significant

Significance level at 0.05= (1.96) with "z" indication.

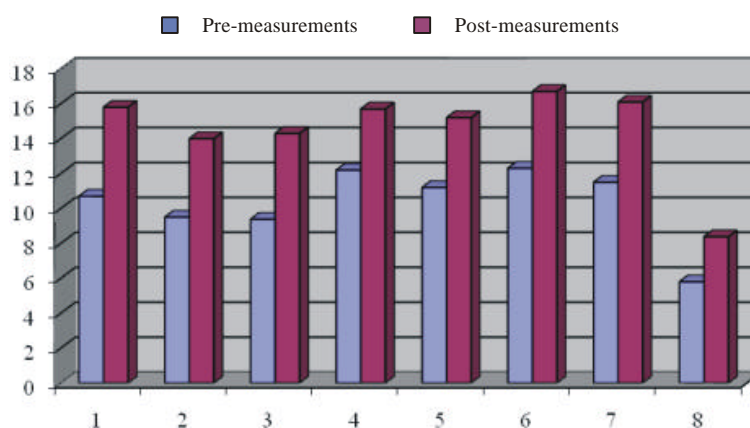


Fig. 1: Significant differences between the pre and post measurements of the research sample in physical elements tests specific for the studied skills

Through the findings reached out by the researchers, it is obvious that the proposed training program of specific exercises has the credit in developing the physical aspects, which confirms that the proposed training program, including specific exercises, led to the development of explosive power level of the superior abdominal muscles with a percentage of 52.4%, achieving the highest value, followed by arm muscles in the Horizontal leaning exercise (47.6%) and bend hang exercise with a percentage of 47.3%, which indicates the high impact of physical exercise in developing abdominal and arms muscular power which is significantly associated with type of muscular work of the skill on topics, followed by physical exercise specific to hang raising trunk with a percentage of 40% and exercise of superior and inferior back muscles with a percentage of 35.7% which had a positive effect on improving the skill performance level to all phases of the motor skills performance of the studied skills. Therefore, the training program raised the player's sense range of motor rhythm of the skill performance by developing and raising the

physical elements that contributes in developing, perfection and fixing the skill performance and recruiting the selected exercises to elevate the player's motor rhythm level, depending on raising the level of their physical condition.

That agrees with the opinion of Abd El- Rahman [9] and Fruedenstin [12] that the development of power has a vital role in increasing significantly the level of motor skills development and also they agreed that the gymnast needs a great deal of power in all body parts especially shoulders, arms and belt of the trunk so that he can perform different skills on all gymnastics apparatuses.

Moreover, it is obvious that the development of motor range of the thighs joints with a percentage of 44% with the development of muscular strength of the abdominal muscles in the direction of bending thighs to the trunk with a percentage of 40% led to perfection of skill performance of the studied skills in general, and the Thomas American scissors skill in particular where specific exercises played an active role within the training program in developing the important physical elements for

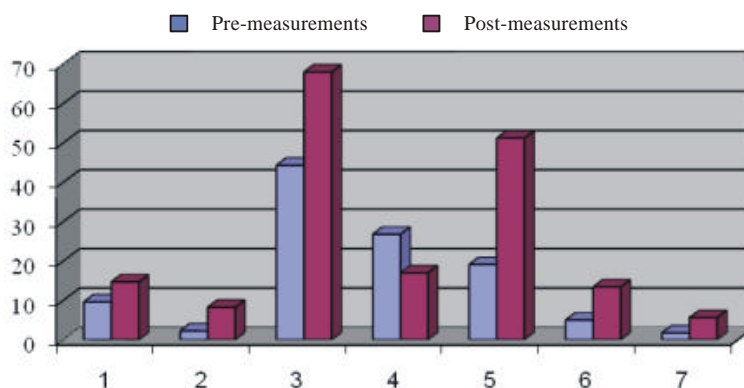


Fig. 2: significant differences between the pre and post -measurements in skill's efficiency tests

Table 4: Significant differences between the pre and post measurements to the sample of the research in skills efficiency tests. (n = 8)

Statistical treatments	Post-measurements		Pre-measurements		Wilkokson test	Improvement %	"Z" indication
	A	S	A	S			
Skills efficiency tests							
Angular v stability (s.)	9.62	2.50	14.7	3.01	2.54	52%	Significant
Press balance							
(parallel bars) (Max. repetitions)	2.25	0.46	8.25	1.28	2.53	266%	Significant
Opening angle support (s.)	44.3	8.6	68.0	13.7	2.54	53%	Significant
Climbing 5 meters rope	26.8	2.16	17.0	1.6	2.53	35.8%	Significant
Skill performance circle (Max. repetitions)	19.1	3.1	51.2	5.1	2.52	167%	Significant
Performing Thomas American scissors	5.0	0.2	13.4	1.68	2.53	168%	Significant
Back blanch (s.)	1.75	0.46	5.62	1.41	2.56	221%	Significant

Significance level at 0.05= (1.96) with "z" indication

the performance of this skill like strength and flexibility in agreement with the opinions of Bomba and Haff [6], Chidac [10] and Conner [13], that the player to be able to develop gymnastics skill performance should perform similar exercises to the actual skill performance to raise and develop the motor skill level, thus reaching perfection and fixation stages.

The proposed specific exercises led to the development of physical fitness components, especially muscular strength and flexibility of thighs joints in the development of performance level of Thomas American scissors, that agrees with Abd El-Maksoud [14] where he confirmed that the flexibility is one of the most important elements in the performance and the gymnast should have a good level of flexibility, so that he can reach perfection, so it is necessary to consider linking motor range and flexibility exercises to power exercises to guarantee working on the balanced value of the nervous system and avoiding the development of only one side and it is also obvious that improving the motor range of thighs joints has a big role side by side with different features of power to achieve the highest sport ability.

This was confirmed by Grosfeld [4] that the motor performance is only a combination where a group of physical elements are arranged to complete the motor task to be implemented.

Table 4 and Figure 2 illustrate the existence of statistically significant differences between post and pre measurements of the research sample in the results of the skills efficiency tests in favor of pre measurements at the level of 0.05, therefore, this emphasizes the effect of specific exercises in improving the player's performance level in skills efficiency tests.

As the arithmetic mean of the post-measurement was higher than the pre-measurement, which emphasizes the effect of specific exercise in improving the player's performance level in the skill tests. The highest percentage was in the press balance test (parallel bars) with 266%, followed by test number7 (the stable back blanch test (s.)) with 221%, then test number 4 (performing Thomas American scissors skill) with 168%, then the skill performance test (circle) (number) with 167%, followed by Opening angle support (s.) test with 53% and the Angular v stability test (s.) with 52%, finally

Table 5: Significant differences between the pre and post measurements for the research sample in Magyar skill performance level. (n = 8)

Statistical treatments	Post-measurements		Pre-measurements		Improvement %	Wilkokson test value	"Z" indication
	A	S	A	S			
Magyar Skill	6.93	0.42	9.11	0.369	31.4%	-2.37	Significant
Sivado Skill	5.14	0.48	8.66	0.26	68.4%	-2.37	Significant
Combination (Magyar and Sivado)	6.04	0.35	8.9	0.25	47.3%	-2.37	Significant
Thomas Skill	5.67	0.37	9.26	0.21	63.3%	-2.36	Significant

Significance level at 0.05= (1.96) with "z" indication

came climbing 5 meters rope test with an improvement percentage of 35%.

Table (5) illustrates the existence of statistically significant differences between pre and post measurements of the research sample in the skill performance level of Magyar and Sivado and combination between them where the z value was -2.37 which is significant at the level 0.05% while z value was -2.36 in Thomas skill, which is significant at the level 0.05%.

It is clear that the high improvement percentage between the pre and post measurements of Magyar skill (31.4%) records the lowest improvement value between the studied skills, while Table (5) illustrates the highest record for the improvement percentage between the studied skills in Sivado skill with 68.4%, followed by Thomas American scissors skill with (63.3%) and through appears the improvement value in combining between Magyar and Sivado skills with an improvement of 63.3%.

Grosfeld [4], Abd El-Rahman [9], Chidac [10] and Roethiberger [11] agreed that reaching perfection in skill performance of gymnastics motor skills depends on the fundamentals and principles of skills perfection in the sport of gymnastics.

- C Amplitude (range) divided into two types, first: External Amplitude and second: internal Amplitude.
- C Segmentation.
- C Closure.
- C Peaking.

This was clear through improvement differences in the arithmetic means of the pre and post measurements of the studied motor skills, where Sivado skill recorded the highest improvement percentage between both the pre and post measurements with 68.4%, then Thomas skill with 63.3%, followed by combination between Magyar and Sivado skills with 47.3% and Magyar skill with 31.4% which confirms the success of the research's training program specific exercise in raising and developing motor skills performance level, where the players are judged through the law by conducting motor-

related combinations depending on perfection of the player in conducting separate motor skills then combining each of them together, where motor rhythm of the motor skill on that apparatus is one of the player's success factors to reach learning and perfection and thus developing the performance level to higher difficulty skills.

The researchers return the progress in the skill level to the specific exercises, which have been developed according to the general rules of skills motor performances divisions (preparation phase, the main phase, the final phase), where it is gradual and sequential in the difficulty degree, which led to the improvement of some sports movement properties, including motor rhythm and related to the harmony in transferring hands and moving forward while maintaining the center of gravity without falling.

### CONCLUSION

From the results derived from statistical analysis, the researchers came to the following conclusion:

- C The training program contributed to the development of specific physical elements for performing the studied skills.
- C Using the specific exercises led to performing the studied skills perfectly.
- C All the physical elements which control those skills should be available in order to perfectly perform skills under study.
- C Combining between the physical and skill preparation is the best method to develop skill performance in the least possible time.
- C Developing motor rhythm of the studied skills and of gymnastics in general helps to develop and connect motor skills.

### REFERENCES

1. Aly, A.A., 2004. Qualitative analysis of the movement of the human body, Library of Egypt, Alexandria, 52.

2. Abd El-Rahman, A.A.M., 2003. Planning the gymnastics training season in light of the Arbitration regulations amendments to performance requirements" 2001". Ph.D. Thesis, Faculty of Physical Education for men, Giza, Egypt, pp: 34.
3. International Gymnastic federation: Cod of points for men's artistic gymnastics competition, sat world championships Olympic Games intercontinental competitions events with international participants, 2009 Edition, pp: 75-85.
4. Grosfeld, A., 1996. Gymnastic planning (Short, Long term planning), Human Kinetics, U.S.A., pp: 32: 89.
5. El-Gebally, O., 2000. Sports Coaching, Theory and Practice, First Edition, GMS House, Cairo, Egypt, pp: 95.
6. Bomba, T.O. and G.G. Haff, 2009. Periodization theory and methodology of training, 5th Edition, Human Kinetics, U.S.A., pp: 152: 182.
7. Hossam El-Din, T.H., T.F. Abd El-Samad and M.F. Abd El-Shakour, 2006. Qualitative analysis, concept - history - models - functions-applications. El dar Elalamia for publishing and distribution, Cairo, Egypt, pp: 77.
8. Knudson, D.V. and C.S. Morrison, 2002. Qualitative Analysis of Human Movement. Human Kinetics, U.S.A., pp: 130,131.
9. Abd El-Rahman, A.M., 1994. Gymnastics practical applications, Training - Education, First Edition, Miligy library, Cairo, Egypt, pp: 52(60): 111.
10. Chidac, F., 1998. The coach's yearly planning handbook, star rise international, Canada, pp: 59(77): 82.
11. Roethisberger, F., 1998. Gymnastic skills progression, The Macmillan Company, New York, U.S.A., pp: 64: 74.
12. Fruedenstin, S.A., 2003. Pommel Horse Exercise in G. George. US Gymnastic federation, U.S.A., pp: 85: 68.
13. Conner, B., 2006. International Gymnastic federation for men's Artistic gymnastics Magazine, 4: 49.
14. Abd El-Maksoud, E., 1995. Athletic training theories, directing and modifying the achievement level path., Hasnaa library, Alexandria, Egypt, pp: 65-66.