Journal of Physical Education

Volume 37 – Issue (1) – 2025 Open Access

P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

The Effect of Exercises Using Equipment on Learning the Skill of Half-Turn Landing Inward on the Pommel Horse for Students

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DOI:
https://doi.org/10.37359/JOPE.V37(1)2025.2221

Article history: Received 8/ November/2024 Accepted 3/ December/2024 Available online 28/ March /2025

Abstract
Abstract

Artistic gymnastics is one of the individual sports, and it is considered one of the most difficult due to its significant physical and motor requirements. Additionally, it involves numerous apparatuses, each containing multiple skills that students must learn. This study aimed to investigate the effect of exercises using equipment on learning the skill of half-turn inward landing on the pommel horse. The research hypothesis proposed that there are statistically significant differences between the post-test results of the control and experimental groups in learning the half-turn inward landing skill on the pommel horse, in favor of the experimental group.The researcher used the experimental method, which is suitable for the nature of the study. The study population comprised 340 students distributed across 10 sections of the second year at the College of Physical Education and Sports Sciences, University of Baghdad. The sample for the study was drawn from second-year students in Section (H), with a total of 28 students. After excluding those injured or failed, the final sample consisted of 20 students, representing 5.88% of the total population. The researcher employed a design with two equivalent groups: a control group and an experimental group, as this design suited the research procedures.Conclusions: Based on the results, the researcher concluded the following: The exercises designed using the correct scientific approach play a significant role in helping students and instructors learn the skill faster. The equipment used provided real support for the technical pathways of performance, facilitating the learning of the half-turn inward landing skill on the pommel horse. The researcher recommends the continued use of these exercises and equipment to teach this skill to students.

Keywords: Gymnastics tools, pommel horse, exercises.

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Journal of Physical Education

Volume 37 – Issue (1) – 2025 Open Access

P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

Introduction

Team and individual sports in physical education and sports sciences colleges are essential for student success, as they vary depending on each sport and are distributed across the four years of study. These sports are categorized into individual and team sports. In individual sports, a student's technical level is more evident, showcasing their physical and motor skills, unlike team sports where individual performance is less distinct. Artistic gymnastics is one of the individual sports, arguably among the most challenging due to its high physical and motor requirements. The sport encompasses various apparatuses, each with multiple skills that students learn across two stages. In the second stage, students practice very basic skills on the six gymnastics apparatuses. By the third stage, the curriculum advances to more difficult skills, demanding significant physical strength, motor coordination, and control, making them challenging for students. The pommel horse, the second apparatus in the sequence of artistic gymnastics equipment, requires substantial arm, shoulder, back, and abdominal strength. As a new apparatus for students, it poses particular challenges early in the second-year curriculum in physical education and sports sciences. One of the major challenges in the third-year curriculum is the skill of dismounting from the apparatus, a skill that has not been previously researched or studied in academia, highlighting the significance of this study. This research focuses on the skill of dismounting with a half-turn rotation inward. The problem is that this dismount requires high levels of muscular coordination and control, as the student must rotate their body mid-air, land securely, and stabilize on the mat. Given the complexity of this skill's three phases—preparatory, main, and concluding—a proper understanding is essential. College students find it helpful to commit to engaging in regular, moderate or intense physical activity that helps them improve their subjective sleep quality, fall asleep faster and stay healthy, which fits into their daily exercise schedule and curriculum, which in turn gives them confidence to perform better (Lian, 2024). Many studies have examined the impact of exercises using equipment, including a study on (Lazem,2024) The researchers concluded that:

- Specific physical exercises improved players' endurance in performing the skill sequence on the pommel horse apparatus.
- Using devices and tools in physical exercises significantly helped players maintain correct body alignment, thus avoiding deductions in the skill sequence performance on the pommel horse.

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Volume 37 – Issue (1) – 2025 Open Access

P-ISSN: 2073-6452, E-ISSN: 2707-5729

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The study by (Nasser,2024) found that targeted exercises had a clear impact on learning the Healy skill. The tools used in learning this skill across its three phases—the preparatory, main, and concluding phases—were beneficial for the players in skill acquisition. Another study by (Ridha,2021) concluded that specific exercises contributed to improving the skill performance of the experimental group. The special exercises had a noticeable positive effect on developing certain physical capabilities, with the experimental group outperforming the control group in the studied variables due to the influence of targeted exercises. Furthermore, the study by (Hussein,2022) concluded that skill-specific physical exercises significantly improved the performance of the Stalder and Endo skills on the high bar. The use of assisting devices and tools was deemed essential for enhancing the performance of these skills on the high bar. The aim of this research is to understand the effect of exercises using tools in learning the skill of dismounting with a half-turn rotation inward on the pommel horse.

Research Hypothesis

There are statistically significant differences in the post-test between the control and experimental groups in learning the skill of dismounting with a half-turn rotation inward on the pommel horse, favoring the experimental group.

Methods and Procedures

- **Research Methodology:** The researchers adopted the experimental method due to its suitability for the nature of the study.
- **Population and Sample:** The research population included 340 students across 10 sections in the second year of the College of Physical Education and Sports Sciences at the University of Baghdad. The sample consisted of 28 students from Section E in the second year, excluding those who were injured or had failed, leaving a final sample size of 20 students, representing 5.88% of the population. The researchers employed a design with two equivalent groups, a control and an experimental group, for suitability to the research procedures.

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Table (1)

shows the sample size and its percentages

	Samples	Number	Percentages
1	Research community	340	%100
2	Research sample	20	%5.88
3	Exploratory sample	3	%0.88

Equivalence of the Research Groups and Their Experimental Design

The researcher conducted an equivalence test for the two research groups concerning the study variables, as shown in the following table.

Table (2) Displays the mean, standard deviation, calculated *t* value, error level, significance, differences in mean values, and the standard deviation of the differences in the pre-test results for the targeted skill between the control and experimental research samples.

Statistical parameters / Research variables	N	Unit of measurement	Control group		Experimental group		Calculated T value	Error level	Type of significance
			A-+	S-	A-+	S-			
Landing skill	20	degree	**.2496**	**2.370**	**2.520**	**.2394**	**1.371**	**.187**	Not significant

Significant at a Confidence Level of (0.05) if the error rate is ≤ (0.05) with degrees of freedom of *n-2=18*.

Instruments and Equipment Used in the Study

Resources Utilized in the Study:

- Arabic references and sources
- Observation and analysis
- Tests and measurement tools
- The internet

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P-ISSN: 2073-6452, E-ISSN: 2707-5729

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Devices and Equipment Used in the Study:

- Stopwatch
- Camera
- Standard pommel horse
- Layered wooden pommel horse
- 1-meter foam mat

Exercises

The successful learning of skills relies heavily on designing exercises in a scientific manner that aligns with the skill's form and segmentation. This approach aids the student in understanding and performing the skill correctly. Consequently, the researcher devised a set of exercises using specific equipment, as illustrated below.

Table (3) Model of exercises utilizing the supporting device.

S	Exercises used	The form
1	Leaning with the knee bent in the middle of the handles while holding the handles with an extended arm, the student extends the other leg and waves from above the other end of the horse, focusing on not bending the free leg that swings in a circular manner from above the horse.	
2	The same as the first exercise. At the end of the swing, the student uses the free leg to push the left arm, twist the body inward, and sit on the other end of the horse.	
3	The same as the second exercise. A 1-meter-high mat is placed on the other side of the pommel horse. After the swing in the second exercise, the student pushes, twists the trunk, and sits on the mat.	

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P-ISSN: 2073-6452, E-ISSN: 2707-5729

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4	The wooden horse divided into five layers is placed so that it is lower than the body of the pommel horse. The student stands on it facing the pommel horse, holding the handles and leaning with one leg on the wooden horse, and swinging the other leg in a circular motion from the pommel horse. That is, the student does not lean on the device, but rather leans on the wooden horse. Then he pushes the left hand and the right foot, twists the trunk, and sits on the device.	
5	The same previous exercise lowers a layer of wooden horse and the student does the same previous exercise and does not sit on the horse but rather twists the trunk and sits on the rug that is 1 meter high.	
6	The same previous exercise, lowering the wooden horse another layer and snatching with the free leg and rotating and performing the skill of twisting the trunk 180 minutes while raising the mat from behind the device and the student lowers the body on his legs in the opposite direction of the device	
7	The same previous exercise, from a standing position on the wooden horse with layers, with the legs apart and holding the handles with both hands, he jumps to rotate 180 minutes and performs the entire skill.	
8	From the position of leaning with the hands on the handles, lower the wooden	

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P-ISSN: 2073-6452, E-ISSN: 2707-5729

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	horse to the lowest height so that the student leans on the instep of the feet, i.e. touches it only, and performs the entire skill.	

Repetitions Allowable Within the Time of the Instructional Unit

Exploratory Experiment The researcher conducted an exploratory experiment with the help of an assisting team to evaluate the exercises and equipment used. This trial was performed in the gymnastics hall at the College of Physical Education and Sports Sciences, University of Baghdad, with a sample of three individuals outside the main research sample. The purpose was to initially test the exercises with the equipment on students and determine whether the exercises align with the skill-learning process.

Pre-Test After completing the exploratory experiment procedures, the pre-test was conducted. The researcher prepared the setting and conditions for the test. Four judges (specialized gymnastics instructors) evaluated the performance in real-time based on their internal assessment. The average of two scores was taken by dividing the total by two to determine the final score. Performance was rated on a scale of 10, as agreed upon, as shown below.

Skill-Based Pre-Test Purpose: To measure performance ability and determine the final score achieved by the athlete in performing the skill of the half-turn inward dismount.

Test Tools: Pommel horse, 1-meter foam mat, 1.5-meter-high wooden pommel horse, stopwatch.

Evaluation Criteria: The assessment was based on the technical performance agreed upon by the judges, accounting for the athlete's errors. The maximum score achievable on the apparatus is 10 points.

Test Procedures: The athlete assumes the ready position by gripping the pommel handles and extends their left leg above the pommel to take the initial position. With a strong swing of the left leg backward, the athlete begins the rotation above the horse. Upon reaching a horizontal position

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P-ISSN: 2073-6452, E-ISSN: 2707-5729
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above the apparatus, the athlete pushes with their left arm, rotates their body 180 degrees inward, and, as the body clears the apparatus, releases the right hand, allowing the full exit of the body. The athlete then re-grasps the handle, as illustrated below.

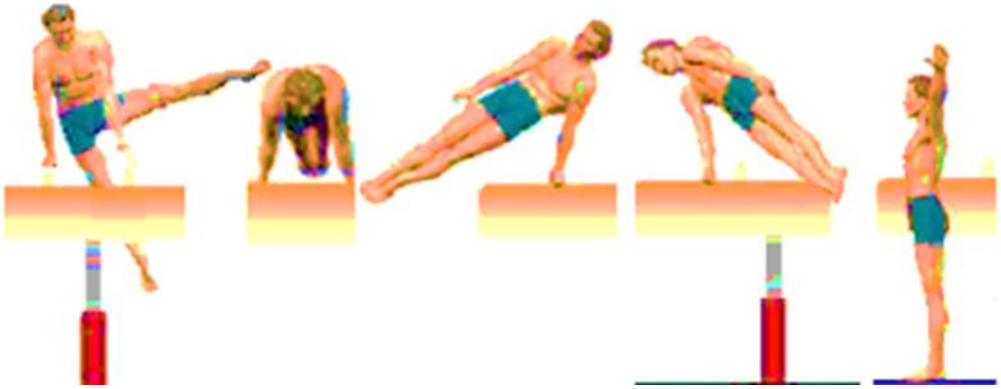

Figure (1): Illustrates the technical execution of the half-turn inward dismount skill.

Implementation of the Main Experiment:

The researcher followed the curriculum set by the college for the second-year apparatus syllabus on the pommel horse without modifying its content. An assisting apparatus was incorporated into the curriculum designated for the sample. The experiment lasted for six weeks, encompassing 12 instructional units, with two units per week as scheduled for the second-year program, totaling four hours per week. Each instructional unit lasted 90 minutes and included two apparatuses per unit (pommel horse and horizontal bar or pommel horse and vault). The instructional regimen on the pommel horse was applied over a duration of 30 minutes, based on the principles of "repetition and rest," and was crafted according to scientific and educational principles, as detailed in the table below.

Post-Tests:

Following the completion of the curriculum, which used equipment-based exercises to teach the half-turn inward dismount on the pommel horse, a post-test was conducted following the same procedures as the pre-test. The researcher ensured identical conditions as the pre-test. The skill was graded on a scale of 10. Judges, adhering to the official international gymnastics' standards, discarded the highest and lowest scores, using the mean of the two middle scores as the final score for each athlete. Direct evaluations were conducted by gymnastics professors at the College of Physical Education and Sport Sciences.

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P-ISSN: 2073-6452, E-ISSN: 2707-5729

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Statistical Methods:

Researchers used the SPSS software to calculate:

- Mean
- Standard deviation
- Paired samples *t*-test
- Independent samples *t*-test
- Percentage

Results:

Table (4) Displays the mean, standard deviation, calculated *t* value, error level, significance, mean differences, and the standard deviation of differences between the pre- and post-tests for the control group in the targeted skill.

Research variables	N	Measurement Unit	Pre-test		Post-test		f	fd	T	Value	Sig
	10	degree	A-+	S-	A-+	S-	**3.98**	**1.44**	**8.71**	**.000**	sig
			.2496	**2.370**	**1.528**	**6.350**					

Significant at the confidence level (0.05) if the error rate ≤ (0.05). And the degree of freedom of n-1 = 9

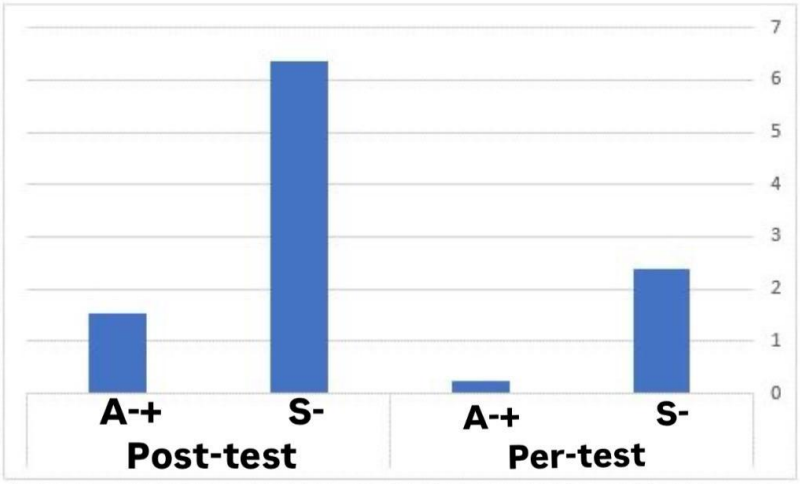

Figure (2) Histogram shows the means and standard deviations of the pre- and post-test for the control group to learn the skill of landing from a half-turn inward on the pommel horse

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P-ISSN: 2073-6452, E-ISSN: 2707-5729
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Table (5) Shows the arithmetic mean, standard deviation, calculated (t) value, error level, significance, differences in arithmetic means, and deviation of differences in the pre- and post-tests for the skill of the experimental research sample

Research variables	N	Measurement Unit	Pre-test		Post-test		f	fd	T	Value	Sig
	10	degree	A-+	S-	A-+	S-	4.980	1.300	12.11	.000	sig
			.2394	2.520	1.159	7.700					

Significant at the confidence level (0.05) if the error rate ≤ (0.05). And the degree of freedom n-1 = 9

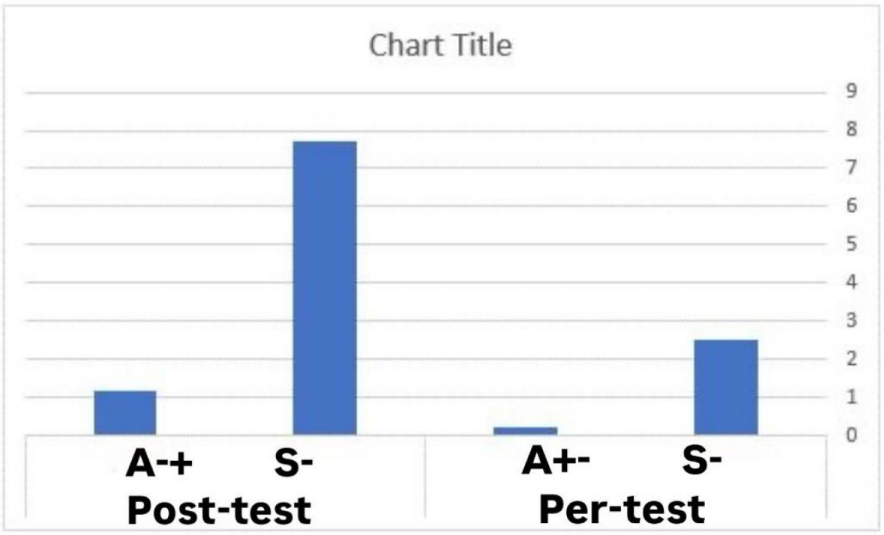

Figure (3) Histogram shows the means and standard deviations of the pre- and post-test for the experimental group to learn the skill of landing from a half-turn inward on the pommel horse apparatus

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P-ISSN: 2073-6452, E-ISSN: 2707-5729

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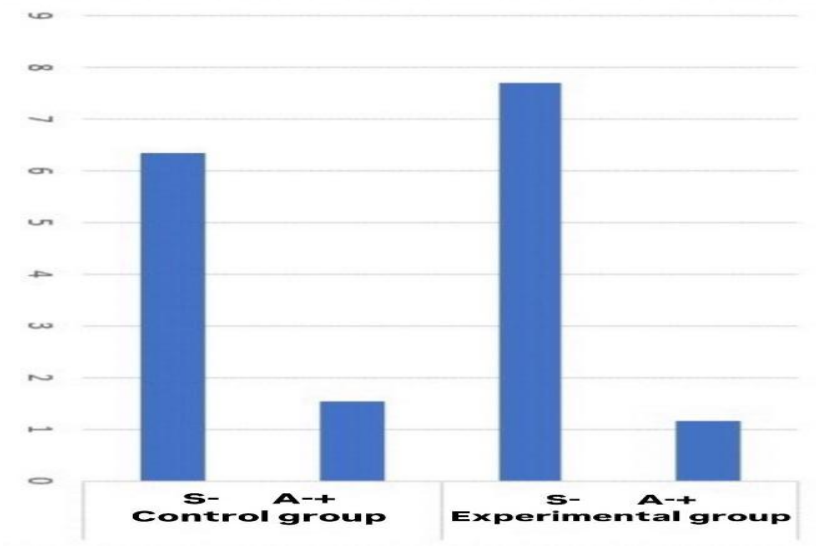
Table (6) Shows the arithmetic mean, standard deviation, calculated (t) value, error level, significance, differences in arithmetic means, and deviation of differences in the two post-tests of the skill for the research sample

Statistical parameters / **Research variables**	N	Unit of measurement	Control group		Experimental group		Calculated T value	Error level	Type of significance
			A-+	S-	A-+	S-			
Landing skill	20	degree	**1.528**	**6.350**	**1.159**	**7.700**	**2.225**	**.039**	significant

* Significant at the confidence level (0.05) if the error rate ≤ (0.05). And the degree of freedom n-2 = 18

Figure (4) Histogram shows the means and standard deviations of the post-test for the two research groups to learn the skill of landing from a half-turn inward on the pommel horse apparatus.



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P-ISSN: 2073-6452, E-ISSN: 2707-5729
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Discussion

The results shown in Table (6) and Figure (4) highlight the mean differences, standard deviations, T-value, and statistical significance, indicating that the mean scores of the experimental group are higher than those of the control group. This suggests that the exercises designed for learning this skill—comprising novel and systematic training for each phase of skill acquisition (initial, main, and final)—were effective. (Manaf, 2015) The researcher crafted exercises for each segment of these phases in an instructional, educational, and training format, facilitating the learning process for both students and instructors. (Abdul Reda, 2016) emphasizes that "varied exercises on the apparatus keep the athlete motivated to learn and activate different muscle groups based on the type of exercise." Similarly, (Ahmed, 2016) states that specialized exercises focus on the muscle groups required for a particular skill or sport, enhancing their capacity and thus reducing time and effort while covering physical, (Kadhim, 2024) motor, technical, and psychological aspects. Furthermore, (Abed Zaid,2008) supports those exercises target specific muscle groups and closely replicate the movements of the intended skill or sport, incorporating elements similar to the target movement's direction and intensity, thereby preparing the muscles in line with competitive actions. The researcher concurs with these findings on the significant role of exercises in diversifying the instructional unit and breaking routine to achieve satisfactory learning outcomes. The use of equipment also contributed to effective skill acquisition through a gradual progression from easy to difficult tasks. In the initial stages, equipment was utilized 100% and then gradually reduced to 10% until its eventual removal, (Kadhim & Mahmood, 2023) allowing students to perform the skill unaided in a short time. This progression underscores the importance of tools in skill acquisition, providing a structured, scientific approach that enhances the learning of each skill phase. (Abdul Kadhim,2012) asserts that "supportive tools play a significant role in the learning process and mastering numerous gymnastics skills by overcoming factors like fear and anxiety and by facilitating movements that reduce the burden on the learner." Additionally, (Al-Kuraimi,2019) highlights that "supportive equipment greatly improves technical performance, aids athletes in understanding movement paths, provides necessary power for core movement phases, and serves as effective safety measures, although some skills may limit manual assistance due to multiple movement axes and complex body positions." The researcher agrees with Abdul Kadhim and Al-Kuraimi regarding the role of correct tool usage, which aligns with the skill's trajectory without disrupting the learning strategy.

Conclusions: Based on the results, the researcher concluded the following:

Scientifically designed exercises play a crucial role in helping both students and instructors achieve rapid skill acquisition. The tools used provided effective support for the technical paths of performance, aiding in the skill acquisition of the half-turn inward dismount on the pommel horse.

Recommendations:

The use of exercises and supportive tools is essential in teaching the skill of the half-turn inward dismount on the pommel horse for students.

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Volume 37 – Issue (1) – 2025 Open Access

P-ISSN: 2073-6452, E-ISSN: 2707-5729
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