

# The Impact of a Computer-Based Educational Program on Learning the Accuracy of the Forehand Serve Skill in Squash

Omar Jamil Al Ja'afreh

Department of Physical Education, Sports Sciences Faculty, Mutah University, Jordan

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**Abstract** The aim of this study, which employed the experimental method, was to determine the impact of a computer-based educational program on learning the accuracy of the forehand serve skill in squash. The study sample consisted of 20 students, which were chosen deliberately. They were divided into two equal groups, the experimental group, learned by using the proposed computer-based educational program for a period of six weeks, three times a week for a period of 50 minutes in each unit, and the control group, learned by using the teacher's teaching method for a period of six weeks, three times a week, for a period of 50 minutes in each unit. The results showed that there were statistically significant differences in the level of performance of the members of the experimental group and control group in the skill of Forehand Serve used in the squash game and in favor of the post-measurement. In addition, the results showed that there were statistically significant differences between the control and experimental groups in the variable (Forehand Serve), which shows that the electronic educational program had a positive impact on the skill of the forehand serve and in favor of the experimental group. The researcher also recommended to use the computer on the skills to be learned and mastered, which makes the learner more focused and helps to diversify and motivate learners to improve performance for the better.

**Keywords** Computer, Accuracy of the Forehand Serve

Skill, Learning, Squash Game

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## 1. Introduction

Every sport has unique physical and skill requirements that must be satisfied by the athlete in order for him to perform at a level that permits him to compete at the greatest level possible in the sport he practices. Indeed, the progress made in various sports was the consequence of applying the most recent scientific and technical means and techniques, not by chance.

Modern educational trends emphasize the value of individualized learning, which shifts the focus of the learning process from the subject and the teacher to the student themselves. This allows the student to reveal his or her unique tendencies, preparations, and abilities and plan for their development in accordance with those needs and preparations in order to realize their full potential [1].

The need for educational means in the field of education emerged since the beginning of education, as educators realized the need for the teacher and learned to make the learning and teaching process successful. Although educational means have been around since ancient times, human beings have used them without programming and as a result of the moment and situation [2].

According to [3], the use of various educational means

in the educational process increases its effectiveness and positive outcomes, transforming the learner from a future and imitator to one who is largely responsible, active, and positive.

The computer is one of the means that provides a large degree of interaction and gives the learner the ability to control the speed, trajectory, sequence, and amount of information he needs. It provides an interactive environment represented in the learner's ability to control his own step, the path he follows through the program, the sequence of information, and the feedback on the learner's response. Indeed, the use of computers in education is considered one of the most effective methods [4].

The importance of using the computer in teaching sports courses lies in its ability to display and clarify the movements of the body during the performance of skills, as well as to show the different movements and reactions and how the learner behaves in these situations. In addition, the computer's task should not entail anything more than helping teachers and students understand concepts more quickly and become more motivated to study [5].

According to [6], the word "skill" is a scientific term that is applied to all aspects of our daily life, not just a certain field. It has several connotations and meanings, as every daily task requires a specific skill, and the superior person in life performs tasks that depend mainly on his mastery of some of the skills specific to these jobs. It also refers to the learner's ability to perform movements with a high degree of stability and accuracy in order to achieve pre-planned objectives.

Due to the many requirements of this game and the complexity of its performance, learning racket games in general and squash in particular requires codified educational programs throughout the learning period. In particular, the skill of serving requires long and influential learning periods so that the learner can master it in a way that qualifies him to score points in different situations and in proportion to the kinetic situation [7].

According to [6], the skill in practicing squash lies in two aspects: the first is to reach a ball on the court, and the other aspect is to hit the ball correctly. Indeed, it requires the learner to move quickly to exploit all opportunities to play the ball without causing any obstruction to the opponent and make him act quickly to face the opponent's strikes in the appropriate place according to the changing situations during the game.

Squash skills are complex and difficult due to the many types and multiple uses at one point. In addition, most of these skills are classified among the open skills whose environment is unpredictable. Therefore, squash teachers must increase the effectiveness of learning so that the learner can identify most of the stimuli that may encounter learners during their learning [7].

The researcher believes that squash is one of the modern games that are characterized by speed, strength, intelligence, and correct expectation. It has gained attention and development in recent years in terms of

modernization and development in the methods and means of learning, teaching, and training. This contributes in general to the various sports activities and squash in particular, to achieving advanced levels through good planning of its various programs.

### Study Problem

According to the researcher, using specialized exercises in accordance with a systematic scientific method will improve the educational process and address many issues related to the use of traditional educational techniques by trainers and teachers. Indeed, accuracy is considered the true indicator of the development of basic skills, as any skill without accuracy loses the main objective of learning it.

As the researcher was a teacher of racquet games, including squash, the researcher noticed the difficulty of students learning the skill of serving in squash and gaining compatibility because they need high compatibility in performance. Also, the traditional method used to teach them is almost insufficient to create a clear perception of these skills among students, and this can be attributed to the fact that the traditional method is sufficient for verbal explanation. In addition, the learning process of basic skills, especially the skill of serving, is carried out according to the adoption of well-known, addressed, repeated, and sometimes random exercises. Indeed, the researcher did not notice any special exercises that would speed up the learning process as well as develop accuracy, which urged the researcher to think seriously about non-traditional means of teaching the skill of serving, as there are many methods of teaching and learning that are still traditional. Therefore, it is necessary to think about modern teaching methods that take into account the different abilities of the student. This study came to investigate the fact that the use of computers in teaching is better than teaching in the traditional way.

### Study Objectives

This study aimed to identify:

1. The impact of using computers on learning the accuracy of the forehand serve skill in squash.
2. The impact of using traditional techniques on the accuracy of the forehand serve skill in squash.
3. The differences between using computers and using traditional techniques of learning the accuracy of the forehand serve skill in squash.

### Study Hypotheses

1. There are statistically significant differences at the significance level  $\alpha \leq 0.05$  between the pre and post measurements of the experimental group, and in favor of the post measurement in learning the accuracy of the forehand serve skill in squash.

2. There are statistically significant differences at the significance level  $\alpha \leq 0.05$  between the pre and post measurements of the control group, and in favor of the post measurement in learning the accuracy of the forehand serve skill in squash.
3. There are statistically significant differences at the significance level  $\alpha \leq 0.05$  between the pre and post measurements between the members of the control and experimental groups, and in favor of the experimental group in learning the accuracy of the forehand serve skill in squash.

**Delimitations of the Study**

1. **Population Delimitations:** Students enrolled in the tennis and squash course at the College of Sports Sciences at Mutah University.
2. **Time Delimitations:** The first semester of the academic year 2021/2022.
3. **Location Delimitations:** Faculty of Sports Sciences/ Mutah University/ Al-Karak.

**2. Study Procedures**

- **Study Methodology:** The researcher used the empirical research for its suitability and the nature and procedures of this study. The experimental design is used for two groups, one is experimental and the

other is control, following the prior and post measurement.

- **Study Population:** The study population consists of 54 students of the Faculty of Sports Science Mutah University who are enrolled in the tennis and squash course during the second term of the academic year 2020/2021.
- **Study Sample:** The study sample is chosen in a probability-free based approach, and the sample size is 20 students. They are distributed into two equal groups.

**Experimental Group:** 10 Students (section 1) of the tennis and squash course learn through the proposed educational program using the computer for six weeks, three times a week, for 50 minutes per unit.

**Control Group:** 10 students (section 2) of the tennis and squash course learn in the traditional way for six weeks, three times a week, for 50 minutes per unit. Tables 1, 2 show the distribution of the study sample members on the two groups.

In order to verify the equivalence of the two research groups (experimental) (control) in order to verify that the improvement in the research variables is due to the proposed educational program (the independent variable), a set of tests was applied, represented by: the forehand serve in addition to verifying the equivalence of the members of the two groups (experimental) and (control) in each of the variables (tall, weight, age).

**Table 1.** Describes the study sample according to its variables

Group		Age	Tall	Weight	Forehand Serve – Prior Measurement
<b>Experimental</b>	No.	10	10	10	10
	Arithmetic Mean	18.7000	171.7000	69.3000	10.4000
	Standard Deviation	.48305	2.90784	2.66875	1.07497
	Coefficient of Skewness	-1.035	-.306	.782	.322
<b>Control</b>	No.	10	10	10	10
	Arithmetic Mean	18.4000	171.0000	69.7000	11.1000
	Standard Deviation	.51640	3.23179	2.21359	1.19722
	Coefficient of Skewness	.484	.099	-.756	-.233
<b>Total</b>	No.	20	20	20	20
	Arithmetic Mean	18.5500	171.3500	69.5000	10.7500
	Standard Deviation	.51042	3.01357	2.39517	1.16416
	Coefficient of Skewness	-.218	-.105	.153	.096

**Table 2.** (Mann-Whitney) test to examine the differences of two groups in the prior measurement

Variable	Group	Arithmetic Mean	Standard Deviation	Ranks Average	Ranks Total	U	Z	Significance Level
Age (year)	Experimental	18.7000	.48305	12.00	120.00	35.000	- 1.314	.280
	Control	18.4000	.51640	9.00	90.00			
Tall (cm)	Experimental	171.7000	2.90784	11.25	112.50	42.500	-.577	.579
	Control	171.0000	3.23179	9.75	97.50			
Weight (kg)	Experimental	69.3000	2.66875	9.50	95.00	40.000	-.767	.481
	Control	69.7000	2.21359	11.50	115.00			
Forehand Serve	Experimental	10.4000	1.07497	8.80	88.00	33.000	-1.325	.218
	Control	11.1000	1.19722	12.20	122.00			

D at the level of significance ( $\alpha \leq 0.05$ )

Because of the small sample size and to verify this, the (Mann-Whitney) test is used to detect the presence of statistically significant differences among the members of the two groups in the prior measurement. Table 2 shows this.

It is clear from Table 2 that there are no statistically significant differences between the control and experimental groups on all the variables: age, tall, weight, forehand serve, which is evident that the two groups are equal in the level of these variables before starting the application of the program.

### Survey

The researcher conducted survey on a sample of 10 students who meet the conditions of the study sample and from outside the study sample. The experiment was applied for a week, with three meetings, in order to identify the obstacles that may hinder the progress of the proposed educational program and to know the suitability of the proposed educational program for the study sample and to avoid errors that may occur during the application of the proposed educational program.

### Study Tools

- Squash rackets 10, squash balls 10, courts 2, colored tape, meter for measuring tall, scale for measuring weight, stopwatch, form for recording the results of the post and prior tests.

### Procedural Stages of the Study

#### ● Prior Tests:

The researcher conducted prior tests on the study sample and the experimental and control groups 27/02/2022 in the squash hall at the Faculty of Sports Sciences at ten o'clock in the morning prepared for this purpose. The tests were conducted according to the sequence:

- Testing the accuracy of squash serving skill with the front side of the racket.

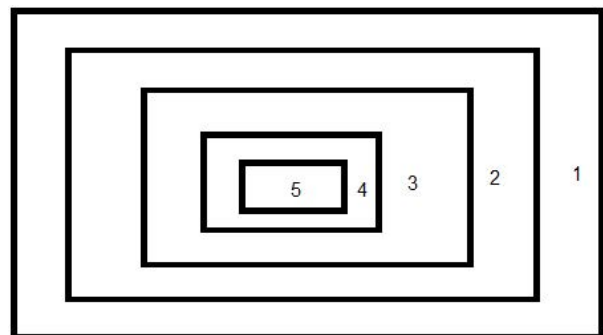
### Testing the Accuracy of Squash Forehand Serve Skill

As mentioned in [6,7,8]

- **Test Purpose:** measuring the accuracy of squash serving skill with the front side of the racket.
- **Test Evaluation:** serving test is a standardized test, as the test credibility score reached 0.87 and the test objectivity score reached 0.78.
- **Test application:** applied to a sample of students from the Faculty of Sports Sciences at Mutah University.
- **Equipment Needed:** squash rackets, squash balls, assistant, and a court planned by the design test.

### The Method of Executing the Test

Five square targets are drawn in the middle of the front wall of the squash court, at a height of 3 m from the service line, so that the distance of the first square is 30 x 30 and the distance between a square and a square 20 cm. One or both feet in the service box and hits the ball on the squares drawn on the wall of the playing court, trying to drop it in the area of the highest score that is listed from (1,2,3,4,5), and serves 15 services.



**Figure 1.** Test Area of Forehand Serve Skill Accuracy

**Table 3.** Time distribution of the proposed educational program

Educational Units No.	Weeks	Time of the Daily Educational Unit in Minutes	Time in Minutes During the Week	Total Time in Minutes
18	6	50	150	900

**Table 4.** The time distribution of the parts of the educational unit

Unit Parts	Time in Daily Unit in Minutes	Learning Time for Educational Unit Parts in Minutes During the Week	Program Total Time in Minutes
Warming up	10	30	18
Educational Part	10	30	180
Practical Part	25	75	450
Concluding Part	5	15	90

### Scoring Method

The score is given according to the place of the ball falling on the squares drawn and the highest score is given - the final result is the sum of the best 10 services out of 15 services, the points are divided (1,2,3,4,5), but if they are outside the boundaries of the squares drawn are given zero, and in the event the ball falls on a common line, the points of the largest square are calculated, As shown in Figure 1.

- The researcher has fixed all the test conditions in terms of place, method and time so that the same conditions can be provided when conducting the post tests
- **General Framework of the Educational Program**

The researcher prepared an educational program for squash, taking into account the available capabilities, the general skill and physical levels of the study sample. The educational program relied on scientific educational foundations, and on the researcher's personal experience in the field of racket games and his knowledge of the scientific sources of the game, and then presented them to a group of experts and specialists in the field of motor learning and racket games. The educational program focused on the serving skill. The educational program aims to prepare students and reach them to the highest possible level of skill performance that their abilities allow with the completion of the educational program units.

The proposed educational program was implemented for six weeks, with three meetings per week, the duration of each meeting is 50 minutes distributed as follows: 10 minutes for warm-up, 10 minutes for educational aspects, 25 minutes for practical aspects, and 5 minutes for the concluding part. Table 3 shows the time distribution of the proposed educational program. Table 4 shows the time distribution of the parts of the educational unit.

The proposed educational program began to be applied on 1/3/2015. The supervising teacher (researcher) on the implementation of the program explained the contents of each educational unit to the students so that all contents of

each educational unit were applied to the experimental group. The application and implementation of the program were completed on 9/4/2015. The content of the traditional educational program included warm-up exercises and skill performance exercises. The daily educational units used in the regular lessons were divided as follows:

- Introductory part is 5 minutes "Running, hand stretches".
- The main part is 35 minutes.

### Post Tests

The researcher conducted the post tests for the study sample and for the control and experimental groups on 10/4/2022. The researcher followed the same way that he followed in the prior tests in terms of place, time, method and tools. He was keen to find the conditions and requirements of all the prior tests when conducting the post tests.

### Scientific Coefficients of Study Tests

#### Validity of Tests

The researcher used virtual honesty, by looking at the scientific references and previous studies, which used these tests, the study of Al-Rubaie et al. 2013, Dakhil and Hadi 2017, and Khazal 2013. The researcher prepared the technical aspects and educational steps for the skills under study, based on what was mentioned in the specialized scientific references, which are the study of Halawani 2019, Jassim and Ramadan 2019, Dakhil and Hadi 2017, and Khazal 2013, then these tests were presented to a group of arbitrators to choose the appropriate tests to measure study skills Annex 1.

#### Test Reliability

To calculate tests reliability, a random sample of 8 from the study population was selected. The tests were applied

to them using the test application and re-application method, with an interval of 24 hours. Their results were excluded from the actual study results, and Table 5 shows the results of that:

**Table 5.** Spearman's correlation coefficient and coefficient between application and re-application on a sample (n = 8)

Test	Reliability Coefficient	Significance Level
Forehand Serve	0.92	*0.000

- Statistically significant at the significance level ( $\alpha \leq 0.05$ )

It is clear from Table 5 that there is a statistically significant correlation at the significance level ( $\alpha \leq 0.05$ ) between the application and re-application on the forehand serve test, which is evidence of the reliability and validity of this test.

### Statistical Methods

- Arithmetic Mean
- Standard Deviation
- Spearman's correlation coefficient and coefficient between application and re-application.
- Wilcoxon Matched Pairs Signed Test.
- Mann-Whitney Test.

## 3. Presentation and Discussion of Results

First Hypothesis: There are statistically significant differences at the level of significance  $\alpha \leq 0.05$  between the two measurements before and after the experimental group in favor of the post measurement on improving the level of performance in the Forehand Serve skill in squash.

The Wilcoxon Matched Pairs Signed test was used to examine the differences between the pre and post applications to test the validity of this hypothesis, and the results are shown in Table 6.

According to the data in Table 6, there are statistically significant differences at the significance level ( $\alpha \leq 0.05$ ) in terms of the (Z) value and the level of significance accompanying it in the experimental group members' performance level in the skill (Forehand Serve) in squash.

Second Hypothesis: There are statistically significant

differences at the level of significance ( $\alpha \leq 0.05$ ) between the pre and post measurements of the control-group in favor of the post measurement on improving the performance level in the skill of Forehand Serve in squash.

The Wilcoxon Matched Pairs Signed test was used to examine the differences between the pre and post applications to test the validity of this hypothesis, and the results are shown in Table 7.

According to the data in Table 7, there are statistically significant differences at the significance level ( $\alpha \leq 0.05$ ) in terms of the (Z) value and the level of significance accompanying it in the control-group members' performance level in the (Forehand Serve) skills in squash.

Third Hypothesis: There are statistically significant differences at the level of significance ( $\alpha \leq 0.05$ ) in the dimensional measurement between the experimental and control-group and in favor of the experimental group on improving the performance level of the skill (Forehand Serve) in squash.

To test this hypothesis, the Mann-Whitney test for independent samples was used, which is one of the appropriate nonparametric tests for detecting the presence of statistically significant differences between the performance of members of the two groups in the post application, and the results are shown in Table 8.

Table 8 shows that there are statistically significant differences in the Forehand Serve variable between the control and experimental groups at the level of significance ( $\alpha \leq 0.05$ ).

It appears that the electronic educational program had a positive effect on Forehand Serve skill and in favor of the experimental group at the level of significance ( $\alpha \leq 0.05$ ).

### Discussion of the First Hypothesis

This result can be explained by the fact that computer use is a type of innovation and that its use allows learners some freedom, particularly because this method includes the use of colors, sounds, moving shapes, and the ability to control the program. So that the learner can easily move from one point to another, and so that the learner is exposed to the frameworks and details of the skill, as well as the number of repetitions in one exercise, allowing the learner to progress through the process of developing skills.

**Table 6.** (Wilcoxon Matched Pairs Signed) examine the differences of the experimental group members pre and post applications

Skill	Application	Arithmetic Mean	Standard Deviation	Ranks Distribution	N for Ranks	Ranks Average	Ranks Total	Z Value	Significance Level
Forehand Serve	Pre	10.4000	1.07497	Negative	0 <sup>a</sup>	.00	.00	-2.810 <sup>b</sup>	.005*
	Post	31.5000	3.74907	Positive	10 <sup>b</sup>	5.50	55.00		
				Equal	0 <sup>c</sup>				

Statistically significant at the level of significance ( $\alpha \leq 0.05$ )

**Table 7.** (Wilcoxon Matched Pairs Signed) test to examine the of the members of the control-group between the pre and post applications

Skill	Application	Arithmetic Mean	Standard Deviation	Ranks Distribution	N for Ranks	Ranks Average	Ranks Total	Z Value	Significance Level
Forehand Serve	Pre	11.1000	1.19722	Negative	0 <sup>a</sup>	.00	.00	-2.812 <sup>b</sup>	.005*
	Post	21.6000	1.89737	Positive	10 <sup>b</sup>	5.50	55.00		
				Equal	0 <sup>c</sup>				

Statistically significant at the level of significance ( $\alpha \leq 0.05$ )

**Table 8.** (Mann-Whitney) test to examine the differences of two groups in the post- measurement

Variable	Group	Arithmetic Mean	Standard Deviation	Ranks Average	Ranks Total	U	Z	Significance Level
Forehand Serve	Experimental	31.5000	3.74907	15.40	154.00	1.000	-3.722	<.001*
	Control	21.6000	1.89737	5.60	56.00			

Statistically significant at the level of significance ( $\alpha \leq 0.05$ )

This result can be attributed to the effectiveness of the computerized educational program as it takes into account the individual differences between students in the educational process, also taking into account their abilities and the speed of their learning, as well as the availability of the method of learning using the computer, in addition to the presence of the suspense and excitement factor for the learner and provides an opportunity for the learner to follow up and observe the optimal performance of the skill in teaching.

As teaching with a computer is an example of innovation because it allows students to break away from the routine and respond directly to the teacher's orders and authorities. Learners have more freedom when they use a computer.

This result can be explained in light of what [9] mentioned about the student's pleasure while using the computer, and the nature of the feedback that students receive through computerized software.

This study agreed with [10], and the results showed that the proposed educational program using visual abilities training resulted in the development of physical abilities and the teaching of basic squash skills. Study [6] and the results showed that the experimental group was superior in the post tests and that the use of various and special exercises had a positive impact on the effect of using some special exercises in the accuracy of the serving skill in squash in developing the accuracy of the serving skill.

**Discussion of the Second Hypothesis**

Due to the regularity of the members of the control-group in the times of the educational units set, this result can be explained by the extent to which the usual exercises contributed to the development of the serving skill in squash in the post-measurement. The members of the control-group improve naturally when they are exposed to a traditional program for a sufficient period of time to bring about an improvement in their performance level

related to the required skills, through what the teacher provides to the learners of information, experiences, and concepts that contribute to achieving the overall goal of the educational process.

The researcher attributes this result to the members of this group's improvement in that they were exposed to an actual program of sufficient time to make changes in their motor level related to serving in squash, through what the teacher provides to students in terms of information, experiences, and concepts that contribute to achieving the overall goal of the educational process. The researcher also attributes the improvement in post-measurement to the usual method, as the teacher makes all decisions related to the educational process (explaining the technical aspects of skills, educational aspects, application start and stop time, providing immediate feedback, and providing a model for the skill) and the learner only has to respond to these decisions and implement them, as well as the repetition of exercises to develop the skills learned in this manner leads to an increase in performance level.

This study agreed with the study [11], and the results showed that the three groups improved in the short serving without any statistical significance, with the computer and the traditional method being the best.

**Discussion of the Third Hypothesis**

The positive effect of the program can be explained by the fact that the learners interact positively with the computerized educational program and receive appropriate reinforcement in an interesting manner, which reinforces and supports the fixation of information to him and helps him to understand and assimilate it, whereas in the traditional method, the focus may be on the learners' effort and the learner's role is that of a recipient of information. The suspense is of the same quality and quantity as that found on the computer.

According to the researcher, the proposed training

program worked to improve the skill of serving in squash among the members of the study sample during training and during competitions, giving the learners the ability and positive efficiency to interact in the performance of the basic skill and adapt to performance vocabulary and playing plans in squash and strengthening them in facing different and difficult situations in competitions. This is accomplished through continuity in the units of the proposed training program and commitment to training in the progression of basic skills in table tennis, as well as taking into account the individual differences between the members of the study sample for the experimental group, and by relying on scientific foundations in learning and training to improve the skill of serving in squash by improving the effectiveness of performance and reaching the level of high achievement. The inclusion of competition-like exercises in educational program units expanded their perceptions and sense of challenge in defeating the competitor during the educational units. The tabular results demonstrated the remarkable progress of the members of the experimental group and distinguished them from the control-group in all variables of the study, and this is a true scientific indication of the researcher's treatment of the educational units used.

The results of this study agreed with the results of the study [12], which showed that the experimental group that used exercises and auxiliary tools performed better in the research tests than the control- group, and the study [13] showed that the special exercises had a positive effect on the development of some physical and motor abilities of the students in the experimental group with squash. In addition, the experimental group improved its accuracy in performing front and back blows in squash when compared to the control-group.

#### 4. Conclusions

The computer-based educational program has a positive effect on improving the level of learners' Forehand Serve skill in squash in the post-test also, The regular program has a positive effect on the level of learners' Forehand Serve skill in squash in the post-test, When it comes to the skill of the Forehand Serve in squash, learning through a computerized educational program outperforms learning through the traditional method.

That showed the importance of using aids and tools such as computers in kinesthetic learning, as their use assists the learner in mastering the technical skill and acquiring the correct development of the skill.

Also the study result showed the requirement to use a computer on the skills to be learned and mastered, which helps to focus the learner and diversify and motivate learners to improve performance.

At last this study increase the interest of racket game teachers, particularly squash teachers, in making periodic measurements of skill, physical, and planning aspects prior

to, during, and after the implementation of educational programs.

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