EXPERIMENTAL INVESTIGATIONS ASSESSMENT ON THE USE OF THE COMPUTERISED SYSTEM FOR THE ACQUISITION AND CORRECTION OF THE VOLLEYBALL PASS FROM BELOW

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Abstract
The present paper is an experimental study on the use of the computer-assisted system in learning, assessing and correcting the two-handed pass from below in volleyball. The subjects of the experiment are two groups of female volleyball players—beginners' level.
The analysis of the statistical mathematical indices on the specific tests in volleyball beginners showed that in the witness group the progress is notable for 6 technical-tactical tests, while in the experimental group all tests improve significantly, which proves that supporting devices may contribute to the acquisition of a superior execution technique in a relatively short amount of time.
The progress made by the experimental group confirms that the new training method is effective.
Key words: *assessment, acquisition, correction, volleyball.*

INTRODUCTION

Pierre J. de Hillerin in his study on "Computer Science and Sport" states that: "there are coaches who do not even conceive of a training with serious chances of getting top places in world classifications without the contribution of computer-assisted devices and the support of a competent personnel able to program computer applications or data processing on training devices, from the common plus – metres of the Finnish company "Polar" to the much more complex simulators"(Hillerin, 2002).

Vitalie Belous indicates how necessary it is to restructure the general performance, asserting that these days "knowing the performance processes by the present and future performer is only possible in the technical performance theory, whose basic component is inventics, in sports and interpretive-component performance, where teachers, coaches may scientifically direct students to performance."(Belous, 1995)

The first universal concept of spatial measurement which is useful to training technique was suggested by Heilfort quoted by Krug, "underlining the advantages of the traditional video technique and the means of modern measurement, as well as the possibility to increase the effectiveness of technical training by digital video processing".(Krug, Heilfort, 1996)

PURPOSE

The purpose of the present is to evince the use of the computer-assisted system in learning, assessing and correcting the two-handed pass from below in volleyball, in the beginners' groups.

CONTENTS

To carry out the experiment, two groups of female volleyball players (beginners) were asked to perform 6 training sessions per week, of 120 minutes each, in normal training conditions, and disposing of specialised materials and devices.

The methods used were the questionnaire and the pedagogical observation, which allowed the drawing up of a curriculum, as well as the necessary methodological orientation. The pilot experiment was aimed at checking the working techniques in the two groups of female volleyball beginners (9-12 years old).

The subjects of the experimental activity were organised in the experimental group made up of 12 players, beginner level, CSS.

The data obtained were compared to the data obtained in the witness group, made up of 12 players following a classic training program.

Our experiment evaluated the indices of somatic growth by means of 3 tests; the functional ability was assessed by 3 tests, 4 motor events; the technical training used 11 tests.

In order to get the full picture of the influence of the training program by means of the "Computer-assisted training device for the acquisition and assessment of the two-handed pass from below" on female volleyball beginners, the changes brought about by this device were measured in point of technical execution, as well as functional and motor development.

The manner in which these changes contributed to the increased efficiency of the training process guarantees that the use of the device proposed in this paper has a clear impact on the level of technical training.

Table 1. The results of the initial and final test and the dynamics of the index evolution in the experimental group—specific tests

SPECIFIC TESTS –EXPERIMENTAL GROUP											
Test	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
TI average	5	5.25	5.66	5.33	5.33	5.33	5.66	5.33	5.41	5.66	5.41
S	1.20	1.35	0.88	0.98	0.88	0.98	1.23	1.23	1.31	1.30	1.08
TF average	2.42	2.33	3.17	2.67	2.58	2.25	2.41	2.25	2.16	2.42	2.08
S	0.79	1.03	1.11	1.07	0.99	0.75	1.08	0.96	0.71	0.90	0.79
Average diff.	2.58	2.92	2.49	2.66	2.75	3.08	3.25	3.08	3.25	3.24	3.33
t-critical	2.074	2.074	2.074	2.074	2.074	2.074	2.074	2.074	2.074	2.074	2.074
t-calculated	6.22	5.95	6.08	6.35	7.19	8.64	6.87	6.36	7.08	6.87	8.62
p	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

The issue of the evolution *of the specific tests* is part of the assessments characterising the dependent variables in the evaluation, providing results function of the independent variable (the training program used). The main purpose of these variables was to determine the progress or regress registered by quantifying the number of errors, to be further continued by a comparison of the averages obtained in the two tests. The data obtained in the measurements and statistic calculations yield the following:

1. Two-handed passes from below on an announced direction

Two evaluations were performed during the experiment, registering average values in the witness group. Thus, the shape of the distribution curve in the test „Two-handed passes from below on an announced direction" went up in point of successful executions and down in point of errors, i.e:

- $\bar{x}$ initial errors= 5 ± 1.20 (initial test);
- $\bar{x}$ final = 2.42 ± 0.79 (final test);

It may be said that the difference between the initial and the final test is 2.58, which proves that the training registered improvements in this specific test, the *distribution registering an increasing tendency between the stages.*

2. Two-handed passes from below on an unannounced direction

Relatively equal values are registered in the initial and final test, the distribution curve of the parameter „Two-handed passes from below on an unannounced direction" went up, i.e.:

- $\bar{x}$ initial = 5.25 ± 1.35 (initial test);
- $\bar{x}$ final = 2.33 ± 1.03 (final test);

The final test shows a relatively better result than the initial test, which is visible in the error number decrease by 2.92, and the difference registered between the results in the initial and final test shows significant *differences (0.001)*.

3. Two-handed passes from below with a 180^0 turn

The two evaluations performed in the experiment exhibit differences as the number of error goes down between the initial and the final test. Thus, the average values obtained were as follows:

- $\bar{x}$ initial = 5.66 ± 0.88 (initial test);
- $\bar{x}$ final = 3.17 ± 1.11 (final test);

It is obvious that the difference between the initial and the final test is 2.49, which proves that the training improved in this specific test, registering significant differences (0.001).

4. Two-handed passes from below preceded and followed by displacement

Relatively equal values are found in the initial and final test, the distribution curve of the parameter was relatively descending, i.e. :

- $\bar{x}$ initial = 5.33 ± 0.98 (initial test);
- $\bar{x}$ final = 2.67 ± 1.07 (final test);

The final test shows relatively better results than the initial test, by reducing the number of errors, and the difference between the results in the initial and the final test shows significant *differences (0.001)*.

5. Two-handed passes from below with given ball followed by hurdle jump

Relatively equal values are found in the initial and final test, the distribution curve of the parameter followed a decreasing trend, i.e.:

- $\bar{x}$ initial = 5.33 ± 0.88 (initial test);
- $\bar{x}$ final = 2.58 ± 0.99 (final test);

The final test shows a relatively better result than the initial test, the difference registered between the two shows *significant differences for the threshold of (0.001)*.

6. Two-handed passes from below on a precise direction and trajectory

The two evaluations performed during the experiment exhibit differences, as this difference improves between the initial and the final test, due to the decrease of the number of errors. Thus, the following average values were obtained:

- $\bar{x}$ initial = 5.33 ± 0.98 (initial test);
- $\bar{x}$ final = 2.25 ± 0.75 (final test);

It may be seen that the difference between the initial and final test is 3.08, which proves that *the training program improves in this specific test, registering a statistically significant threshold (0.001).*

7. Take-over from service in zone 3

Relatively equal values are registered in the initial and final test, the distribution curve of this parameter going down, i.e.:

- $\bar{x}$ initial = 5.66 ± 1.33 (initial test);
- $\bar{x}$ final = 2.41 ± 1.33 (final test);

The results in the final test are better than in the initial test, and the difference between these results has a value of 3.25, showing no *statistical significance (0.001).*

8. Take-over from service with place exchange

Relatively equal values are found in the initial and final test, the distribution curve went down, i.e.:

- $\bar{x}$ initial = 5.33 ± 1.23 (initial test);
- $\bar{x}$ final = 2.25 ± 0.96 (final test);

The final test registered relatively better results than the initial test, since the number of errors decreases, and the difference between the initial and the final test is 3.08, i.e. showing no *significant differences from a statistical point of view (0.001).*

9. Take-over from service to the right- to the left

Relatively equal values are registered in the initial and final test, the distribution curve of the parameter had a decreasing evolution, i.e.:

- $\bar{x}$ initial = 5.41 ± 1.31 (initial test);
- $\bar{x}$ final = 2.16 ± 0.71 (final test);

The final test shows a relatively better result than the initial test, but the difference registered between these two tests has a value of 3.25, which means no *statistically significant difference (0.001).*

10. Take-over from zone 6 towards zone 3

Relatively equal values are registered in the initial and final test, the distribution curve of the parameter went down, i.e.:

- $\bar{x}$ initial = 5.66 ± 1.30 (initial test);
- $\bar{x}$ final = 2.42 ± 0.90 (final test);

The final test shows a relatively better result than the initial test, as the number of mistakes goes down, but *the difference* between the results in the final and initial test is 3.24, showing no *significance from a statistical point of view (0.001).*

11. Take-over followed by net clearing

Relatively equal results are found in the initial and the final test, the distribution curve of the parameter showed a decreasing tendency, i.e.:

- $\bar{x}$ initial = 5.41 ± 1.08 (initial test);
- $\bar{x}$ final = 2.08 ± 0.79 (final test);

In the final test the results are relatively better than the initial test, and the *difference between the two tests* is 3.33, viz. it is statistically *significant (0.001).*

Table 2. Results in the initial and final test and the index evolution dynamics in the witness group—specific tests

SPECIFIC TESTS – WITNESS GROUP											
TEST	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
TI average	5.33	5.58	5.67	5.83	5.42	5.42	5.83	5.25	5.42	5.83	5.33
S	0.88	1.37	0.88	0.87	0.99	0.90	1.33	1.05	1.31	1.33	0.98
TF average	4.33	4.64	4.67	4.83	4.33	4.42	4.83	4.25	4.42	4.83	4.33
S	0.88	1.37	0.88	0.83	0.98	0.90	1.33	1.05	1.31	1.33	0.98
Average diff.	1	0.94	1	1	1.09	1	1	1	1	1	1
t-critical	2.074	2.074	2.074	2.074	2.074	2.074	2.074	2.074	2.074	2.074	2.074
t-calculated	2.78	1.78	2.78	2.88	2.71	2.72	1.84	1.96	1.86	1.84	2.49
P	0.01	0.08	0.01	0.008	0.01	0.01	0.07	0.06	0.07	0.08	0.02

The issue of the evolution *of the specific tests* is part of the assessments characterising the dependent variables in the evaluation, providing results function of the independent variable (the training program used). The main purpose of these variables was to determine the progress or regress registered by quantifying the number of errors, to be further continued by a comparison of the averages obtained in the two tests. The data obtained in the measurements and statistic calculations yield the following:

12. Two-handed passes from below on an announced direction

Two assessments were performed in the experiment, which yielded moderate values in the witness group. Thus, the shape of the distribution curve in the test "Two-handed passes from below on an announced direction" went up in point of the

successful executions and down in point of errors, i.e.:

- $\bar{x}$ initial errors= 5.33 ± 0.88 (initial test);
- $\bar{x}$ final = 4.33 ± 0.88 (final test);

It is found that the difference between the initial and the final test is 1, proving that the training improved in this particular respect, the distribution *being on an ascending curve between stages.*

13. Two-handed passes from below on an unannounced direction

Relatively equal values were found in the initial and final test, the distribution curve of the parameter "Two-handed passes from below on an unannounced direction" went up, i.e.:

- $\bar{x}$ initial = 5.58 ± 1.37 (initial test);
- $\bar{x}$ final = 4.64 ± 1.37 (final test);

The final test yields a relatively better result than the initial test, which is obvious in the decrease of the number of errors by 1 unit, and the difference between the initial and final test does not show significant *differences.*

14. Two-handed passes from below with 180^0 turn

The two assessments performed during the experiment exhibit differences as the number of mistakes decreases from the initial test to the final test. Thus, the following average values were obtained:

- $\bar{x}$ initial = 5.67 ± 0.88 (initial test);
- $\bar{x}$ final = 4.67 ± 0.88 (final test);

It may be said that the difference between the initial and the final test is 1, which proves that the training program improved in this particular test, leading to statistically significant differences (0.01).

15. Two-handed passes from below preceded and followed by displacement

Two relatively equal values are found in the initial and final test, the distribution curve of the parameter was relatively downward, i.e.:

- $\bar{x}$ initial = 5.83 ± 0.87 (initial test);
- $\bar{x}$ final = 4.83 ± 0.83 (final test);

The final test provides a relatively better result than the initial test, decreasing the number of errors, and the difference registered between the results of the initial and final test shows significant *differences (0.008)*.

16. Two-handed passes from below with given ball followed by hurdle jump

Relatively equal values are found in the initial and final test, the distribution curve of the parameter had a downward orientation, i.e.:

- $\bar{x}$ initial = 5.42 ± 0.99 (initial test);
- $\bar{x}$ final = 4.33 ± 0.98 (final test);

The final test yields a relatively better result than the initial test, and the difference between the results of the initial and final test shows *significant differences for the threshold (0.01)*.

17. Two-handed passes from below on a precise direction and trajectory

The two assessments made during the experiment show differences, displaying a notable improvement from the initial to the final test, due to the fact that the number of errors decreases. Thus, the average values obtained are:

- $\bar{x}$ initial = 5.42 ± 0.90 (final test);
- $\bar{x}$ final = 4.42 ± 0.90 (final test);

It may be seen that the difference between the initial and the final test is 1, proving that the *training improved in this specific test, registering a statistically significant threshold (0.01).*

18. Take-over from service in zone 3

Relatively equal values are registered in the initial and final test, the distribution curve of this parameter was downwards, i.e.:

- $\bar{x}$ initial = 5.83 ± 1.33 (initial test);
- $\bar{x}$ final = 4.83 ± 1.33 (final test);

The final test yields a better result than the initial test, and the difference registered between the results obtained in the initial and final test is 1, viz. it has no statistical *significance (0.07).*

19. Take-over from service with place exchange

The values of the initial and final test are relatively equal, the distribution curve of the parameter had a downward evolution, i.e.:

- $\bar{x}$ initial = 5.25 ± 1.05 (initial test);
- $\bar{x}$ final = 4.25 ± 1.05 (final test);

The final test yields a relatively better result than the initial test, as the number of errors decreases, and the *difference* registered between the results of the initial and final test is 1, viz. not *statistically significant (0.06).*

20. Take-over from service from right to left

The values registered are relatively equal in the initial and final test, the distribution curve of the parameter had a downward evolution, i.e.:

- $\bar{x}$ initial = 5.42 ± 1.31 (initial test);
- $\bar{x}$ final = 4.42 ± 1.31 (final test);

The final test yields relatively better results than the initial test, but the *difference* between the initial and final test is 1, viz. holding no *statistical significance (0.07).*

21. Take-over from zone 6 towards zone 3

The initial and final test yield relatively equal results, the distribution curve of the parameter went down, i.e.:

- $\bar{x}$ initial = 5.83 ± 1.33 (initial test);
- $\bar{x}$ final = 4.83 ± 1.33 (final test);

The final test yields a relatively better result than the initial test, as the number of errors decreases, and the *difference* between the initial and the final test is 1, viz. without any statistical *significance (0.08).*

22. Take-over followed by net clearing

The final and initial test yield relatively equal results, the distribution curve of the parameter had a downward evolution, i.e.:

- $\bar{x}$ initial = 5.33 ± 0.98 (initial test);
- $\bar{x}$ final = 4.33 ± 0.98 (final test

The final test yields a relatively better result than the initial test, and the *difference* between the initial and the final test results is 1, viz. it is *statistically significant (0.02).*

CONCLUSIONS

The analysis of the mathematical-statistical indices in regard to the specific tests for female volleyball players, beginners level, evinces that the witness group made notable progress in 6 technical –tactical tests, while the experimental group made progress in all the tests, which proves that supporting devices may contribute to the acquisition of superior execution technique in a relatively short amount of time.

The progress made by the experimental group confirms that the new method using the computer-assisted system in learning and correcting the two-handed pass from below is efficient.

The training means allowing the exact assessment of the player's evolution from a stage to another or even during the same stage or the same training session favours the accurate orientation of the training program in the beginners' groups.

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