Strategies of optimizing the motor learning process by applying means of monitoring the individual evolution of beginner volleyball players

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Abstract

This paper aims at presenting theoretical-methodical and practical aspects which allow the optimization of motor learning to an evolution which includes an infrared barrier and a computer equipped with a software application enabling network control, communication and interface with the user (DIRPAS-NS2006). Data processing confirms the positive evolution of all followed parameters, to girls indicating 46.22\% for the overhead pass and 44.31\% for the forearm pass, 46.03\%, respectively 45.11\% to boys, meaning significant differences as compared to control groups.

Keywords: Motor learning, evaluation, volleyball, computer, matrix network in infrared (IR);

1. Introduction

Similar to other sports games, technique development relies on the effectiveness of individual and team actions. Therefore, we should pay special attention to technical aspects, particularly, during the learning stage (Niculescu, 2002). Skills inadequately acquired are not easy to correct because of the complexity of the volleyball technique. This involves movements less used for performing daily activities (object rejection) as compared to those specific to other sports games (throwing, catching etc.). Skill development belongs to motor learning which leads to the organization of certain behaviour till they become automatically acquired (Ortanescu, 2001) and relies on practice. Through practice the subject gains new forms of behaviors and, concurrently, achieves an increase of his/her motor ability and, implicitly, an improvement of his/her performances. As compared to other sports games, in volleyball, due to the skill complexity, the results deriving from practice can appear later than in other games. Therefore, in order to avoid monotony, especially when dealing with beginners, we apply a large number of exercises for solving the same tasks. Under these circumstances, the review of certain behavioral aspects till they become automatically acquired, needs a diligent monitoring of the sportsman’s evolution. This is meant to prevent error prevalence and to provide the most efficient methodical measures able to determine efficiency in learning (Epuran et al, 2010). For

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this reason, the present study approaches new means of action and observes to what extent they influence the optimization of motor learning to volleyball players aged between 10 and 12.

2. Subjects and Methods

2.1. Subjects

The experiment group included 31 subjects (16 boys and 15 girls) and the control group was made up of 33 subjects (19 boys and 14 girls), the age interval varying between 10 and 12. These sportsmen belonged to the category “volleyball - beginners”. The research period included the interval January 2011 – June 2011, the location being provided by „Nicolae Titulescu” National College of Craiova, Romania.

2.2. Material and Methods

For learning the basic motor skills specific to the volleyball game, we have introduced a system for monitoring the sportsman’s evolution, designated as DIRPAS-NS2006 (figure 1), which includes a matrix network in infrared and a computer equipped with a software application (figure 2) enabling the network control, the communication and the interface with the user (Shaao et al, 2009).

![Figure 1](image)

Figure 1. The DIRPAS-NS2006 system - the mechanical support, the testing framework, the local electronic block, PC and the interface with the user

Following a certain type of execution, the infrared barrier placed at the level of the net identifies the balls passing within the area limited by this testing frame (1x1m), the information being transmitted to the computer. The system automatically collects and stores data resulting from testing and when completing the test (automatically, after a predetermined number of executions or manually, by enabling the command „test ok” at a specific moment) it determines automatically the success rate of executions saving the test in a database. Accessing this database, one may observe the player’s evolution in real time, to certain parameters or compare the performances resulting from the same test considering an indefinite number of players (figure 3). Therefore, the DIRPAS-NS2006 system may be used as a means of training meant to enhance the pass accuracy and constancy coefficients. It also is used well as a system for monitoring testing activity which improves the system including training and evaluation means applied in sport.
2.3. Experimental Procedure and Training Program

After assessing the initial level of group performances as a first stage of the experiment, we followed their evolution during 20 weeks. The control group (including girls and boys) followed the classical training program (without our involvement) performing three training sessions per week planning 40 minutes during each session for learning and improving the overhead and underhand passes. The applied action means (exercises) have been focused on individual passes to the wall, on the work in pairs and on exercises designed for the integration of game procedures (3 to 3, 4 to 4, 6 to 6 game).

For the experiment group (including girls and boys), from the interval of 40 minutes designed for the same objectives, namely, the learning and the improvement of motor skills specific to the overhead and the underhand pass, 20 minutes were allotted to the application of certain action means which included the DIRPAS-NS2006 system. Therefore, applying specific methods to beginners, respectively, the analytical and global practice of the basic skill mechanism in order to determine the correct technique of execution (for the overhead pass, as well as for the underhand pass). Thus, we have introduced exercises which involved passing the ball through a framed area (an area of 1x1m which marks the IR barrier surface afferent to the DIRPAS-NS2006 system) following, the parameters of distance and height required for pass execution. The new exercise drills allowed us to record the number of successful executions when dealing with individual performances, as well as when working in pairs or in groups, organized for games including specific elements meant to develop motor skills. Regularly recording each player’s evolution, we were able to elaborate worksheets, to observe training deficiencies and to elaborate working programs taking into account the sportsmen’s needs.
2.4. Evaluation and Statistical Analysis

The evaluation of performances is achieved by means of the DIRPAS-NS2006 monitoring system, previously presented. The control tests consisted in the execution of 20 overhead passes and 20 underhand passes by each sportsman/sportswoman (performed when receiving the ball thrown by the trainer) oriented towards the “target” area (IR barrier) from a distance of 3-4m. The software application automatically generates the individual success rate. It is useful for the current evaluation and for following up the sportsmen’s evolution. We have initially and finally calculated the arithmetic mean for each group in order to determine the evolution of performances registered by the subjects involved in the experiment. The group performance (for girls and boys) is determined by calculating the difference between the means achieved to the final and the initial testing (real value or percentage). We have analyzed the differences between groups to the two testing. We applied the Student Test in order to observe whether the differences between means were significant.

3. Results

3.1. Results Achieved to the Evaluation of the „Overhead Pass” Technique

![Graph](image)

Figure 4. The arithmetic means and the evolution registered by the experiment and the control group (girls and boys) for the overhead pass

For the groups of girls, an increase of 46.22% (4.53 executions) recorded by the experiment group was noticed between the final and the initial testing, while the control group indicated an increase of 26.06% (2.57 executions), implying significant differences between the means of the two testing to both groups ($t_{calculated} = 10.42 > 2.977$ ($t_{table}$), $p < 0.01$; $t_{calculated} = 8.31 > 3.012$ ($t_{table}$), $p < 0.01$). For the initial testing, the arithmetic mean achieved by the experiment group being inferior to that achieved by the control group (with 0.61%; 0.06 executions), while for the final testing, it was superior (with 15.28%; 1.90 executions); there were no significant differences between the means achieved by both groups for the initial testing ($t_{calculated} = 0.07 < 2.052$ ($t_{table}$), $p > 0.05$), while they registered significant values for the final testing ($t_{calculated} = 2.06 > 2.052$ ($t_{table}$), $p < 0.05$).

For the groups of boys, an increase of 46.03% (3.94 executions) recorded by the experiment group was noticed between the final and the initial testing, while the control group indicated an increase of 25.29% (2.21 executions), implying significant differences between the means achieved to the two testing by both groups ($t_{calculated} = 12.11 > 2.947$ ($t_{table}$), $p < 0.01$; $t_{calculated} = 8.49 > 2.878$ ($t_{table}$), $p < 0.01$). For the initial testing, the arithmetic mean achieved by the experiment group being inferior to that achieved by the control group (with 2.06%; 0.18 executions), while for the final testing, it was superior (with 14.15%; 1.55 executions); there were no significant differences between
the means achieved by both groups for the initial testing ($t_{\text{calculated}} = 0.31 < 2.042$ ($t_{\text{table}}$), $p > 0.05$), while they registered significant values for the final testing ($t_{\text{calculated}} = 2.40 > 2.042$ ($t_{\text{table}}$), $p < 0.05$).

3.2. Results Achieved to the Evaluation of the „Underhand Pass” Technique

![Figure 5. The arithmetic means and the evolution registered by the experiment and the control group (girls and boys) for the underhand pass](image)

For the **groups of girls**, an increase of 44.31% (3.93 executions) recorded by the experiment group was noticed between the final and the initial testing, while the control group indicated an increase of 23.18% (2.07 executions), implying significant differences between the means of the two testing to both groups ($t_{\text{calculated}} = 9.93 > 2.977$ ($t_{\text{table}}$), $p < 0.01$; $t_{\text{calculated}} = 5.60 > 3.012$ ($t_{\text{table}}$), $p < 0.01$). For the initial testing, the arithmetic mean achieved by the experiment group being inferior to that achieved by the control group (with 0.67%; 0.06 executions), while for the final testing, it was superior (with 16.36%; 1.80 executions); there were no significant differences between the means achieved by both groups for the initial testing ($t_{\text{calculated}} = 0.12 < 2.052$ ($t_{\text{table}}$), $p > 0.05$), while they registered significant values for the final testing ($t_{\text{calculated}} = 3.04 > 2.771$ ($t_{\text{table}}$), $p < 0.01$).

For the **groups of boys**, an increase of 45.11% (4.06 executions) recorded by the experiment group was noticed between the final and the initial testing, while the control group indicated an increase of 24.42% (2.21 executions), implying significant differences between the means achieved to the two testing by both groups ($t_{\text{calculated}} = 10.09 > 2.947$ ($t_{\text{table}}$), $p < 0.01$; $t_{\text{calculated}} = 6.37 > 2.878$ ($t_{\text{table}}$), $p < 0.01$). For the initial testing, the arithmetic mean achieved by the experiment group being inferior to that achieved by the control group (with 0.55%; 0.05 executions), while for the final testing, it was superior (with 15.99%; 1.80 executions); there are no significant differences between the means achieved by both groups for the initial testing ($t_{\text{calculated}} = 0.09 < 2.042$ ($t_{\text{table}}$), $p > 0.05$), while they registered significant values for the final testing ($t_{\text{calculated}} = 3.17 > 2.750$ ($t_{\text{table}}$), $p < 0.01$).

4. Discussions

Results analysis confirmed the fact that the evolution registered by the experiment group, including girls, as well as boys, was superior to that indicated by the control group. Considering this aspect, as well as the discussions with the trainers of the teams involved in the research, we concluded that the presence and the integration of the monitoring system in their activity had the role of reducing the subjective component in evaluation and of facilitating the work of recording and controlling sportsmen’s performances. Moreover, the trainers have noticed that the new series of exercises were enjoyed by the children who had become constantly interested in their own performance following each training session, as well as in the “place” occupied according to the ranking automatically generated by the system.
5. Conclusions

The training means allowing a real assessment of the player’s evolution, from one training session to another, or within the same training session, facilitate the management of the individualized training creating the premises for improving the specific educational process.

When dealing with children aged between 10 and 12, their interest and attraction for training means, reflected by an increased level of subjects’ physical and emotional involvement, represents an important aspect, as long as, it is doubled by measures of preventing incorrect movements (during the executions) and for avoiding the implementation of technical errors.

As a conclusion, the evolution indicated by the experiment groups and the significant differences registered as compared to the control group, for both techniques submitted to the study (overhead pass and underhand pass), confirmed the effectiveness of the new working method used for the optimization of motor learning and of basic techniques in volleyball.

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