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Original article

CORRECTION OF KYPHOSIS TO VOLLEYBALL PLAYERS BY GAME SPECIFIC METHODS

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Abstract

Objective. This paper aims to highlight the need to broaden the concerns of identifying solutions for improvement - correction of usual posture deficiencies by sport-specific means, given that the usual posture deficiencies installed during schooling are accentuated and aggravated by the practice of sports activities; over the specific demands of performance sport, it is transferred to the spine so that, in the absence of compensatory and corrective exercises based on sport-specific means, it increases the risk of chronic these mild conditions at the beginning, but which can turn over time into complicated clinical cases.

Methods. This experiment started from an initial purpose that of correcting the kyphosis installed to volleyball players through the specific game exercises.

During the experiment, another very important goal emerged from the perspective of the game of volleyball, that of developing game actions on the opposite segment to the one that is commonly used.

Results. The development of specific motor baggage is extremely important and was possible based on exercises to compensate the demands on the spine using segments opposite to those used in training and play, exercises integrated in the kyphosis recovery program.

Conclusions. The entire kyphosis correction program was based on changing the coordinates of some exercises commonly used in training and increasing the share of trunk extension movements in the warm-up part and in physical training.

Key words: kyphosis, physical therapy, volleyball, correction, game-specific methods.

Introduction

The usual column deficiencies are of worrying frequency in the school population in our country (Cordun, M., 1999), which is a worrying aspect from the perspective of the population from a somatic point of view. If we also take into account the fact that many children and young people engage in performance sports activities, we can think that requests on the same movement coordinates for a long time can exacerbate and aggravate a number of usual column deficiencies already installed (Geambașu, A., 2015).

In this context, we thought about the possibility of transferring the means of volleyball to the area of improvement of the kyphosis to the volleyball players (Croitoru D., 2002), given that the positions specific to the structure of the movement of defense actions, emphasize the kyphotic attitudes installed.

It is very important to note that during the period of growth and development corresponding to the schooling, these installed deficiencies can be

more easily influenced by movement, corroborating the effects of kinetotherapeutic recovery programs, with those of the carefully administered and directed movement within the training lessons.

All movements in the volleyball game involve one-handed or two-handed action. These modes of action generate symmetrical demands on the body (two-handed, top or bottom) and asymmetrical stresses (one-handed, top or bottom) (Dina, G., 2009).

Thus, we can create corrective programs for usual kyphosis, acting from the top with two hands having ameliorative effects. If in training work actions in which the ball is hit with a single upper hand (service or attack), it is necessary to use a series of exercises in which the ball is struck and with the other hand, in order to compensate for asymmetrical demands in the posterior thoracic muscle, which play an important role in the improvement and correction of kyphoses.

Goals

The main purpose of the research is to correct the kyphosis in volleyball players by means

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specific to the game, by means specific to the game actions, coupled with the increase of the pod of torso extension exercises in physical training programs.

The need for compensation which such an approach entails, requires action to be carried out with segments other than those associated with the skills formed. This made it possible to establish another goal by which we aimed to develop the specific skills of the volleyball game for the other segment, the clumsy one.

Research tasks

- Establishing the debresearch group;
- Making specific measurements to determine the level of initial clinical status;
- Selection, exercises and their association with the different degrees of deficiency identified at the column level;
- Organize exercises in tailored corrective programs based on the specialization of players in positions;
- Fixing specific control samples to assess the execution of actions with the clumsy segment;
- Performing initial testing;
- Application of compensatory and corrective programmes based on volleyball-specific means;
- Performing the final test;
- Interpretation of the results;
- Formulation of final conclusions.

Assumption

The directions that we set out to develop the erection, led to the formulation of two working hypotheses:

1. The design of corrective programmes based on volleyball-specific exercises but administered in a manner adapted to the type and degree of deficiency may result in the improvement of different types of kyphotic conditions.

The need for compensatory practice with the other segment of actions that are performed with one hand, opens a new direction of action in the research, which makes it possible to formulate another working hypothesis.

2. The compensatory exercises which pre-execute the execution with the segment opposite the one on which the skills are formed, may lead to the formation of new skills associated with the clumsy segment, which develops the technical baggage of the players.

Sample description

This research began at the end of February 2019 and lasted until the courses were suspended in March 2020. The fact that the experiment started earlier allowed to make in February a second set of records that can be compared with the initial results.

The research was carried out on a group of 10 14-16 year old volleyball players from the volleyball team of the Mihai I Railway Technical College, which recorded deviations in the vertebral column.

The important data from the perspective of the approached topic are related to the measurement of the deviation index of the column that indicates the severity of an existing condition at this level, and on the other hand, the control tests that indicate the level of efficiency of some game actions we influence in the experiment. From this second perspective, we are not interested in the efficiency of actions already formed, but we will focus on the new skills we can form by associating with the corrective purpose of this research. The compensatory means used in this scientific approach aim at practice rounds with the opposite segment (here we refer to the attack), and in the case of the block, we follow the execution of the defensive block, an action that is not very well represented in the volleyball player's training, execution and guidance. This defensive action is important for players who are not very tall or when a state of fatigue is established that no longer allows the development of very high jumps. At the same time, this can be an energy dosing alternative that allows additional mobilization for the attack, given that both actions are performed by the same player in line I, sometimes with a very high speed of succession of the two game actions. As a result, the specific tests we are building aim to attack with the opposite arm and the defensive block which is a new action.

Measurements to determine column deviations

To determine the deficiencies installed in the sagittal plane at the level of the spine, we used the lead wire testing method.

Through this we tried to identify the deviations of the spine at the cervical and thoracic level that highlight the kyphotic attitudes and those of the head - neck inclined anteriorly, extremely common in the school population.

We applied the wire from the C7 vertebra to the tangential interfacial groove on the top of the thoracic curvature and measured in cm with ruler two indicators:

1. Cervical arrow - from the C7 vertebra to the lead wire;
2. Lumbar arrow - from the L5 vertebra to the lead wire.

We mention that the normal values of these indicators must be of 3 cm. Thus, any deviation from this value falls within the area of interest from the perspective of integrating the subjects into the experimental group.

Specific tests of the efficiency of the game actions

1. Defensive blocking to attack from Z4

Executes 10 consecutive defensive blocking actions to attack from Z 4 which will be evaluated. An action is correct if it registers a contact with the ball after which the ball bounces on a trajectory that allows the continuation of the game phase.

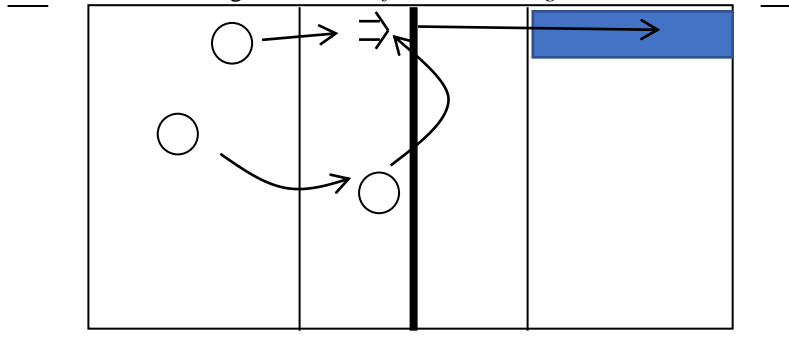
2. Defensive blocking to attack from Z2

Executes 10 consecutive defensive blocking actions to attack from Z 4 which will be evaluated. An action is correct if it registers a contact with the ball after which the ball bounces on a trajectory that allows the continuation of the game phase.

3. Attack from Z4 on long line

Executes 10 consecutive attack actions with the opposite arm, from Z4 with the ball sent from Z3, preceded by the ball offered to the Z3 by a teammate positioned in Z5. The ball is sent in a marked area of 1/6 m, and the action is considered correct if the ball touches the delimited surface.

Figure 1. Attack from Z4 on long line - Test

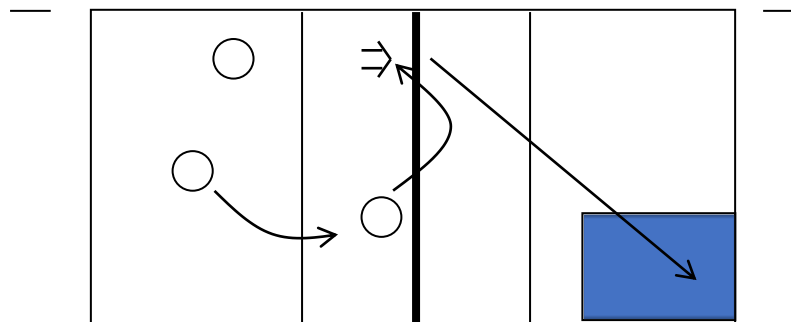


4. Attack from Z4 on long diagonal

Executes 10 consecutive attacks with the opposite arm, from Z4 with the ball sent from Z3, preceded by

the ball offered to the Z3 by a teammate positioned in Z5. The ball is transmitted diagonally to a delimited area of 3/4 m and the action is considered correct if the ball touches the delimited surface.

Figure 2. Attack from Z4 on long diagonal - Test

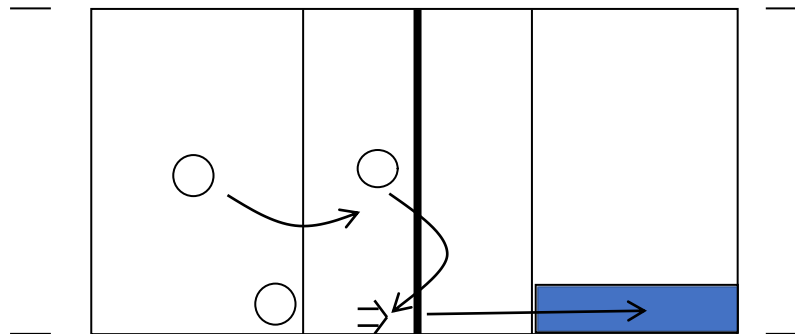


5. Attack from Z2 on long line

Executes 10 consecutive attack actions with the opposite arm, from Z2 with the ball sent from Z3,

preceded by the ball offered to the Z3 by a teammate positioned in Z6. The ball is sent in a marked area of 1/6 m, and the action is considered correct if the ball touches the delimited surface.

Figure 3. Attack from Z2 on long line - Test

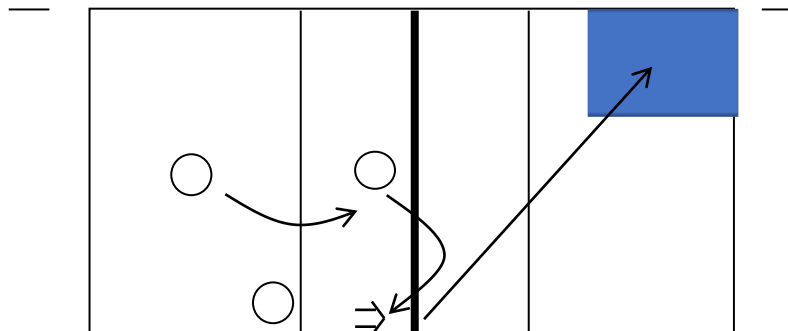


6. Attack from Z2 on long diagonal

Executes 10 consecutive attacks with the opposite arm, from Z2 with the ball sent from Z3, preceded by

the ball offered to the Z3 by a teammate positioned in Z6. The ball is transmitted diagonally to a delimited area of 3/4 m and the action is considered correct if the ball touches the delimited surface.

Figure 4. Attack from Z2 on long diagonal - Test



Research Methods

Observation - It consisted of participating in training lessons in which we consulted with the coach on the organization and adaptation of exercise programs according to the specialization of players and establishing the most suitable place in training for the implementation of corrective programs.

Experiment - It consisted of the application of a set of exercises selected according to the structure of movement and the effects of execution on the muscle groups responsible for correcting the kyphoses.

In addition to the corrective effects of the exercises, it was aimed at the formation of skills in clumsy segments, through which we tried to improve laterality and ambidexterity. Against this background, the aim was to increase efficiency in the game by

training skills that allow a more efficient adaptation and creative resolution of the playing tasks.

Method of statistical-mathematical processing - The aim was to determine the value of statistical indicators reflecting the effectiveness of the exercise programmes used.

Results

Measurements to column deviations

In order to determine the degree of kyphosis installed we used the method of testing with lead wire, which determined the deviations of the spine at the cervical and toracal level that highlight the cyphotic and head attitudes – the anteriorly inclined neck. Two indicators were followed (Gherghel, R.F. , L.,C., 2015):

1. Cervical arrow – from the C7 vertebra to the lead wire;

2. The lumbar arrow – from the L5 vertebra to the lead wire.

We note that the normal values of these indicators must be 3 cm (Cordun, M., 1999).

A number of specific test of the effectiveness of the game actions executed with the clumsy segment have also been created.

Table 1. *Spinal column measurements*

| Nr. crt. | name | Initial measurement cervical arrow | deviation | Initial measurement lombar arrow | deviation |
|----------|-------|------------------------------------|-----------|----------------------------------|-----------|
| 1. | A. C. | 4,7 | 1,7 | 6 | 3 |
| 2. | I. A. | 5 | 2 | 5,5 | 2,5 |
| 3. | C. A. | 4,8 | 1,8 | 4,8 | 1,8 |
| 4. | C. D. | 4,5 | 1,5 | 5,5 | 2,5 |
| 5. | D. J. | 6 | 3 | 6,5 | 3,5 |
| 6. | B. E. | 5,3 | 2 | 6 | 3 |
| 7. | D. D. | 5,8 | 3 | 6,4 | 3,4 |
| 8. | M. A. | 6,4 | 3,4 | 6,8 | 3 |
| 9. | V. I. | 5,7 | 2,7 | 6,5 | 3,5 |
| 10. | N. C. | 5 | 2 | 6 | 3 |

Figure 5. *Cervical arrow measurement*

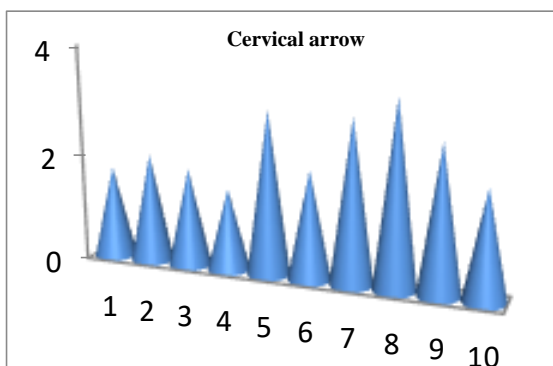
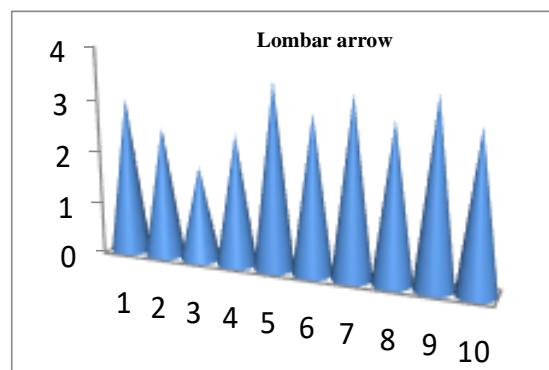


Figure 6. *Lombar arrow measurement*



The values at the cervical arrow level show that all athletes have a certain degree of deviation in the cervical spine, which confirms that an extremely widespread usual defiance in the school population, head - anteriorly inclined neck, also characterizes our sports.

The values at the lumbar arrow recorded at the beginning of the experiment show the existence of cyphotic attitudes already installed.

Unfortunately, the final measurements for column deviations were planned for the end of our experiment so that the suspension of courses at the beginning of March blocked the collection of data.

Regarding the specific tests aimed at the efficiency of the game actions performed with the opposite arm, there were differences in the manifestation of the players in relation to the coordinates of the test. Thus, the actions performed in

areas with which the players were familiar, allowed the rapid adaptation of the execution with the opposite arm. This ability to adapt quickly resulted in small differences in value between the two tests.

New actions, such as defensive block and unusual execution areas for most players, have brought interesting data in terms of the formation of new skills.

From this perspective, of the relevance of the results, we will present only the results of the tests that highlighted greater progress and thus confirmed the efficiency of the exercises used as a means of correcting kyphosis but also of developing new actions

Defensive block to attack from Z4

Table 2. *Defensive block to attack from Z4*

| Nr. crt. | Name | Initial test | Final test | Progres rate |
|-------------|-------|--------------|------------|--------------|
| 1. | A. C. | 3 | 8 | 5 |
| 2. | I. A. | 3 | 6 | 3 |
| 3. | C. A. | 3 | 6 | 3 |
| 4. | C. D. | 4 | 7 | 3 |
| 5. | D. J. | 4 | 8 | 4 |
| 6. | B. E. | 2 | 6 | 4 |
| 7. | D. D. | 3 | 7 | 4 |
| 8. | M. A. | 3 | 6 | 3 |
| 9. | V. I. | 3 | 7 | 4 |
| 10. | N. C. | 2 | 5 | 3 |
| Media value | | 3 | 6,6 | 3,6 |

Figure 7. *Defensive block to attack from Z4 score*

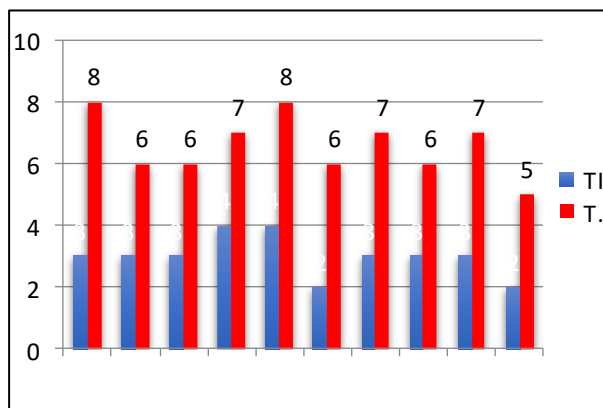
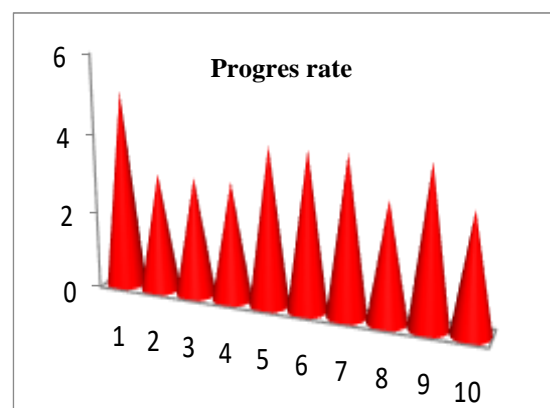


Figure 8. *Defensive block to attack from Z4 progres rate*



Given the close values for the two blocking samples (on the Z4 attack and in the Z2 attack), we limit ourselves to presenting in the paper only one of the examples. Thus, we can observe in the initial testing a small number of successes that reflect real difficulties in adapting an extremely little practiced action in practice.

The amplitude value $W = 2$, indicates a low level of dispersion aspect that characterizes a homogeneous collective but on a low efficiency. The graph reflects a positive development after the second test, with higher values recorded across the entire sports group, with a maximum of 5 successful actions.

Defensive block involves symmetrical action, with both arms, trunk and head in extension, having a corrective effect for kyphosis by toning the chest muscles.

Regarding the attack action, we introduced in research 4 tests aimed at executing the attack with the opposite arm, on game-specific coordinates. The asymmetrical executions that characterize the game of volleyball generate asymmetrical demands on the spine and amplify the risk of scoliosis.

Executions with the opposite arm to the one commonly used, balance the level of stress on the spine, tone the antagonistic muscle areas and have a compensatory effect. The fact that the exercises

followed the action from above (at the attack the ball was hit at a higher level), directed the request in the upper area of the spine, amplifying the corrective effect of kyphosis.

Measurements were made on 4 specific samples targeting game actions executed with the opposite arm:

- Attack from Z4 on long line with the ball sent from Z3;
- Attack from Z4 on long diagonal with the ball sent from Z3;
- Attack from Z2 on long line with the ball sent from Z3;
- Attack from Z2 on long diagonal with the ball sent from Z3

At the level of these indicators, progress has been made, with average between 1.8 and 4.1 successes. Reduced progress values were recorded by areas of action with which the players are familiar, proving a good ability to adapt for acting with the other segment. These small advances demonstrate that the volleyball game develops components that play an important role in anticipating and effectively adapting actions to variable coordinates such as laterality, ambidexterity and orientation capacity.

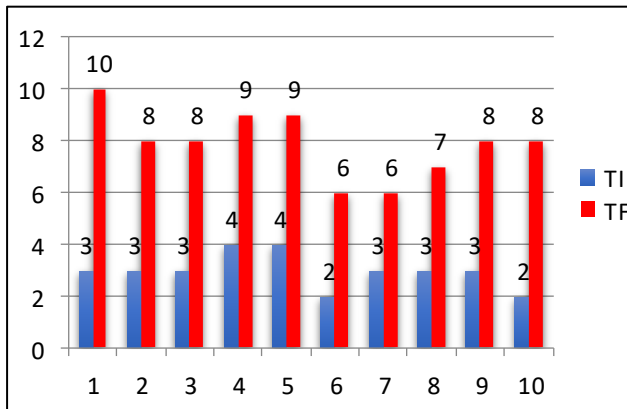
In this context, we will only present the data on the indicator that has made the greatest progress.

Attack from Z2 on long diagonal with the ball sent from Z3

Table 2. *Attack from Z2 on long diagonal*

| Nr. crt. | Name | Initial test | Final test | Progres rate |
|-------------|-------|--------------|------------|--------------|
| 1. | A. C. | 3 | 10 | 7 |
| 2. | I. A. | 3 | 8 | 5 |
| 3. | C. A. | 3 | 8 | 5 |
| 4. | C. D. | 4 | 9 | 5 |
| 5. | D. J. | 4 | 9 | 5 |
| 6. | B. E. | 2 | 6 | 4 |
| 7. | D. D. | 3 | 6 | 3 |
| 8. | M. A. | 3 | 7 | 4 |
| 9. | V. I. | 3 | 8 | 5 |
| 10. | N. C. | 2 | 8 | 6 |
| Media value | | 3 | 7,1 | 4,1 |

Figure 9. Attack from Z2 on long diagonal - score



The low values between 2 and 4 successes recorded in the initial test demonstrate adaptation difficulties involving the diagonal orientation after detachment to control the direction.

The second test illustrates an increase in the number of successful actions with values up to 10, with a progress rate of 4.1 successful actions. This situation highlights the efficiency of the means used. This coordinate being specific only to the lifter, for the other players was an unusual co-ordination, especially with the clumsy arm.

The amplitude value after the second test, $W = 4$, shows a higher degree of dispersion of values, which is visible in the progress rate graph.

Conclusions

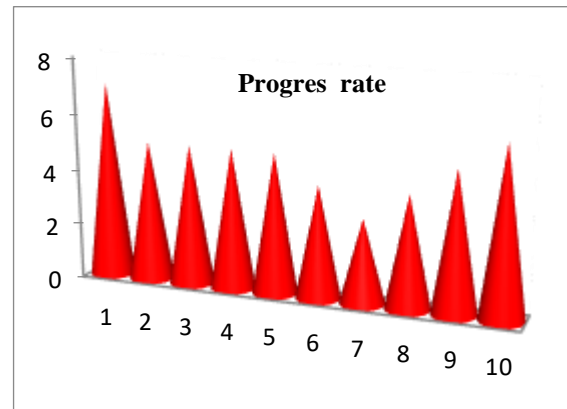
At the level of all the evaluated actions, progress was registered, the technical baggage of the players being enriched with new skills not previously approached in training, thus confirming the efficiency of the exercises used;

At the level of new actions such as defensive blocking, totally new as biomechanics, the highest progress rate was recorded (up to 5 successes);

The attack, on most coordinates registers a low rate of progress, between 1.8 - 2.2 successes, against the background of unexpectedly high values recorded at the initial test. This situation can be explained by the fact that the game of volleyball develops a series of components of the coordinative capacity (ambidexterity, laterality, coordination, orientation) that positively influence the adaptive capacity of the players;

At the diagonal attack in Z2, the highest progress rate is recorded (4.1 successful actions), a situation that highlights the usefulness of the exercises. We motivate the conclusion by the fact that

Figure 10. Attack from Z2 on long diagonal - progres rate



this coordinate is unusual, especially with the opposite arm.

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