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PROMOTING ATHLETES FROM THE JUNIOR II TO JUNIOR I CATEGORY BY OPTIMIZING LAND TRAINING AND SNOW TRAINING IN SKI BIATHLON TESTS

Bogdan-Iulian PELIN1,8, Florin PELIN2

1 Transilvania University, Faculty of Physical Education and Mountain Sports, 1 Universității Street, Brașov, Romania
2 National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
*Corresponding author: bogdanpelin189@yahoo.com

Abstract. In recent years, in ski biathlon, a substantial increase in performance has been recorded worldwide, with some evidence that there is a gap between our athletes’ results and world results. Performance has seen significant increases from one year to the other. The achievement of these notable performances contributed to the improvement of the quality of materials (skis, sticks, boots, wax and optimal trajectory), but first of all to the continuing refinement of the training methods. The aim of this research is to determine the level of endurance improvement through the participation of a group of athletes (juniors aged 16-18 years) in a different training program (junior training program I), in terms of both land training and snow training. The training program proposed in this paper was selected and streamlined following the pedagogical observation activity on several groups of athletes within the Dinamo Râșnov School Sports Club. The biathlon training pattern should be continuously monitored by coaches to avoid the negative effects of overtraining, such as muscle strength reduction, increased heart rate at rest, abnormally increased blood pressure, muscle pain and fatigue.

Keywords: ski biathlon, training program, morphofunctional and psychological particularities.

Introduction

The objectives and tasks of the ski performance and high performance in our country in the coming years can only be achieved to the extent that the training methodology will be properly guided and scientifically grounded. Achieving this qualitative leap is not possible if the instructive-educational process ignores the following issues (Pelin, Gaspar, & Lungociu, 2007):

a) continuous modernisation of the training process, knowledge and application of the latest achievements of the theory and practice in the field;
b) changing the concept of workload so as to reach 1,200-1,400 training hours per year;
c) increasing the value of the motor level indices and the specific physical training;
d) working to acquire and perfect the technique should be an important and constant concern at all levels, especially in children and juniors, and in seniors, to improve the technique for the competition conditions (speed);
e) developing and improving psychological qualities: will, stress resistance, combativeness;
f) conducting training processes with as many objective data as possible.

Particular performance can be achieved through systematic, continuous (year-round) training over several years, with the possibility of operative change.

All these are added sporting materials and equipment of great importance (skis, sticks, boots, combos, wax) (Pelin, 2001a). In order to raise the national result ceiling, a larger number of athletes need to enter a continuous training program, with an appropriate volume and quality of the effort to ensure the qualitative leap to the world requirements.

In drawing up individual training plans by coaches, account must be taken of the main methodological requirements of modern training for children and juniors.

Importance and contribution of motor qualities to modern sporting presentation

The human motor function has two sides, namely: motor skills and qualities of these skills recognized by what we call physical qualities or, in another form, motor qualities expressed in speed, strength, endurance etc. (Grosu, 2008).

We present here a brief argument in favour of the term motor quality - a term that we prefer to that of physical quality. As is well known, the “quality” category sums up the content characteristics of objects and phenomena expressing their essential attributes, and the notion of physical, associated with quality (physical quality), refers to the body of living beings - especially muscle activity. Thus, the notion of physical quality has a much too limited content referring only to biological, morphological, biochemical and functional determinations. However, motor activity - like any other form of human activity - also has psychological determinations: processes, capacities and mental states.
The former term can be added the argument that these qualities (such as speed, strength, endurance) can be emphasised only in relation to the movement, the motor act.

Based on the above argument, we consider the notion of motor quality more comprehensive - for which we propose the following definition: the essential acquisition of muscular activity expressed through motor acts, conditioned by the morphological structure and functional capacities of different systems of the human body, but mediated by processes, capacities and mental states (Dragnea, 1996).

In sports, the performance, synthetically expressed by its extremely high level, has evolved as a result of the improved sports technique, sports facilities and materials, but especially due to the improvement of methods for the development of speed and strength in a specific proportion and combination.

The limited and standardised motor behaviour puts the forefront in the struggle for increasing sports performance and raising motor qualities to very high levels, which has compelled specialists in the field to deepen the problems of theory, scientific substantiation and methodological approaches aimed at continuously improving these qualities.

In the motor act, qualities do not manifest separately, but combined in different proportions, one having a preponderant role. Motor qualities can grow well above the level they reach during the normal growth and development of the body. In the development of motor skills, there are optimal age, individual and gender limits, the latter determined - among other factors - by the hereditary factor.

In their development, basic motor skills are interconditioned to a certain level, after which the exaggerated development of a quality can negatively influence another quality (Pelin, Gaspar, & Lungociu, 2008).

Materials and methods

The research took place between June 2017 and April 2018, namely the one-year period of the Romanian Ski Biathlon Federation. It was conducted continuously during two periods; the first one consisted in dry-land training from June to November, and the second one consisted in snow training from December to April.

The place of research was the training centre of the Dinamo Râșnov School Sports Club, located on the Râșnoavei Valley. The group of athletes - 10 juniors aged 16-18 years.

Means and methods to develop endurance in the biathlon training process for junior II level

Taking into consideration the structure-requirement correlation in the competition events, we divided the training into three groups (Pelin, 2001b):
1. Specific means - utility level I:
   1.1. Skiing in the biathlon competition;
   1.2. Under conditions of technical training and improvement;
   1.3. Air rifle shooting in the biathlon contest conditions and effort at different intensity levels in the training;
   1.4. Air rifle shooting - under conditions of improving the biathlon technique.
2. Special means - utility level II:
   2.1. Cross-country roller skating;
   2.2. Downhill by imitating skiing with or without sticks;
   2.3. Cross-country running;
   2.4. Air rifle shooting;
   2.5. Simulated tube.
3. General means - utility level III:
   3.1. Strength exercises - using the body weight;
       - using different difficulties or inconveniences;
   3.2. Gymnastics exercises for coordination and mobility;
   3.3. Cycling;
   3.4. Training games;
   3.4. Swimming.

These selected instruments, rationalised in intensity and volume and grouped into standardised action systems, can provide a more accurate guidance to the targeted training effects in the weekly and annual cycles.

A set of tests (presented below) were performed to conduct the research, once at the beginning of the study and then at the end of the training period. The participants’ reactions to the specific and non-specific set of ski biathlon exercises were tracked. To objectively assess the evolution of the group during the research, we used the same samples in the initial and final tests. The results were summarised and presented in the graphical form.
As in the first test, the final test was performed over three days to prevent excessive fatigue in athletes, otherwise the results might have not been conclusive.

Athletes were supposed to be rest before testing and not to have another training session on that day.

Results

Below, we present the tables with the initial and final results and their graphical interpretation (Tables 1-4 and Figures 1-3).

Table 1. Results on initial testing

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Name and Surname</th>
<th>Cross-country endurance running – 2000 m</th>
<th>Endurance running in the stadium – 1000 m</th>
<th>Ski running – 3000 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>G.M.</td>
<td>7'35''</td>
<td>3'12''</td>
<td>10'20''</td>
</tr>
<tr>
<td>2</td>
<td>M.C.</td>
<td>7'39''</td>
<td>3'18''</td>
<td>10'16''</td>
</tr>
<tr>
<td>3</td>
<td>V.A.</td>
<td>7'36''</td>
<td>3'20''</td>
<td>10'10''</td>
</tr>
<tr>
<td>4</td>
<td>G.R.</td>
<td>7'28''</td>
<td>3'07''</td>
<td>10'05''</td>
</tr>
<tr>
<td>5</td>
<td>A.D.</td>
<td>7'45''</td>
<td>3'21''</td>
<td>10'28''</td>
</tr>
<tr>
<td>6</td>
<td>O.C.</td>
<td>7'50''</td>
<td>3'21''</td>
<td>10'33''</td>
</tr>
<tr>
<td>7</td>
<td>G.A.</td>
<td>7'30''</td>
<td>3'12''</td>
<td>10'44''</td>
</tr>
<tr>
<td>8</td>
<td>L.L.</td>
<td>7'35''</td>
<td>3'15''</td>
<td>10'35''</td>
</tr>
<tr>
<td>9</td>
<td>C.I.</td>
<td>7'52''</td>
<td>3'20''</td>
<td>11'05''</td>
</tr>
<tr>
<td>10</td>
<td>I.A.</td>
<td>7'38''</td>
<td>3'18''</td>
<td>10'33''</td>
</tr>
</tbody>
</table>

Table 2. Results on final testing

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Name and Surname</th>
<th>Cross-country endurance running – 2000 m</th>
<th>Endurance running in the stadium – 1000 m</th>
<th>Ski running – 3000 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>G.M.</td>
<td>7'28''</td>
<td>3'08''</td>
<td>10'05</td>
</tr>
<tr>
<td>2</td>
<td>M.C.</td>
<td>7'35''</td>
<td>3'05''</td>
<td>10'02</td>
</tr>
<tr>
<td>3</td>
<td>V.A.</td>
<td>7'30''</td>
<td>3'11''</td>
<td>9'54''</td>
</tr>
<tr>
<td>4</td>
<td>G.R.</td>
<td>7'27''</td>
<td>3'05''</td>
<td>9'50''</td>
</tr>
<tr>
<td>5</td>
<td>A.D.</td>
<td>7'38''</td>
<td>3'14''</td>
<td>10'14''</td>
</tr>
<tr>
<td>6</td>
<td>O.C.</td>
<td>7'44''</td>
<td>3'18''</td>
<td>10'30''</td>
</tr>
<tr>
<td>7</td>
<td>G.A.</td>
<td>7'28''</td>
<td>3'10''</td>
<td>10'12''</td>
</tr>
<tr>
<td>8</td>
<td>L.L.</td>
<td>7'29''</td>
<td>3'11''</td>
<td>10'22''</td>
</tr>
<tr>
<td>9</td>
<td>C.I.</td>
<td>7'44''</td>
<td>3'17''</td>
<td>10'45''</td>
</tr>
<tr>
<td>10</td>
<td>I.A.</td>
<td>7'35''</td>
<td>3'15''</td>
<td>10'11''</td>
</tr>
</tbody>
</table>

Table 3. Participants - initial testing (descriptive statistics)

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Test</th>
<th>Arithmetic mean</th>
<th>Standard deviation</th>
<th>Coefficient of variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cross-country endurance running – 2000 m</td>
<td>7'39''</td>
<td>7.95 sec</td>
<td>1.73%</td>
</tr>
<tr>
<td>2</td>
<td>Endurance running in the stadium – 1000 m</td>
<td>3'16''</td>
<td>4.74 sec</td>
<td>2.41%</td>
</tr>
<tr>
<td>3</td>
<td>Ski running – 3000 m</td>
<td>10'29''</td>
<td>17.56 sec</td>
<td>2.78%</td>
</tr>
</tbody>
</table>

Table 4. Participants - final testing (descriptive statistics)

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Test</th>
<th>Arithmetic mean</th>
<th>Standard deviation</th>
<th>Coefficient of variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cross-country endurance running – 2000 m</td>
<td>7'34''</td>
<td>6.49 sec</td>
<td>1.43%</td>
</tr>
<tr>
<td>2</td>
<td>Endurance running in the stadium – 1000 m</td>
<td>3'11''</td>
<td>4.59 sec</td>
<td>2.39%</td>
</tr>
<tr>
<td>3</td>
<td>Ski running – 3000 m</td>
<td>10'12''</td>
<td>16.57 sec</td>
<td>2.70%</td>
</tr>
</tbody>
</table>
In this test, we can see an improvement in the arithmetic mean of the initial results. All athletes improved their cross-country performance. Regarding homogeneity, in both the initial and final stages, it is very good, the sample being homogeneous with 1.43% after the final testing. The arithmetic mean improved, increasing from 7'39'' to 7'34'' at the end. (Figure 1)

For this event, in the initial test, the mean value of the group members was 3'16'', with a standard deviation of 4.74 seconds. The variation of the subjects was very good, 2.41%, the sample being homogeneous. In the final test, the mean value of the research group is 3'11'', and the standard deviation is 4.59 seconds. The coefficient of variation calculated for the group after the final testing is 2.39%. We noticed a progress of 5 seconds in the arithmetic mean compared to the initial testing. The most important progress was 13 seconds. (Figure 2)

In this event, at baseline, the mean value of the study group members was 10'29'', with a standard deviation of 17.56 seconds. The variation of the subjects in the research group was 2.78%, demonstrating that the group had a
high degree of homogeneity in the initial test. In the final test, the mean value progressed with 17 seconds reaching 10'12'', with a standard deviation of 16.57 seconds. The coefficient of variation calculated after the final stage dropped to 2.70%, which shows that the group has maintained a high degree of homogeneity.

Conclusions

For the training of juniors II in ski biathlon, it is necessary to train or improve motor skills specific to this sport with a higher weight on strength, speed and endurance.

Choosing the control tests and setting the rules for the junior category II in ski biathlon in order to be effective is a basic criterion. The control tests and competitions organized by the Dinamo Râşnov School Sports Club are in line with the FRSB (Romanian Ski Biathlon Federation) tests. Particularly important is the choice of materials and work area for the specifics of the ski biathlon activity.

The third part of the training program is applied to junior category II, where the amount of effort to develop endurance is achieved by training various efforts (3 cross-country training sessions/week) - a sports performance compatible with junior team I. The same performance also develops during the snow stage, where, in the applied training program, the amount of effort to develop endurance is achieved by a higher amount of skiing (the number of kilometres covered by junior II in each training session should be as close as possible to the number of kilometres covered by junior I).

Following the research, it is necessary for the training of junior II of the Dinamo Râşnov School Sports Club to continue with the dry-land training three times a week and with more ski training sessions, in terms of snow training, to develop a sports performance compatible with that of juniors I. Planning the training year that is used in the training process of junior II should be as close as possible, both qualitatively and qualitatively, to that of junior I in the Romanian biathlon. This biathlon training pattern should be continuously monitored by coaches to avoid the negative effects of overtraining, such as muscle and strength reduction, increased heart rate at rest, abnormally increased blood pressure, muscle pain and fatigue. In order to prevent these symptoms, we suggest that this training model should pay attention to both the vitaminisation and nourishment of athletes and the careful supervision of recovery methods.

Authors’ Contributions

All authors contributed equally to this study and should be considered as main authors.

References

OPINIONS ON THE ROLE AND DEVELOPMENT OF SUPPLENSES TO PREVENT SHOULDER DISLOCATION IN PERFORMANCE ATHLETES

Ahmed Hadi AL DHUHAIBWI1*

1 National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
*Corresponding author: aligold36@yahoo.com

Abstract. The study aimed to identify the opinions of specialists in the field of kinetotherapy on the role and development of suppleness to prevent shoulder dislocation in performance athletes. To this purpose, we applied a questionnaire survey including 18 items with closed and/or open responses. The proposed questionnaire was published on 10.05.2016 and was distributed on all networks specialised in kinetotherapy, so that it could be accessed by as many people as possible. Eighty people responded to our questionnaire, of whom 20 males and 60 females, but we have obtained only 71 valid responses that are analysed in this paper. As for the research hypothesis, we have assumed that the respondents are aware that shoulder joint mobility improves after dislocation by applying a recovery programme based on the development of suppleness. If the research objective has been fulfilled, because we identified the respondents’ opinions on the topic addressed, the research hypothesis has been only partially checked, because a number of specialists are really aware that shoulder joint mobility improves after dislocation by applying a recovery programme based on the development of suppleness, but many participants are quite confused in their responses. The investigated sample and the online questionnaire survey might be the answer for this situation. All in all, further effort should be provided to raise awareness on the topic of preventing shoulder dislocation in performance athletes through the development of suppleness.

Keywords: shoulder joint, dislocation, prevention, suppleness, sport.

Introduction

The shoulder is the most frequently dislocated joint in the human body, and anterior dislocation is the most common injury in everyday life, particularly for youth (Rumian et al., 2011).

In young people, the shoulder joint dislocations are often associated with the practice of various sports, such as basketball, volleyball, football, hockey, rugby, skiing or rock climbing (Kerkar, 2018). Anterior shoulder dislocation, which accounts for 95% of cases (Hegg, 2017), usually occurs when throwing or hitting a ball; thus, when the arm is held over the head with the elbow bent, a force is applied that pushes the elbow backward and lever the humeral head out of the glenoid fossa (Wedro, 2018).

Physical therapy is an important component that helps return the shoulder to its normal function. It may include exercises to strengthen the muscles surrounding the shoulder with the purpose of preventing recurrent dislocations, but also to maintain range of motion in the shoulder joint (Wedro, 2018). The use of elastic (resistance) bands with free weights is also recommended (Jakobsen et al., 2013).

Therefore, it is very important to keep the shoulder muscles both flexible and strong so that the arm can move safely in many directions. Sports that require precision and a high level of coordination also require suppleness, which allows linking the body movements together in a continuous trajectory of motion. Stretching is a way to increase suppleness, but its practice involves understanding the relationship between flexibility and suppleness: the former has to do with the range of motion of the joint, while the latter is connected with the elastic and plastic properties of the myofascial tissues. Tone is a key component of suppleness, because too much tone creates rigidity with the potential of injury, while too little tone creates lack of support with the potential of injury (Sweeney-Hillman, 2015).

According to Caplan and Smith (2005, pp. 48-49), suppleness or flexibility is defined as the range of movement possible at a joint, meaning that the more a joint can move, the supplier or more flexible an individual is. Suppleness (flexibility) is one of the most important elements of fitness, and greater suppleness improves posture, sports performance, functional capacity in daily life and stress management, reducing at the same time the risk of injury. Suppleness is particularly important in injury prevention, because the more easily a joint can move through its normal range, the better it can cope with the forces put onto the body during the practice of sport.

Many specialists believe that suppleness is the fifth motor quality, since it represents an important parameter in achieving sports performance; however, suppleness is less examined by professionals, because not all of them include it among the main motor abilities (Al Dhuhaibawi, Macovei, & Ciocoiu, 2017, p. 165). Reeser and Verhagen (2006) explain this by the fact that terminology is not yet clarified, the literature using the word “suppleness” alternately with those of “mobility”, “flexibility”, “elasticity”, which may indicate that it is studied, but under various names. Suppleness, as any component of motor ability, may have internal biological determinations that will be influenced by external aspects coming from the environment and the activity performed by each person (Macovei, 1999, p. 36). Although suppleness is thought to have limitations due to heritability, it
can be influenced by the level and quality of specific training, which may result in providing the musculoskeletal system its autonomy of movement (Petrofsky, Laymon, & Lee, 2013). Developing suppleness involves a high number of repetitions, the prescribed exercises addressing both the joint range of motion and tissue elasticity. They can be performed freely or with a partner, using various pieces of apparatus or objects. Suppleness can be developed with maximum effectiveness, provided that the exercises have continuity and consistency (Al Dhuhaibawi, Macovei, & Ciocioi, 2017, p. 166).

The need to develop suppleness results from the high incidence of injury among athletes, and one of them is scapulohumeral dislocation. Suppleness plays a crucial role in preventing such injuries, and special stretching exercises are prescribed in this regard. Therefore, performance athletes practicing sports in which the shoulder joint is often used (for instance rugby, handball, volleyball, football, swimming etc.) should follow an effective exercise programme to develop suppleness, under the supervision of a specialist.

Injury prevention programmes combine conditioning and warm-up with appropriate stretching and strengthening exercises (Moynes, 1983). Exercise should be done regularly to maintain strength and flexibility in the muscles and joints (Orthoanswer, 2012).

Materials and methods

**Objective.** To identify the respondents’ opinions on the role and development of suppleness to prevent shoulder dislocation in performance athletes

**Hypothesis.** The respondents are aware that shoulder joint mobility improves after dislocation by applying a recovery programme based on the development of suppleness.

**Research methods.** Documentation, questionnaire survey (using the Google-program online platform), mathematical and statistical method

Our research included a survey carried out among specialists in the field of kinetotherapy. The proposed questionnaire was published on 10.05.2016 and could be accessed at the following link: https://docs.google.com/forms/d/e/1FAIpQLScrjd79dFug5Dy3ZMMy3wFP1rMBzXCFbqD80HXY6wyUbaxQw/viewform. This link was distributed on all networks specialised in kinetotherapy so that it could be accessed by as many people as possible. Eighty people responded to our questionnaire, of whom 20 males and 60 females. Their average age was 36 years. The questionnaire consists of 18 items with closed and/or open responses. For closed responses, a 5-level scale was used.

Participants were assured that all responses would be used for scientific purposes, without allowing their personal identification, and the provided information would not be transmitted to other organisations.

Results and discussion

After applying the questionnaire, we obtained 71 valid responses that were analysed and helped us draw conclusions. The questionnaire items and the responses (in percentages), accompanied by our comments, will be presented in the following lines:

1. Do you think that shoulder dislocation is commonly encountered in performance athletes?

<table>
<thead>
<tr>
<th>Total agreement</th>
<th>Agreement</th>
<th>Relative agreement</th>
<th>Disagreement</th>
<th>Total disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.8%</td>
<td>22.5%</td>
<td>38%</td>
<td>9.9%</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

Most respondents (38%) relatively agree with the statement, which means that they have already met cases of shoulder dislocation, but not necessarily, depending on the practiced sport. It should be noted that athletes involved in certain sports such as volleyball, handball or tennis are much subjected to such injuries, while those practicing cycling, for instance, are prone to injuries mainly affecting other parts of their bodies. Therefore, the variety of responses is explainable, because they are influenced by each one’s previous experience in this area, specifically the cases encountered, as well as by each one’s personal knowledge of the issue, namely their interest in keeping informed about everything that is new in the field, even it is beyond the work they use to do.

2. Do you think that shoulder dislocation can seriously decrease the performance of athletes?

<table>
<thead>
<tr>
<th>Total agreement</th>
<th>Agreement</th>
<th>Relative agreement</th>
<th>Disagreement</th>
<th>Total disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>45%</td>
<td>31%</td>
<td>16.9%</td>
<td>5.6%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Most participants (45%) totally agree with the statement, even if some of them do not know much about shoulder dislocation (as revealed by the responses to question 1), but it is common sense to infer that any injury
(such as the discussed one) has negative consequences on sports performance. So, the responses are generally fair, except for the percentage of 7% (“Disagreement” and “Total disagreement”), because no athlete can perform well in the presence of pain or incomplete recovery, regardless of the sport. As a matter of fact, they would not be allowed to practice in the absence of good health condition and proper recovery. So, we take for granted only the “responsible” responses.

3. Does kinetotherapy play an important role in preventing shoulder dislocation?

<table>
<thead>
<tr>
<th>Total agreement</th>
<th>Agreement</th>
<th>Relative agreement</th>
<th>Disagreement</th>
<th>Total disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>70%</td>
<td>10%</td>
<td>12.9%</td>
<td>2.9%</td>
<td>4.2%</td>
</tr>
</tbody>
</table>

The total agreement with this statement is prevailing (70%), which means that most participants in the questionnaire are aware of the role played by kinetotherapy in preventing shoulder dislocation. Obviously, this refers to applying appropriate injury prevention programmes including conditioning, warm-up, stretching and strengthening exercises. Because the remaining 30% of respondents are not fully (or not at all) convinced of the beneficial effects of kinetotherapy on preventing shoulder dislocation, perhaps they do not accept it as a prevention means either in sports where other parts of the body are prone to be injured, and this is bad for the athletes. When modern concepts and practical ideas prove to be effective, they should be adopted, and the reluctant attitudes should be replaced by the use of updated methods and techniques able to improve the athlete’s performance, not to delay its normal progress. Knowing in detail each method, technique and exercise proposed, correctly choosing from the multitude of possibilities, but especially “understanding that each human being is a unique and unrepeatable experience, a living book of knowledge and discovery”, represents “the proper horizon to reach the optimal form of health” (Geambașu, 2006, p. 22).

4. Do you think that athletes should participate in additional kinetotherapy sessions?

<table>
<thead>
<tr>
<th>Total agreement</th>
<th>Agreement</th>
<th>Relative agreement</th>
<th>Disagreement</th>
<th>Total disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>59.2%</td>
<td>25.4%</td>
<td>9.8%</td>
<td>2.8%</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

Most participants (59.2%) totally agree with this statement, thinking that additional kinetotherapy sessions for athletes would be welcome. However, a percentage of 10.8% respondents have lost on the way, and we say this because, at the previous question, there were 70% who expressed their total agreement that kinetotherapy would play an important role in preventing shoulder dislocation. But, despite this statement, inconsistency arises since the percentage has decreased as regards the participation in additional kinetotherapy sessions. So, kinetotherapy is important, but the normally provided sessions seem to be enough to prevent sports injuries. It is a matter of perception and patience to let athletes get involved in other activities than training. All in all, the obtained results are satisfactory and show that many respondents have a global view of the complex nuances involved in the process of training and competition and they know that injury prevention is a particularly important issue for the physical integrity (safety) of the athletes, a prerequisite of their development as remarkable performers in one sport or another.

5. Indicate the sport with the highest risk of injury.

<table>
<thead>
<tr>
<th>Rugby</th>
<th>Handball</th>
<th>Volleyball</th>
<th>Football</th>
<th>Swimming</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.4%</td>
<td>35.2%</td>
<td>5.6%</td>
<td>5.6%</td>
<td>2.8%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Most respondents indicate handball (35.2%) and rugby (32.4%) as the sports with highest risk of injury, which is our opinion, too, because they involve direct contact with the opponent and, in many cases, collision and fall, especially in rugby. However, handball is on the first place due to the frequent ball throw overhead to score goals, which is the essence of the game. While rugby is a violent game in itself, handball requires “violent” or powerful motions of the upper extremity, and this strong force may result in scapulohumeral injuries when the shoulder is pulled out of place. The extreme rotation of the shoulder pops the ball of the upper arm bone (humerus) out of the shoulder socket (glenoid), which is part of the shoulder blade (scapula). There are also many other sports where the shoulder dislocation is common, for example ice hockey, downhill skiing, tennis or javelin throw and shot put (in athletics), but they are not listed at this item. Football also involves a high risk of injury, but the recorded percentage is low. Perhaps the question was quite ambiguous and the respondents did not know whether it was strictly about the shoulder injuries or about injuries to any part of the body in various sports.

6. Do you think that suppleness needs to be developed to reduce the risk of injury?

<table>
<thead>
<tr>
<th>Total agreement</th>
<th>Agreement</th>
<th>Relative agreement</th>
<th>Disagreement</th>
<th>Total disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>46.5%</td>
<td>28.2%</td>
<td>22.5%</td>
<td>1.4%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>
Most participants (46.5%) totally agree that suppleness plays an important role in reducing the risk of injury, but the question is general, with no reference to sports. So, they responded according to their own knowledge and experience or may be in relation to those of the athletes they had trained or treated in their careers. All in all, suppleness is known to be essential in the prevention of injuries both in everyday life and particularly in the world of performance sports. A supple branch bends, but a less supple one breaks.

7. To what extent is it important to develop joint suppleness to prevent shoulder dislocation?

<table>
<thead>
<tr>
<th>Extent</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>To a very large extent</td>
<td>36.6%</td>
</tr>
<tr>
<td>To a large extent</td>
<td>35.2%</td>
</tr>
<tr>
<td>To some extent</td>
<td>21.2%</td>
</tr>
<tr>
<td>To a small extent</td>
<td>7%</td>
</tr>
<tr>
<td>To a very small extent</td>
<td>0%</td>
</tr>
</tbody>
</table>

“To a very large extent” (36.6%) and “to a large extent” (35.2%) are the predominant responses given by the participants, the overall percentage being 71.8%, which is more than satisfactory, but indicating that there is still room for education and better understanding of the issue.

8. To what extent do you use exercises to develop suppleness in your kinetotherapy sessions?

<table>
<thead>
<tr>
<th>Extent</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>To a very large extent</td>
<td>21.1%</td>
</tr>
<tr>
<td>To a large extent</td>
<td>33.8%</td>
</tr>
<tr>
<td>To some extent</td>
<td>26.8%</td>
</tr>
<tr>
<td>To a small extent</td>
<td>11.3%</td>
</tr>
<tr>
<td>To a very small extent</td>
<td>7%</td>
</tr>
</tbody>
</table>

“To a large extent” (33.8%) is the common response, followed by “to some extent” (26.8%), which reveals that suppleness is regarded by some respondents as a significant fitness component that must be developed to prevent injuries, while others address it briefly (18.3%, which sums up the percentages for “to a small extent” and “to a very small extent”), perhaps believing that other motor qualities are more important to be trained in their sport. It seems that all depends on the practiced sport and the individual needs of the athlete; and may be on the openness to the new requirements of modern sports or, quite the opposite, on the “rooted” experience which is thought to be the best, so there is no need to change it.

9. How often do you use specific exercises to develop suppleness?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very often</td>
<td>31%</td>
</tr>
<tr>
<td>Often</td>
<td>23.9%</td>
</tr>
<tr>
<td>Moderately</td>
<td>36.6%</td>
</tr>
<tr>
<td>Rarely</td>
<td>5.6%</td>
</tr>
<tr>
<td>Very rarely</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

Specific exercises to develop suppleness are moderately used (36.6%) in general, which is in line with the previous responses related to this issue. Surprisingly, 8.4% (totalling “rarely” and “very rarely”) have other priorities in their kinetotherapy sessions. But probably they use other terms instead of “suppleness” and therefore they train flexibility or mobility or elasticity, words that do not appear in our questionnaire. Terminology is a critical issue in many sports disciplines and events, which often creates confusion and generates false responses.

10. How often do you use specific exercises to develop other qualities needed to prevent shoulder dislocation?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very often</td>
<td>24.3%</td>
</tr>
<tr>
<td>Often</td>
<td>44.3%</td>
</tr>
<tr>
<td>Moderately</td>
<td>20%</td>
</tr>
<tr>
<td>Rarely</td>
<td>10%</td>
</tr>
<tr>
<td>Very rarely</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Specific exercises to develop other qualities needed to prevent shoulder dislocation are used more often than those aimed to develop suppleness (44.3% versus 23.9%). It would have been interesting for us to know the qualities that are prioritised in the prevention of shoulder dislocation during the kinetotherapy sessions, but the respondents were not asked to mention at least one of them. This would have provided information about the respondents’ views of the issue and their way of managing it.

11. Do you think that suppleness is similar to joint mobility and stability?

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total agreement</td>
<td>14.1%</td>
</tr>
<tr>
<td>Agreement</td>
<td>22.5%</td>
</tr>
<tr>
<td>Relative agreement</td>
<td>29.6%</td>
</tr>
<tr>
<td>Disagreement</td>
<td>9.9%</td>
</tr>
<tr>
<td>Total disagreement</td>
<td>23.9%</td>
</tr>
</tbody>
</table>

Most participants (29.6%) relatively agree with the statement, 23.9% totally disagree with it, and 22.5% agree with it. Besides, 14.1% totally disagree with the statement, while 9.8% disagree with it. Such responses indicate different perspectives and perceptions of some key terms, and therefore interpretations are divergent and probably influenced by each one’s previous learning. This usually leads to inconsistency and errors when interpreting the obtained results and drawing conclusions. There are still many fields of knowledge where a unified terminology remains an ideal.

12. Do you think that suppleness needs to be developed to the same extent as the other components of motor ability?

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total agreement</td>
<td>49.3%</td>
</tr>
<tr>
<td>Agreement</td>
<td>29.6%</td>
</tr>
<tr>
<td>Relative agreement</td>
<td>14.1%</td>
</tr>
<tr>
<td>Disagreement</td>
<td>5.6%</td>
</tr>
<tr>
<td>Total disagreement</td>
<td>1.4%</td>
</tr>
</tbody>
</table>
Most participants (49.3%) totally agree with the statement, which is somehow in contradiction with the previous responses to questions related to suppleness, because this percentage is rather high. Therefore, almost half of the participants admit that suppleness needs to be developed to the same extent as other components of motor ability; but only theoretically, because, in practice, developing suppleness is not a priority for many of them, which is clearly highlighted by their responses to the previous questions. If the first two percentages are cumulated, the total is 78.9%, which is really great and indicates better awareness of the fact that suppleness should be trained as much as the other components of motor ability.

13. What means do you use in your training programmes to prevent shoulder dislocation?

The responses are quite diverse, but we can notice that certain means are mostly specified, such as the push-ups (2.8%) and muscle toning (2.8%). Other means listed by the participants in our questionnaire were: isometry, Kabat diagonals, elastic (resistance) bands, avoiding aggressive contact, warm-up, stretching, massage etc.

14. What is your professional background?

<table>
<thead>
<tr>
<th>Kinetotherapist</th>
<th>Reflexive therapist</th>
<th>Physiokinetotherapist</th>
<th>Student</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.9%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>59.7%</td>
</tr>
</tbody>
</table>

The professional background of most respondents (59.7%) is various and unclear, because we do not know the meaning of “other”. It would have been interesting for us to find out about this, which might have helped us to explain some responses, but no details were required in this regard. Anyhow, a considerable percentage of 31.9% is made up of specialists in kinetotherapy, so we are entitled to think that their responses are reliable.

15. How many years of experience do you have in kinetotherapy?

<table>
<thead>
<tr>
<th></th>
<th>0-2 years</th>
<th>2-4 years</th>
<th>4-10 years</th>
<th>10-20 years</th>
<th>Over 20 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.1%</td>
<td>14.3%</td>
<td>20%</td>
<td>22.9%</td>
<td>5.7%</td>
<td></td>
</tr>
</tbody>
</table>

Most respondents (37.1%) have between 0 and 2 years of experience, so they are “fresh” into the job, and therefore enthusiastic and ready to help with their minor experience. Besides, young people are very active on the Internet, so they were the first to identify our questionnaire and give responses to the 18 items proposed by us. By contrast, those with over 20 years of experience are in a very low percentage (5.7%). Of course, they are much more numerous on the labour market, but certainly they are busier than the youth and do not have enough time to surf the Internet or the willingness to fill out a questionnaire issued by a stranger. Life restricts availability and makes us selective.

16. What is your educational background?

<table>
<thead>
<tr>
<th>High school</th>
<th>Bachelor’s degree</th>
<th>Master’s degree</th>
<th>PhD</th>
<th>Postdoctoral studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1%</td>
<td>31.4%</td>
<td>52.9%</td>
<td>4.3%</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

Almost all participants (92.9%) are graduates from higher education institutions, predominantly holders of a Master’s degree, which shows that they have an educational background allowing them to provide relatively well-informed responses. We say “relatively” because of the 38.5% percentage (including high-school graduates, 7.1%, and those holding a Bachelor’s degree, 31.4%), whose responses might not be totally reliable due to their lack of experience and perhaps their subjectivity resulting from personal feelings and intuitions.

17. What is your gender?

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>23%</td>
<td>77%</td>
</tr>
</tbody>
</table>

The female participation in our questionnaire is clearly superior to that of males (77% versus 23%). Despite this disproportion between the two genders, we appreciate the respondents’ kindness to share their opinions and contribute to the progress of a survey with scientific purposes. Such an attitude reveals a high degree of awareness and involvement in the acts and facts of the today’s society, whose members try to reach findings expected to be important for a certain field of knowledge. Women are certainly more open to communication and more willing to be helpful, but this is known since the beginning of time.

18. What is your residence area?

<table>
<thead>
<tr>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>95.7%</td>
<td>4.3%</td>
</tr>
</tbody>
</table>
Respondents are mainly from the urban area, which it normal, because higher education graduates and kinetotherapy specialists work in the cities, where they have the equipment needed for patient rehabilitation, and also the network allowing them to access information (including our questionnaire). The rural population who responded to our questionnaire might have been made up of a small number of people working in villages, who seemed to be interested in keeping informed via the Internet and being useful to their professional community by getting virtually involved in various activities (in our case, filling out the questionnaire) to express their opinions on a certain topic.

Conclusions

After analysing the results, we can draw some conclusions and see whether the research objective and hypothesis are checked.

Thus, we can state that the participants in our questionnaire survey, most of them females (77%) from the urban area (95.7%), predominantly graduates from higher education institutions (92.9%), with a professional background in the therapy field (37.5%) and 0 to 2 years of experience (37.1%), have a quite clear picture of the risk of shoulder dislocation in performance athletes. In this regard, 38% relatively agree that shoulder dislocation is commonly encountered in this category of athletes and 45% totally agree that it can seriously decrease the performance of athletes (as a matter of fact, as any other injury that allows them competing, but with poorer results than in normal conditions when they use their full potential). Most respondents (70%) totally agree that kinetotherapy plays an important role in preventing shoulder dislocation and that athletes should participate in additional kinetotherapy sessions (59.2%), especially those practicing handball (35.2%) and rugby (32.4%), two sports considered by them to have the highest risk of injury (obviously, among the sports proposed in our questionnaire). 46.5% of participants totally agree that suppleness generally needs to be developed to reduce the risk of injury and 36.6% are fully convinced that joint suppleness should be developed to prevent shoulder dislocation. Of them, only 21.1% intensely use exercises aimed to develop suppleness in their kinetotherapy sessions, confirming that knowing and doing (theory vs. practice) are sometimes two different things. If specific exercises to develop suppleness are however used, this occurs moderately (36.6%), while other qualities needed to prevent shoulder dislocation are often used (44.3%). 29.6% of respondents relatively agree that suppleness is similar to joint mobility and stability, and this seems to be a key question that might have determined other confusing responses, and we insist that terminology is the cornerstone of any science. As for the means used by specialists in their training programmes to prevent shoulder dislocation, they are quite diverse, depending on each one’s knowledge, updated information and routines.

Based on these data, we can say the research objective has been validated, because we identified the respondents’ opinions on the role and development of suppleness to prevent shoulder dislocation in performance athletes. Concerning the research hypothesis, we can conclude that a number of specialists are aware that shoulder joint mobility improves after dislocation by applying a recovery programme based on the development of suppleness, but many participants are quite confused in their responses. The investigated sample and the online questionnaire survey might be the answer for this situation.

All in all, further effort should be provided to raise awareness on the topic of preventing shoulder dislocation in performance athletes through the development of suppleness.

References


VIOLENCE IN SPORTS

Constanța URZEALĂ1*, Silvia TEODORESCU1

1 National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
*Corresponding author: ritmicuta@gmail.com

Abstract. Nowadays, violence is encountered in more and more social and professional contexts, the management of aggression becoming a phenomenon which is increasingly difficult to control. Violent acts against other people and the environment have repercussions on the evolution of the human species and may degenerate into extreme situations. The fact that sport is a social phenomenon entitles us to analyse some issues related to the manifestation of aggression in sports. The fierce struggle for victory leaves the impression that aggression and violence are integral and necessary components of sportsmanship conduct, which actually diminishes the real values of sport. For this reason, we want to highlight that, while combativeness is the individual’s general inclination to compare with others in order to surpass them and surpass oneself, aggression is the negative, destructive tendency that finds numerous opportunities to manifest, which is why it must be inhibited and controlled. Aggression turns into violence when the athlete, from a desire to win, intentionally causes physical or emotional pain to the opponent. Unfortunately, a “win-at-all-costs philosophy” has often led to unethical and aggressive behaviour, with a negative and destructive impact on the development and wellbeing of young athletes and society, in general. Tolerance in sport becomes a moral value that should be part of the early education of the individual, along with the instruction strategies focused on the management of emotions.

Keywords: violence, aggression, combativeness, sports.

Introduction

Nowadays, violence is encountered in more and more social and professional contexts, the management of aggression becoming a phenomenon which is increasingly difficult to control. Sociological studies highlight that, although people generally have the same particularities, men are more aggressive, dominant, violent and competitive than women (Brown, 1991; Segall et al., 1990; Ghiglieri, 1999). These aspects are fostered by the interpretations of human personality in evolutionary and biological terms (the level of testosterone conditioning aggressive behaviour), while the social learning approach emphasises that individuals and groups differ from both the intra- and intercultural points of view as regards their propensity for aggression and violent behaviour.

Violent acts against other people and the environment have repercussions on the evolution of the human species and may degenerate into extreme situations. The fact that sport is a social phenomenon entitles us to analyse some issues related to the manifestation of aggression in sports.

There are specialists who consider that socialisation (as a learned response) might be the cause of violence and aggression in sports (Nucci & Young-Shim, 2005). Socialisation can be influenced by participation in sports activities, since sports provide a microcosm for living and society. The structure of social relationships in sports influences the development of participants’ social skills. Based on these prerequisites, researchers have tried to answer whether sports offer a positive experience for the formation of social skills or, on the contrary, reinforce aggression (Nucci & Young-Shim, 2005).

Supporters of the beneficial effects of sports activity on interpersonal relationships believe that human beings cannot live a meaningful life in isolation and can have a more efficient and healthier life through association with other peers; consequently, people have to learn how to live together. Performance sports provide learning environments where participants have the opportunity to experience competition, cooperation, role-playing and discipline with regard to rules, regulations and goals (Bloom & Smith, 1996). In this respect, sports can be seen as a laboratory of human experience. The structure of social relationships in organised sports activities can give participants experience in different roles and group interactions and can contribute to the development of social skills that integrate them into existing larger social structures (Nucci & Young-Shim, 2005).

Unfortunately, a “win-at-all-costs philosophy” has often led to unethical and aggressive behaviour, with a negative and destructive impact on the development and wellbeing of young athletes and society, in general.

As a result, the following question remains open: does sport provide a positive experience for managing instinctive aggression or sport fosters and reinforces aggression by its extremely competitive nature?
Topic addressed

Violence – aggression – combativeness

The phenomena of sports aggression are controversial and result in less encouraging conclusions drawn by specialists, who even take into account the interdiction or suspension of some sports activities that they consider to have a destructive nature (Epuran, Holdevici, & Tonita, 2001, p. 196).

In sports, aggression represents a complex emotional state, a specific cognitive structure with a strong motivational basis, which engages the entire psychological life. It mainly occurs when the athlete is prevented from fulfilling his/her tasks or achieving certain goals. However, aggression is accepted in sports activity, in the sense that teams are prepared and willing to compete. Team aggression in contact sports games is intrinsic and sanctioned, provided that interactions between players remain within the limits of regulations, which act, in this case, as a kind of contract in the pursuit of aggression (Kerr, 1999, p. 116).

Although most people consider aggression as a negative psychological feature, some sports psychologists highlight that aggression can improve performance (Widmeyer & Birch, 1984), taking into account assertive behaviour (Bredemeier, 1994), according to which a player will observe the rules and will not have any intention to harm an opponent, even though the match is played at a very high intensity.

In sports, aggression was divided into two categories: hostile aggression and instrumental aggression (Silva, 1983). Hostile aggression occurs when the main aim is to cause harm or injury to an opponent. Instrumental aggression occurs when the main aim is to achieve a goal by using aggressive behaviour. For instance, a rugby player aggressively tackles an opponent to win the ball; the player does not use aggression to hurt the opponent, but rather to gain an advantage.

Coulomb and Pfister (1998) conducted a study on aggression in high performance sports; the results highlighted that skilled athletes used more instrumental aggression to resolve competitive actions in their favour and that hostile aggression was less used. Experienced athletes show increased self-control that helps them manage their aggression.

Specialists go on arguing that, although “controversial as it may sound”, it should be reasserted that sanctioned violence and aggression are a necessary part of team contact sports, and those who participate know that there are risks of physical injury and sometimes even death (Kerr, 2002, p. 72). This is similar to practicing extreme sports, where athletes assume a certain degree of risk (for example, skiing, snowboarding, motorcycle racing) (Chirivella & Martinez, 1994; Zuckerman, 1983).

Sports psychologists admit that aggression and violence, kept within statutory limits, are a primary source of enthusiasm, pleasure and satisfaction for players, and thus a major factor in their motivation for participation (Kerr, 1999; Novak, 1976; Russell, 1993). This argument was not made to exonerate unsanctioned aggression and violence, but to understand the real nature of these sports (Kerr, 2002, p. 72).

Epuran et al. (2001) mention the studies conducted by Folkamer on the sports team, which is regarded as a miniature society that involves frustrating-type interactions, rewards and interrelations of all kinds. The author considered personal aggression (faults), verbal and physical aggression as aggressive manifestations. The data obtained by Folkamer reveal the following aspects:

- defeated teams commit more violations of the rules compared to the winning ones; frustration entails the open expression of aggressive behaviour;
- teams that play at home have fewer violations of the rules than those playing away. The author explains this by the influence of the unfamiliar and hostile environment on the behaviour of athletes; in this case, aggression is directed to opponents and spectators as well;
- less violations of the rules are found when the team has more scored goals compared to situations where the effectiveness is lower. The author believes that, with each scored goal, the level of mental strain decreases and the structure of the relationships between players changes;
- teams that occupy a more modest place in the rankings have a larger number of violations of the rules due to the higher level of frustration within the team; it acts more aggressively even when it wins;
- in competitions between two teams that occupy different places in the rankings, the better placed team will be more aggressive, as an expression of its superior status;
- when the game involves teams that are on extreme places in the rankings, more irregularities are noticed than when it involves teams having close values. The author assumes that players in higher-ranked teams are strained because they are afraid of losing the championship or the title, while more poorly-ranked teams only fear relegation. Medium-level teams do not confront with such problems and consequently are more relaxed;
when the score difference is large, more aggressive behaviours arise than when the score is equal. When teams have equal scores, they strive to win and, for this reason, they self-control to avoid unnecessary aggressive manifestations.

In the opinion of Romanian experts, aggression should not be confused with antisocial behaviour, delinquency and criminality. The boxer’s conduct is not antisocial and the more aggressive it is, the higher its efficiency (obviously, within the limits of regulations). Conversely, not any antisocial behaviour, including the criminal one, can be characterised by aggression. There are infringements committed by inaction, so without aggression. Quite often, aggression is associated and even confused with violence. Of course, aggressive behaviour is often violent, but there are also cases of aggressive conduct with a clear intent to harm, to injure in non-violent forms (Mitrofan, 2003).

Sport, a field of competition, combat and rivalry, also includes aggression phenomena that sometimes lead to discouraging conclusions, in light of the following aspects (Epuran, 2013, p. 298):

- the brutality specific to some sports where the victory is achieved by eliminating the opponent, in full compliance with the provisions of the regulations;
- the brutality manifested by some athletes towards their partners (opponents), as a means to intimidate them, decrease their physical potential or gain an advantage, despite the statutory provisions;
- cheating, evading these provisions when referees or officials are not sufficiently vigilant;
- the use of doping means that offer unauthorised advantages and can also be translated by self-aggression, through the late consequences;
- derision or insults against the opponent etc.

In sports, combativeness is the most commonly used term to designate the intense physical, motor and mental commitment required in training and competitions; it opposes the aggression term, which involves eliminating the opponent. Combativeness is specific to sports activity, which seeks success within the boundaries of regulations and fair-play.

What matters in triggering (or not triggering) aggressive behaviour is not the event or the situation itself, but the interpretation given to it and the emotional states that accompany the perception and interpretation processes. Under these conditions, aggressive behaviour should not be considered as an isolated response to a singular aspect of reality, but rather as a dominant aspect of the individual way of understanding and coping with situations. Therefore, emotional experiences play an important role.

An aggressive act may present both violent and non-violent forms. Violence materialises in aggressive acts that, when taking place, involve the use of force or physical constraint and are one of the major forms of aggression.

In the literature (Zahn, Brownstein, & Jackson, 2004), violence is related to the following six dimensions:

- level of action of the behaviour (individual, interpersonal or collective one);
- nature and degree of force;
- outcome of the action, including the degree of injury;
- type of harm (for example, physical damage, emotional degradation, interpersonal domination);
- nature and significance of the target;
- degree of intentionality of the action.

Increased aggression and, in this case, violence on sports grounds is caused by several factors (Dragnea, 2006, p. 159):

- the high stakes for victory made by club leaders, spectators and the media;
- the team atmosphere regarding the need for aggressive conduct that leads to performance;
- the increased rates of violence and criminality in society;
- promoting aggressive conduct through the media.

Violence in direct contact sports

Direct contact sports are among the typical motor activities that generate aggression between opponents, and situations where athletes are violent on the sports grounds are common. Also, conflicts between spectators, which degenerate into violent actions and acts of hooliganism, occur frequently. Of course, according to the official rules of competitions, violent physical and verbal manifestations, unsportsmanlike gestures and antisocial behaviour of both players and supporters are sanctioned. However, sports events where violence annihilates sports values and shades performance are not rare.
If usually man becomes aggressive from the desire to be better than others, from the need for comparison to assert his value, there are cases where aggression also manifests in the form of social maladjustment (personal dissatisfaction, educational gaps etc.).

There are sports activities that, by their nature, involve increased violence from direct participants. In this respect, the most eloquent example is boxing, a sport with long-standing roots in the Ancient Olympics, which has remained in the circuit of Modern Olympics as a symbol of the traditions related to this competition. Regarding this sport, authors like Simon (2007) talk about the impact that violence in a boxing match has on spectators, who, watching such an interaction between two individuals, become more tolerant of physical aggression and more violent in various contexts outside sports arenas. Idolisation of boxers and the popularisation of their victories among people and especially among children are interpreted by psychologists and sociologists as less beneficial in terms of individual development. The fact that athletes turn into social models due to their performances is the starting premise of specialists who argue that violence in sports can distort the perception of physical aggression and the control of one’s own impulses of rage and revenge. The higher level of civilisation that has been reached is the argument that supports the idea of not exposing the public to acts of violence either in sports or in other fields.

On the other hand, the option of individuals to practice a combat sport is based on different reasons. It is not unusual for great boxing or wrestling champions to overcome their social condition through sport, finding in disciplines with hard contact between opponents a favourable environment for emotional release and the manifestation of rage, frustration and other negative emotions. Wacquant (1992) conducted a study in a boxing club in a socially disadvantaged neighbourhood in Chicago. The researcher has demonstrated that there is a strong interaction between boxing skills and social habits, social paths, living conditions, ghetto ambiance etc. The mix of technique and symbolism in boxing practice is a way of expressing violence in everyday life, in an attempt to get away from a socially disadvantaged environment, to escape from a harmful, aggressive, dysfunctional universe marked by physical and moral insecurity. In this case, combat sport becomes a means of social self-assertion, emotional management, education of self-control, generating controlled violent situations in which protagonists are somehow protected by the referee, through the competition rules. On the opposite side, real aggression in socially disadvantaged environments may lead to dramatic situations, where the bodily integrity of individuals is much affected, even to the most undesirable effects.

Nevertheless, combat sports enthusiasts deliberately expose themselves to physical aggressions that can mark their health in the long term, besides the body wear and tear specific to performance activity. Dunning and Malcom (2003, p. 69) talk about a paradox of these sports, highlighting that, among fighters, who are seen as strong, with a very good physical condition, a very good health status and increased physical strength, there is a high incidence of chronic traumas, disabilities, alcoholism, drug use, obesity and heart disease.

Starting from the premise that physical aggression is more increased in combat sports compared to other sports, sociologists differentiate within them the aikido and judo fights. Clement (cited by Corneloup, 2002, p. 143) reveals that, in combat, the direct hard physical contact (kimono – in aikido and judo) and strength prevail, unlike contact martial arts, where there is an expressive and subtle exchange of blows that are not based on the raw strength of athletes. It should be mentioned here that martial arts benefit from a specific behavioural code that encompasses distinct moral and ethical values observed by all athletes. Under this code, the acts of uncontrolled physical violence and aggression rarely occur. In the case of wrestling, there are societies that have old traditions in this sport (e.g. Iran, Russia, Romania), where the social models of great champions convey strong moral values based on respect, mutual support, unconditional involvement and gratitude.

Although the specific content of combat sports involves an increased manifestation of violence, the benefits of practicing them cannot be neglected, as long as they serve to meet some needs of performers, who take the risk of exposing their bodily integrity. The public has the option of watching or not a competition of this kind. Dunning and Malcom (2003, p. 69) talk about a paradox of these sports, highlighting that, among fighters, who are seen as strong, with a very good physical condition, a very good health status and increased physical strength, there is a high incidence of chronic traumas, disabilities, alcoholism, drug use, obesity and heart disease.

Another category of sports with increased physical aggression is that of team sports. Sports games with direct contact between opponents involve an intrinsic and positive manifestation of on-field violence, with a fine line delimiting intentional violent acts applied by an athlete to an opponent and involuntary, spontaneous actions through which a player is hit, in search of solving a problematic situation during the game (Kerr, 2005, p. 7). Unsporting gestures are sanctioned by the referee, which gives some advantage to the hit athlete. Sometimes players have violent tactical game strategies and are instructed to be unscrupulous on the field, a situation...
involving an increased risk of injury and/or occurrence of violent conflicts. In performance sports, players’ bodies can be considered real weapons in the case of hard and aggressive on-field contacts. Their decision to practice violent contact sports at the highest level, although they are exposed to the risk of injury, depends on a complex social and psychological context (Dunning & Malcom, 2003, p. 63).

Sports games such as football, basketball and baseball may involve aggressive tactics, but real violence is considered to be outside the statutory limits. In sports such as American football, ice hockey, rugby and water polo, sports contact involves certain levels of physical violence, but in this case too, game regulations include restrictions and sanctions for the excessive and dangerous use of force. Visible physical actions that occur in sports can be described as both aggression and violence (Kerr, 2002, p. 68). These actions took place for many reasons and can become dangerous for both athletes who interact on the field and spectators watching the competition. Physical interactions between players/fans were subdivided into two types of distinct actions, namely aggression and violence (Brink, 1995, p. 29). In rugby, the play is hard, aggressive by its very nature, consequently the borders between the permissible and the unacceptable are not always very clear, both being inherently violent. The distinction between hard (aggressive) play and foul (violent) play is given by the team members’ behaviour, and one player is enough to be violent, defy the rules and hurt the opponent(s); the athlete’s unsportsmanlike behaviour is not directed to winning victory by the technical and tactical domination over the opponent, but to the private goals of rage and revenge, to “get at” a specific opponent in order to “prove his supremacy”. Aggressive physical actions, such as tackling in American football, scrums in rugby and technical combinations coupled with the use of body strength in ice hockey, can be extremely violent actions, but which fit into the rules of the game, as they are not intentionally performed to hurt the opponent.

Violence in sports, in the case of children

Several studies analyse the influence of sports events that have a certain degree of violence on the child. Accepting a certain degree of violence in performance sports sends a message to children and young people, who might consider that, to some extent, aggression is necessary to achieve success (Brackenridge, Kay, & Rhind, 2015, p. 19).

As regards children, there are situations where violence in sports can influence their development and transformation into physically and mentally healthy individuals, into balanced members of the society in which they live. Although sport is a useful tool in character building, violent situations with which children might come into contact are sooner or later reflected in their education and development. At national level, violent acts against children, as athletes, were part of the training methodology of some coaches in the communist era. If, in the past, there was a tendency not to talk about violent practices in sports training, we have noticed that, in recent decades, this issue is no longer avoided by specialists and the media in several countries. Studies such as that of Jamieson and Orr (2009, p. 92) analyse the causes for which coaches apply some violent instruction measures. Beyond any justification, physical aggression towards a child is a reprehensible and inadmissible action, knowing that repercussions on their development can be very difficult to recover (psychological trauma).

The literature mentions several elements for the child protection against violence in sports which he or she is exposed either as an athlete or a spectator, by creating a safe and protective sporting environment. Brackenridge et al. (2015, pp. 13-15) analyse eight of them:

- attitudes, traditions, customs, behaviour and practices in performance sports activity – the child will be protected from acts of violence if there are no such habits in the sporting environment that he or she uses to attend; the authors argue that the phenomenon of globalisation in sports will lead over time to the elimination of possible violent practices against children;
- governmental commitment to fulfilling protection rights – close cooperation between the government, sports federations, sports clubs and social services for child protection is needed, so that this approach benefits from political support, financial resources, legislative provisions etc.);
- open discussion and engagement with child protection issues;
- protective legislation and enforcement – the sporting environment must respect the child’s rights, as well as the educational school environment, even if sport is a secondary concern for the authorities;
- the capacity to protect among those interacting with the child in the sporting environment (coach, choreographer, kinetotherapist, bus driver etc.);
- development of child’s life skills, knowledge and participation – all children must take part in the sporting act to enjoy the benefits of motor activities;
- monitoring and reporting;
services for recovery and reintegration – even if sport is a means of social reintegration and recovery from psychological trauma, this benefit cannot be brought to a child who develops in an unsafe violent sporting environment; although, for various reasons, children resist many years in such an ambiance, but when they reach maturity, some of them declare they do not want any longer to hear about that sport.

Violence in sports, in the case of supporters

Sports events are perceived as scenes of an honest hierarchy based on the real merit of the athlete, with equal opportunities for all competitors and the award of the title of champion, regardless of socioeconomic status, profession, race, culture, nationality etc. Given that other social contexts are full of favouritism and acts of corruption, the space of sports competition is considered to be pure and protected from injustice or discrimination (Duret, 2008, p. 28). In this context, the violence of some spectators is a release of personal frustration triggered sometimes by the lack of impartiality of the referees. They identify with the athlete or their favourite team and intensely feel the injustice on the field, becoming aggressive if they notice any refereeing error or any questionable situation related to the award of points. Consequently, sports competitions are not just about the confrontation of opponents on the field. The public is a competitor next to the athletes; in this situation, it expects victory, more precisely wants it and tries to do what depends on it, so that this becomes reality. It plays its role, in the position it has in the stands, by its own means, gives indications, criticises, shouts, cheers to encourage its favourites, whistles, uses irony and defies to demobilise the opponents (Georgescu, 1998, p. 65).

The stakes of sports competitions, the passion for a particular sport and the admiration for certain players can make supporters become aggressive when their favourite team or athlete does not achieve a favourable score to win. Psychologists explain these violent behaviours through both the failure to meet the needs for which individuals have taken part in the sporting act and their unsolved problematic mental issues. Fans are distinguished by their behaviour, falling within several typologies: temporary, local, devoted, fanatical and dysfunctional ones (Hunt, Bistol, & Bashaw, 1999).

Supporters are known to participate in a sports event for various reasons, such as the need for belonging to a group, the need for breaking the monotony of everyday activities, the need for social assertion by identifying with the favourite athletes, the need for entertainment etc. The lack of personal fulfilment felt by fans after a failure of the athletes they support may degenerate into acts of violence manifested in the stands and sometimes elsewhere.

Wann et al. (2008) have identified eight motives that are most often invoked for participating in a sports event, as a spectator: escape, economic, eustress, self-esteem, group affiliation, entertainment, family and aesthetics. They differ in women compared to men, as well as from one sport to another.

There are studies of specialists who argue the attraction or repulsion to a certain sports activity through the connection between sport and the projection-identification of spectators with emblematic athletes, based on the symbolic function of sport. Females prefer activities where competitors are less aggressive, while men like better combat sports (Corneloup, 2002, p. 140).

Duret (2008, p. 33) talks about four types of spectators who participate in the sporting show for different reasons:

- the mere spectator – the individual considered impartial, who does not necessarily supports a certain team and participates for the beauty of the game, without being a subscriber; he appreciates the successes of both teams on the field or disapproves unsuccessful actions or refereeing errors;
- the supporter – the individual who supports a certain team, regularly participates in competitions as a member of a group, is faithful to his favourite team and believes that the victory depends on his support and actions;
- the fanatic – the individual who is younger and more organised than the supporter, allocating increased time to the sports event already during the week; he protects his favourite team and the group to which he belongs, wear the marks of that club, hoists flags or banners, sings his own anthems or utters his own slogans, builds a reputation and requires respect; he may cause acts of violence;
- the hooligan – the individual who does not participate for the sporting show, but to make a show of himself; he easily generates conflicts and manifests violently before, during and after the game; he organises in groups to confront and fight with the opposing team’s supporters; he adopts vendetta-type behaviours, perpetuating rivalry between the favourite team and another specific one.

In mercantile terms, knowing these needs and the typology of sports consumers can be regarded as an opportunity to develop marketing strategies based on which sports events are regularly organised in certain regions, with the promotion of products or services, the involvement of the media etc.
Numerous manifestations of violence in sports are related to football matches, especially derbies, when fan rivalry exceeds rational limits, starting from frustrations linked to daily life, financial shortcomings, alcohol, physical appearance, personal fulfilment etc. All this leads to excessive actions (Corneloup, 2002, p. 178).

Bromberger (1995) states that football matches have a passionate, festive, fetish, archaic and sacrificial dimension, overflowing with cultural and social rituals that belong to a particular group. The author believes that, against this background, spectators’ violent manifestations fall into a metaphoric war, where harsh words are exchanged and a vulgar, barbaric language is used, and where clothing, banners, flags, vuvuzelas, tambourines etc. become symbols of a fight ritual. The ceremony of triggered violence increases group cohesion and shapes the identity of the galleries, for which sports competition is an opportunity to test and confirm masculinity.

Thus, sports competitions generate aggression and violence among spectators, given that both victories and defeats are celebrated or lived through street fights and scuffles, devastation of arenas etc. (Epuran, 1968, p. 139).

Many times, violent conflicts in stadiums degenerate, and the competitive space turns into an environment for the manifestation of issues related to racial and/or gender discrimination, political affiliation, nationality etc. The slogans for supporting the favourite teams are replaced by insults against political factors or by verbal expressions that offend certain athletes or representatives of the technical staff.

**Measures to prevent violence in sports**

Violence in sports can be counterbalanced by tolerance in sports, a desideratum of the European Council for both professional and amateur athletes. Additional security measures adopted in stadiums, video cameras, guards, crowd control, police etc., all these are part of a hooligan management strategy at European level, which includes campaigns for general public education and fan coaching. In the case of large-scale competitions, especially the football ones, interdisciplinary measures are taken to combat violence, which involves both the security forces and the responsible local officials, against the background of increased hospitality, which remains a priority. Efforts are constantly made to prevent the outbreak of violent acts throughout the competition. Local people are prepared, and foreign fans are carefully watched on the pre-day, the day and the day after the event. In the case of tournaments lasting several weeks, the masses must be controlled, so that the atmosphere remains calm and stress-free (Cameron, 2002, p. 13).

Higher authorities that pledge for the values of sport in social and performance terms implement numerous strategies to settle conflicts in sports arenas, by promoting respect, honesty and fair-play. Various public information campaigns aim at acquiring moral values in sport, promoting Olympism and raising awareness of the need to control aggressive impulses and manage negative emotions. Cameron (2002, p. 17) provides the example of Denmark, which has implemented the “Fair Fans” programme to prevent violence in sport, thus facilitating dialogue between rival supporters. Scotland is mentioned by the same author as an example of combating violence in sport through tolerance and fair-play, developing a positive culture for their supporters and making them responsible, as true ambassadors of moral values.

**Conclusions**

The fierce struggle for victory leaves the impression that aggression and violence are integral and necessary components of sportsmanship conduct, which actually diminishes the real values of sport. For this reason, we want to highlight that, while combativeness is the individual’s general inclination to compare with others in order to surpass them and surpass oneself, aggression is the negative, destructive tendency that finds numerous opportunities to manifest, which is why it must be inhibited and controlled. Aggression turns into violence when the athlete, from a desire to win, intentionally causes physical or emotional pain to the opponent.

Therefore, if we accept that sport is the mirror of a society, we admit that violence in sports arenas comes from a complex of social, cultural, economic, political, and last but not least, psychological factors, which also manifest in other environments, not only in the sporting ones.

Tolerance in sport becomes a moral value that should be part of the early education of the individual, along with the instruction strategies focused on the management of emotions.

**Authors’ Contributions**

Both authors contributed equally to this study and should be considered as main authors.
References


THE EFFECTIVENESS OF SPECIFIC CHEST MUSCLE TRAINING IN IMPROVING THE RESPIRATORY FUNCTION IN CHILDREN WITH CEREBRAL PALSY

Rodica POPESCU1, Eva ILIE1*, Dorina ORȚĂNESCU2, Ligia RUSU2

1 National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
2 Faculty of Physical Education and Sport, 146 Bretei Street, Craiova, Romania
*Corresponding author: eva_moldoveanu@yahoo.com

Abstract. The interdisciplinary approach to physical therapy for children with infantile cerebral palsy (ICP) is currently an action line with good and very good results in improving the quality of life. The complex assessment of cardiorespiratory status in children with cerebral palsy allows the development of kinetic programs that can be objectified and customised to improve their physical condition and, implicitly, their quality of life. The present research aims, based on the studied long-term cases and the observation of their evolution under the functional aspect, to obtain real data on the effect of a complex therapy of respiratory re-education in children with spastic tetraparesis. The results show that, after applying the kinetic program, the FEV1 values have increased to 50% of the predictive value. However, the evaluated subjects fall within the scope of moderate restrictive ventilatory dysfunction. It will be necessary to approach complex work programs including exercises for toning the respiratory muscles, but also correcting the scoliosis.

Keywords: infantile cerebral palsy, quality of life, respiratory re-education.

Introduction

Cerebral palsy (CP) describes a group of permanent disorders affecting the development of movement and posture, causing activity limitation, which are attributed to non-progressive disturbances that have occurred in the developing foetal or infant brain (Rosenbaum et al., 2007).

Cerebral palsy occurs in about 2 to 2.5 per 1,000 live births and is the most prevalent childhood neuromuscular condition seen by paediatric rehabilitation practitioners, including physical therapists. The prognosis for gross motor function among children with CP is extremely variable. This variation has been a key challenge for scientific descriptions of motor function as children with CP develop. It is also a fundamental consideration for clinicians who regularly deal with practical issues of examination, prediction, intervention planning and outcome evaluation when working with children with CP (APTA, 2001).

The spastic subtypes are the most common manifestations of cerebral palsy (Scholtes, 2006). Spasticity is defined as “a velocity-dependent increase in tonic stretch reflexes (muscle tone), with exaggerated tendon jerks resulting from hyper-excitability of the stretch reflex, as one component of the upper motor neuron syndrome” (Lance, 1980). Although the role actually played by spasticity in motor dysfunction may be less than that suggested by some authors, antagonistic muscle spasticity can limit the force demonstrated by an agonist muscle during voluntary movement (Knutsson & Martensson, 1980). This type of behaviour can influence not only muscle activity, but also vital organs. Medical and physical treatment in children with CP is therefore largely directed at minimising or eliminating spasticity. In either case, current treatment of spasticity is directed at diminishing neural activation of skeletal muscle in the belief that this will promote functional ability and prevent the development of contractures (Koman, Smith, & Shilt, 2004).

Pulmonary functions in healthy normal children are closely related to growth and development (Dickman, Schmidt, & Gardner, 1971). They are influenced by anthropometric, environmental, genetic, ethnic, socioeconomic and technological variations (Anudhakar et al., 1985). Among the various investigating modalities available, pulmonary function tests (PFTs) are an invaluable tool for the assessment of lung function (Nagpal et al., 2013). In the case of children with cerebral palsy, cardiopulmonary functions are changing completely, demanding a proper development of programs as regards the necessity of cardiopulmonary management.

The objective of this study was to assess the effectiveness of a complex treatment for the recovery of pulmonary functions in children with cerebral palsy, starting with a complex evaluation.

Methods

Participants

The study analysed the evolution of 10 subjects aged 7-14, diagnosed with CP, under medical supervision, and participants in neuromotor rehabilitation programs addressing aspects related to motor disorders.
The inclusion criteria were:
- subjects diagnosed with tetra-type CP and spastic hemiparesis;
- cooperative subjects;
- no associated pathology or surgery less than 1 year prior to initiating this program;
- GMFC (Gross Motor Function Classification) level that will allow the application of the work schedule.

The exclusion criteria were:
- subjects with significant motor deficit that does not allow movement and participation in the kinetic program;
- uncooperative subjects;
- reduced effort capacity and respiratory capacity.

Instruments and evaluation

The evaluation included functional clinical elements focused on the assessment of the quality of life, functional status and respiratory function, which will be presented below.

The equipment and protocol for evaluating the respiratory function were: a Microlab 300r, digital spirometry consisting of the single-use mouthpiece for airflow, a calibration syringe and records of the respiratory parameters. The spirometer was calibrated prior to the evaluation, the subject was placed in the sitting position, relaxed, and was instructed how to perform the manoeuvres, i.e.: normal breathing, maximum inspire/ maximum expire, then normal breathing. Three recordings were performed with 5 extensive breaths. The data collected from the equipment display were consistent with age, gender, height and race, information that was entered at the beginning of the record.

The measured parameters were: maximum expiratory volume per second - forced expiratory volume (MEVS-FEV1), FVC - forced vital capacity, FER - the FEV1/FVC ratio, the instantaneous peak expiratory flow (PEF) rate, the FEV1/VC ratio.

In this paper, we will only present the evolution of FEV1 and FEV1/FVC ratio, the relevant parameters for the characterisation of ventilatory dysfunctions. The evolution of FEV1 is indirectly influenced by the training of respiratory muscles, in the sense that the role of this exercise is to reduce the risk of developing respiratory obstruction occurring in a more or less disease-based context, but having a direct effect on the ventilatory capacity which can be improved. The parameters are presented like recorded value, percent of recorded value from the predictive value (generated by the equipment software according to age, height, weight and gender) and range for each parameter.

Procedure

The rehabilitation program is based on the kinetic intervention. The specific objectives of the kinetic program to improve respiratory function are:
- increasing the overall or segmental airflow by drainage;
- increasing the chest compliance;
- training the chest muscles;
- restoring muscle balance in the dorsal paravertebral area;
- increasing the amount of removed secretions, increasing oxygen saturation (SO2).

The proposed means of action

To begin, an environment conducive to the activity was created using dialogue or the game aimed at relaxing the subject. Then, they were explained how to inspire and expire correctly during the physical exercises and later during the corrective physical exercises.

A. The postural drainage

It was performed during the percussion recovery session and following the application of some rules:
- the pulmonary area was positioned vertically;
- each postural position was maintained between 3 and 7 minutes, depending on tolerance;
- the bronchial drainage of the upper pulmonary lobe is performed in the seated position, the percussion between the xiphoid and clavicle appendices is done along the chest wall anteriorly, bilaterally, for 2-3 minutes.

B. Combination of percussion and vibration

Percussions and vibrations applied in the drainage posture were related to the movements we make when we want to “remove ketchup from a bottle”, a shattering of the chest box called “clapping”. Certain subjects, however,
did not tolerate the posture for as long as it was needed for secretions to reach the upper airways. Therefore, these mechanical percussion manoeuvres were associated with the shortening of the time when the secretions were removed from the area where they were immobile. Percussions were of the type of tapping in the chest wall. Vibrations were applied in the sense that the ribs and soft tissue of the chest was moving during expiration.

C. Toning the respiratory muscles

To tone the respiratory muscles, there were used: a) physical exercises by manual manoeuvres, b) the Schufried system; c) breathing exercises from different positions were performed concurrently with exercises to correct the scoliosis identified in all subjects.

The Schufried system allows specific training, the subject following the curves on the feedback display, their minimum and maximum amplitude limits being determined according to the previously assessed respiratory parameters.

Thus, the participant performed inspiration and expiration with resistance at a certain pace, aiming to keep the frame within the curves displayed on the screen, as shown in Figure 1. The morphology of the curve to be followed included 30% inspiration, 60% expiration, and 10% was the pause. These percentages were modulated according to the subject’s tolerance and requirements, often increasing the percentage of inspiration. The subjects were trained on the training procedure and were in a comfortable seated position. We found that progressively, after about six weeks, the subjects were able to perform the exercises correctly, without biofeedback.

![Figure 1. The inspiration and expiration curves - biofeedback](image)

The main principles of the method are: loading, specificity, reversibility:

Loading: is obtained by the modulation of duration, intensity and frequency.

Specificity: high intensity, short duration, which allowed the improvement of force and low intensity, increased duration for increasing the endurance. Exercises begin after a forced expire (as close as possible to the residual volume) and finish at maximum capacity (forced inspire).

Reversibility: refers to the involution of respiratory parameters under conditions of therapy discontinuation for more than 1-2 months.

The management involved designing a training schedule based on reducing the training frequency by 1/3 for cases complaining of fatigue. These exercises represent a novelty in the approach to the recovery of respiratory function and have been designed to combine the action of the lower body muscles with a short period of apnea or breathing at a certain rhythm while maintaining a certain position.

Attempting to integrate movement into the breathing motions is to couple inspiration with the trunk in extension and then expiration with the lower body flexion. Each of the positions is maintained. This set of exercises was applied in two phases: in the first phase, we simultaneously pursued the global toning of the trunk muscles, without any functional integration. This type of exercise aroused the inspiratory muscles that had been isolated by lifting a weight. In the second phase (after 6 weeks), we integrated the activity of inspiratory muscles into a functional motor act.

The work intensity corresponded to a maximum effort, each inspiration occurring at high speed during fast run for 1-2 seconds, with a whistling sound to increase the flow rate. The opposite of this mechanism, in the case of expiration, was performed slowly and passively for 3-4 seconds.
Because the aim of our sets of exercises was to increase endurance in the inspiratory muscles, we determined the number of repetitions and the training frequency as follows:

- 4 months with 3 sessions per week, 30 minutes per session;
- for 4 weeks, 2 x 10 repetitions were performed, and in the next 8 weeks, their number increased by 20%.

After the first 4 weeks, loading was 30% of the inspired force in the first 2 weeks, then 2 weeks - 40%, 2 weeks - 50% and 2 weeks - 60%.

The physical therapy session was run over an interval of 50-60 minutes, 3 days a week.

Results

Table 1 shows the average maximum expiratory flow rate in the first second. The average is lower than predicted, which confirms the presence of ventilatory dysfunction.

Table 1. *Data on the maximum expiratory flow rate per second (FEV1) recorded in initial testing*

<table>
<thead>
<tr>
<th>No.</th>
<th>Initial testing</th>
<th>Pred.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>Recorded value</td>
<td>Pred. %</td>
<td></td>
</tr>
<tr>
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<td>48.72</td>
<td>3.9</td>
</tr>
<tr>
<td>2.</td>
<td>1.5</td>
<td>37.5</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>1.49</td>
<td>36.43</td>
<td>4.09</td>
</tr>
<tr>
<td>4.</td>
<td>1.8</td>
<td>43.06</td>
<td>4.18</td>
</tr>
<tr>
<td>5.</td>
<td>1.8</td>
<td>51.43</td>
<td>3.5</td>
</tr>
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<td>6.</td>
<td>1.7</td>
<td>43.48</td>
<td>3.91</td>
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<td>7.</td>
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<td>8.</td>
<td>1.15</td>
<td>57.78</td>
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<td>9.</td>
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<td>10.</td>
<td>1.18</td>
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<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>47.98</strong></td>
<td><strong>3.2</strong></td>
</tr>
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</table>

The FEV1/VC ratio is below the predictive level, its decrease to 66% indicating the existence of severe restrictive ventilatory dysfunction, as shown in Table 2.

Table 2. *Data on the individual FEV1/VC values recorded in initial testing*

<table>
<thead>
<tr>
<th>No.</th>
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<td></td>
<td><strong>Average</strong></td>
<td><strong>80.91</strong></td>
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</tbody>
</table>

Table 3 shows the average of spirometry parameters at the initial and final tests, which are present as percent from the predictive value. An average value of half the predictive value is found, even if it has increased by 0.12 l from the initial test, which means that the ventilatory dysfunction still remains, which should be considered when restructuring the recovery program.

Table 3. *Mean values of spirometry data in the two tests*

<table>
<thead>
<tr>
<th>Recorded parameter</th>
<th>Predictive value</th>
<th>Initial testing</th>
<th>Final testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recorded value</td>
<td>Pred. %</td>
<td>Recorded value</td>
</tr>
<tr>
<td>VC</td>
<td>3.9</td>
<td>2.14</td>
<td>57.92</td>
</tr>
<tr>
<td>FVC</td>
<td>4.9</td>
<td>2.8</td>
<td>57.53</td>
</tr>
</tbody>
</table>
Although there are no standardised FEV1 parameters, studies have reported specific values ranging from 1.06 to 2.17 litres. Analysing the initially recorded values, we note that the FEV1 falls within the above-mentioned limits, but represents only 47.98% at initial testing and 52.15% at final testing of the predictive value, indicating severe restrictive ventilatory dysfunction.

After applying the kinetic program, the FEV1 values increased to 50% of the predictive value. This increase is 13.13%, a progress in the vital capacity (VC), which is a proportional evolution of the two parameters, based on the improved expiratory function. However, the evaluated subjects fall within the scope of moderate restrictive ventilatory dysfunction.

The FEV1/VC ratio had an average of 66% before the kinetic program and 68.4% after participating in the program, therefore a 2.4% increase. We notice that this ratio is at the lower limit of values.

Although the restricted ventilatory dysfunction is maintained in all subjects, the kinetic program is moderate.

The analysis of spirometry data indicates a favourable evolution of the subjects included in the research, their respiratory function showing improvement with an increase in the FEV1/FVC ratio, which means an improvement in the permeability index, in the conditions where the VC has remained almost constant, the increase in vital capacity being predominantly related to inspiration and less to expiration.

The analysis of overall parameters, with relevant FEV1- and FVC-related elements, indicated that the evaluated subjects had non-specific pattern to severe restrictive ventilatory dysfunction in which the CV was less than 80%, and the FEV1 dropped to only 36.8% of the predictive value.

After applying the kinetic program, the values increased by approximately 13.13%, meaning a proportional evolution of the parameters, based on the improvement of the expiratory function. Even if the restrictive ventilatory dysfunction is maintained after the end of the kinetic program, it has a moderate level.

Although the parameters of the respiratory function have progressed, the studied subjects are still in the area of a moderate restrictive syndrome, which means that, besides the motor deficiencies that concern the thoracic muscles, there is also an important involvement of the vertebral static disorders affecting the respiratory mechanics.

It will be necessary to approach complex work programs including exercises for toning the respiratory muscles, but also correcting the scoliosis. Additional assessments are needed in this respect.

Conclusions

We observe that, in the study participants, the values of the two parameters are lower than the predictive values and we can conclude that there is severe restrictive ventilatory dysfunction. Although the parameters of the respiratory function have progressed, the studied subjects are still on the border of a severe restrictive syndrome area, which means that, besides the motor deficiencies that concern the thoracic muscles, there is also an important involvement of the spinal static disorders affecting the respiratory mechanics.

Although the evolution of respiratory parameters has been favourable, we do not believe that the kinetic program has a major long-term impact, which is why we consider it necessary to complete the investigations and also the kinetic program.

The fact that the evolution of volumes and breathing rates is not considerable, in a positive sense, requires the completion of the kinetic program with exercises that promote maximum inspiration.

References


GENERATION OF EFFICIENT BEHAVIOURS IN THE CASE OF PERFORMANCE ATHLETES

Florin PELIN¹, Radu PREDOIU¹*, Georgeta MITRACHE¹, Alexandra PREDOIU¹, Vasilica GRIGORE¹

¹National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
*Corresponding author: radu_predoiu@yahoo.com

Abstract. In performance sports activity, a particularly important problem is the strengthening, fostering, development of adaptive, effective, positive (desirable) behaviour and the suppression, removal, remission of undesirable behaviour. The regulation and self-regulation of behaviour implies the synergic action of all components of the human psychological system. The purpose of our study is to provide support for the specialists in the fields of sports science and physical education by describing useful techniques aimed at developing effective behaviours in the case of athletes, as well as stopping inappropriate conduct during training or competitions. Sports performance programmers (coaches) will learn to be experts in “behavioural surgery” and perform a functional analysis of athletes’ behaviour by identifying the elements of a situation with the highest information value. Last but not least, being aware that everything that an athlete does outside of the playing field (nutrition, hydration, rest, hobbies, recreational activities, sex life etc.) influences his/her competitive performance, coaches (but also the multidisciplinary team members, sponsors or representatives of sports federations) will be able, using the latest technology, to manage the behaviour of athletes on the road to great performance, even across the globe.

Keywords: behaviour, athletes, techniques.

Introduction

Any behaviour is directed towards adaptation to the environment - this is an assertion that, for certain psychotherapeutic methods and techniques (for example, NLP - Neuro-linguistic programming), is in fact an axiom.

Behaviour can be defined, from an operational point of view, through the following parameters: status, transformation and finality. Being a main parameter for defining the psychological behaviour, mental status has a particular importance for work efficiency and performance. It is a function of time and space. Transformation denotes the transition from an initial state A to a final state F through causal chains of the type A → B → C → … → F, by both invariant fixation (long-lasting phenomena) and prospective adjustments. The finality expresses the purpose (goal) of the behaviour.

The regulation and self-regulation of behaviour implies the synergic action of all components of the human psychological system. The improvement of self-regulation mechanisms is specific to human beings, due to the involvement of logical cognitive mechanisms and communication mechanisms - language (Mitrache, Tüdös, & Predoiu, 2015).

In performance sports activity, a particularly important problem is the strengthening, fostering, development of adaptive, effective, positive (desirable) behaviour and the suppression, removal, remission of undesirable behaviour. If a particular behaviour occurs in a specific situation, this means that the situation concerned includes a set of factors favouring that behaviour. Thus, through functional analysis, we can answer questions such as: “Under what conditions is there a greater likelihood of behaviour?” , “What are the circumstances that favour the emergence of certain behaviour?” or “Under what conditions is the behaviour the least likely to occur?” and “What are the circumstances that inhibit the occurrence of a particular behaviour? The analysis of athletes’ behaviour also involves the analysis of the optimal concentration time to achieve high-level performance, depending on the sport and the technical execution that will be performed (adaptation after Murăreţu, 2011).

The purpose of our study is to provide support for the specialists in the fields of sports science and physical education by describing useful techniques aimed at developing effective behaviours in the case of athletes, as well as stopping inappropriate conduct during training or competitions.

Topic addressed

In order to effectively manage athletes’ behaviours, persuasion is an important tool available to the coach. To be specialists in “behavioural surgery“, sports performance programmers need to pay attention to the following aspects (Harvard Business School Press, 2008):

- credibility – refers to trust and expertise; involves constructing positive relationships with athletes and acquiring expertise; credibility of the source (the coach) fulfills a very important role in the cognitive
motivation of athletes. In this context, it is essential how coaches communicate (in verbal, nonverbal and paraverbal ways), how they interact with the others in an effort to build their prestige and authority.

- **informational support** – athletes should be stimulated so that they want to learn more and more;
- **common ground** – beliefs, values are of particular importance; the information provided should be centred on both personal values and athletes’ values;
- **deep understanding of emotions** – the coach has to connect with the athletes’ emotions, has to be able to recognize the affective states experienced by athletes during competitions (and not only). Through their interventions, coaches should determine the athletes to carefully examine their own behaviour trying to find constructive solutions.

We present several techniques aimed at developing effective behaviours in the case of performance athletes (adaptation after Mih, 2010) (Figure 1).

![Figure 1. Techniques for generating effective behaviours](image)

*Shaping or gradual consolidation* involves establishing steps to follow in order to achieve the desired behaviour and providing reinforcements/rewards for each completed milestone. Effective behaviour is broken down into several components, and each component is rewarded as the athlete performs it.

Gradual strengthening is effective, for example, in the development of motor skills or the development of the ability to maintain attention (athletes are helped to form attentional psychological skills).

Reinforcements provided to the athletes should be administered steadily (in the beginning) and immediately after the behaviour in question. Later (when the desired behaviour starts to stabilise), the reinforcement can be intermittent. Note that positive consolidation is more effective than the negative one.

*The situational factor* requires explaining the athlete that, depending on the context, a particular behaviour may or may not be allowed. Thus, the coach has the task of telling athletes the situations in which certain behaviour can be manifested. For example: “You are allowed to shout if you want, not on the field, but in a place where no one can hear you (preferably), “You can talk to other colleagues, not during practice, but in a break” etc.

*Behavioural control* involves the following steps:

- ignoring minor inappropriate behaviour
- use of proximity

The persistent inappropriate behaviour of the athlete causes the coach to use proximity, namely to move closer to the athlete (or relocate the athlete closer to him/her in the workspace). Physical distances between the coach and athletes may be a barrier to communication, and therefore, the shortening of these distances should lead to stopping unproductive behaviour.

- avoiding interruptions and continuing the training through visual contact

The coach will continue the training process while maintaining a prolonged eye contact with the athlete who exhibits undesirable behaviour. Knowing that the look (the eyes) is the most expressive component of nonverbal communication, the coach will use it to control the behaviour of athletes.
nonverbal signs established by mutual agreement

In performance sports activity, performance programmers (coaches) should also have a very rich sign vocabulary – competitive rituals, tactics, playing systems (which can be activated by signs), with a decisive role in achieving success. Successful coaches know that, during competition, it is easier to make signs than to produce words (we also specify that during the ontogenesis, the centres of the brain that control physical movements develop faster than the centres of speech).

- prudent use of humour

In order to eliminate the athlete’s maladaptive behaviour, the coach may resort to humour. A well-placed joke can give the athlete a reason to think (to analyse his/her own behaviour). However, the specialist will be cautious in using humour (it is not allowed to ridicule athletes).

The Principle of Premack or grandmother’s promise (“If you eat vegetables, you will have dessert) consists of using reinforcements.

When manifesting effective behaviours, the athlete is rewarded with a pleasant activity, which is preferred by him/her. Thus, the athlete can choose the exercises to be performed at the end of the training or can be allowed (even guided), for a short period, to play on the computer – logical games and those involving strategy development are known to activate the left cortical sector, while the games of chance activate the left limbic sector (Roco, 2004) – the coach can thus stimulate different brain areas/sectors, which are important in planning and emotional control.

Prompting involves providing stimuli (prompters):

- physical guiding - the athlete’s movement is directed by the coach;
- verbal guiding - the messages that the coach sends before and during the execution of an action;
- modelling - the coach exemplifies repeating the steps of the process (verbal stimuli are also used).

Prompting aims to remind athletes, in a positive manner, their work tasks. The stimuli (prompters) are provided before and during the athletes’ activity in order to facilitate learning.

The contingency contract involves open talks between the athlete, parents and coach on the issues identified, discussions that materialise in the negotiation and signing of an agreement between the parties.

In working with pre-adolescents and adolescents, the contingency contract proved to be effective in eliminating unproductive behaviour manifested in competition, such as shouting on the sports field. For example, a 12-year-old athlete wrote on a sheet of paper: his name, what behaviour he would NOT adopt on the field and what rewards he would receive if he succeeded in his approach (the coach was in partnership with his parents).

The preadolescent was asked to write the date and sign at the end of the contract. A photocopy was made in the presence of the athlete to stimulate him (even more) to get involved - one copy was for the athlete and one for the coach. Within the term specified in the contract, the preadolescent managed to stop shouting on the field during the competition.

The contract will be formulated in positive terms (Figure 2):

- includes tasks in which the athlete will engage willingly
- contains the rewards that the athlete will obtain and the possible penalties he will receive in the event of non-compliance with the clauses
- positive reinforcements are preferred – “If you work well in training, you will go on that trip!” instead of negative reinforcements (“If you work well in training, I will stop bothering you!”)
- is useful in the following situations: aggressive behaviour of athletes, low motivation, hyperactivity, poor personal hygiene etc.

Figure 2. Essential aspects of a contingency contract

Also, a useful strategy to develop a certain type of athletic behaviour (for example, in the case of technical executions) requires the coach to make two positive comments, between which he/she will include the feedback on
what the athlete should do (the “sandwich” method). Thus, the athlete receives the criticism/information of interest (in our example, about the proper manner of executing motor actions) between two positive messages.

If the techniques above do not work and the athlete’s behaviour cannot be ignored, specialists can use the following methods (Figure 3, Table 1):

**Figure 3. Techniques for remission of inappropriate behaviour**

**Table 1. Eliminating unproductive behaviour in the case of athletes**

<table>
<thead>
<tr>
<th>Technical name</th>
<th>Operating mode</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time-out</strong></td>
<td>The athlete is deprived of certain privileges as a result of an inappropriate attitude during training or competition. Before implementing the time-out, the coach will establish: the warnings that will be given to the athletes, the types of behaviour to be sanctioned and the duration of the punishment. It is very important for the coach to observe what types of behaviour are imitated by athletes. When adaptive behaviour is imitated, showing that the athlete is motivated, the coach has to strengthen (by praise, graphical reinforcements, sports activities preferred by athletes, diplomas etc.) it. Instead, when improper behaviour is imitated (indicating that athletes lack interest and motivation), it should be discouraged by using acceptable punishments (Huber, 2013). By penalising inappropriate types of behaviour, the coach inhibits their manifestation in the case of other athletes who, by imitation, might take on the role model. For example, sanctioning an athlete for being late for the training session and being lazy - the coach can put the athlete on the bench at that training session, and thus he/she will discourage the other team members who, by imitation, may exhibit similar behaviour. In this situation, the coach sends out a clear message - if someone is not motivated enough to adopt certain behaviour, he/she should do something else/have another program.</td>
</tr>
<tr>
<td><strong>Win-win method</strong></td>
<td>If behavioural problems are generated by a social conflict, the establishment of a compromise between protagonists is intended. In this way, both the athlete and the coach will have the feeling of gain, not of loss.</td>
</tr>
</tbody>
</table>

**Cognitive-behavioural approaches**

**Learning rational thinking methods** - developing the athletes’ self-control ability through self-monitoring, autosuggestion and cognitive self-training

Through self-monitoring, athletes will record their reactions to the different situations they are going through. By means of autosuggestion, athletes can encourage themselves before desirable types of behaviour occur. Interior monologue is useful for impulsive athletes, improving performance and generating efficient behaviours.

**Reassigning**

Athletes need to become aware that the safest way of controlling behaviour is through their own (intellectual/time-related) effort.
Relaxation techniques
In stressful situations, the techniques based on breathing, visualisation, muscle contraction and relaxation, the induction of weight and warmth, can support athletes (see Predoiu, 2016, to learn relaxation techniques based on breathing, visualisation etc.).

The problem-solving method
D’Zurilla and Goldfield (1971)
In the case of impulsive athletes or those with interaction difficulties, the coach and athletes propose a common plan to solve the problem. Thus, they will: define the problem and the behavioural objectives; identify alternative ways for solving the problem (through brainstorming); set the milestones for achieving the goals; discuss the consequences of different types of behaviour.

An effective coach also uses the following strategies in the training process in order to prevent inappropriate conduct (Kazdin, 1988):

- *sets the rules* – athletes know in advance what is expected of them. The rules can be expressed by the coach in a positive way – “During training, we focus on the task, on what we have to achieve” or a negative way – “Do not talk at the same time with me when I explain something!”

- *organizes physical space efficiently* – athletes who are easily distracted will be placed farther from noise sources (for example, intense traffic), the level of visual and auditory stimulation will be controlled (non-functioning lights, devices whose functioning generates subliminal stress), and so the attention of athletes during training will not be negatively affected.

- *teaches procedures* – it is better for the coach to demonstrate how different devices/equipment is used in the training process (demonstration is sometimes more important than verbal instructions).

- *rewards appropriate behaviour* – the coach appreciates (reinforces) the manifestation of adaptive/appropriate behaviour (positive feedback, praise or smile stimulates the repetition of such behaviour).

Regarding positive feedback, it seems that an increase in its frequency is related to the increased performance of athletes (Kidman & Hanrahan, 2010). Also, positive feedback needs to be provided as quickly as possible after the obtained result, as opposed to negative feedback, which is more valuable if given with a certain delay (Lavigne & Good, 2015).

Providing negative feedback to athletes may generate a negative environment during training. In this context, coaches need to know (and avoid) a number of practices that have proved to be ineffective in training (adaptation after Mih, 2010) (Figure 4):

![Figure 4. Practices that should be avoided by coaches during training](image-url)
In order to effectively manage the behaviour of athletes, the coach should be a good observer to decode their emotional expressions. The human being is capable to distort information - to lie - at an early age. For example, at about 2 years old, around 30% of the children lie, at 4 years old, 80% of the children lie, and after this age, almost all children lie (it seems that adults cannot detect childhood lies more than 55% - Lee, 2016). We can imagine the accuracy with which an adolescent or a 20-year-old athlete can control his/her mime and pantomime (body postures, gestures) if they want to.

In the context where reaching high performance in sports involves an effort of sustaining and abstaining, the compliance with a certain lifestyle (we refer to nutrition and relaxation “hygiene”, recreational activities, sex life and hobbies), we consider it important to provide a possible behavioural rating scale (DePaulo et al., 1993, quoted by Chiru, 2003). Lying, as regards the behaviour or activities carried out at home or in different environments, will not be the same (Table 2).

Table 2. How to tell if the athlete is lying – nonverbal cues

<table>
<thead>
<tr>
<th>Condition/ Gesture</th>
<th>Frequency in liars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand to the head</td>
<td>12-1</td>
</tr>
<tr>
<td>Vague answer</td>
<td>10-1</td>
</tr>
<tr>
<td>Self-contact or playing with nearby objects</td>
<td>8-1</td>
</tr>
<tr>
<td>Interruptions</td>
<td>6-1</td>
</tr>
<tr>
<td>Glance at the clock</td>
<td>5-1</td>
</tr>
<tr>
<td>Hesitation</td>
<td>5-1</td>
</tr>
<tr>
<td>Weak eye contact</td>
<td>4-1</td>
</tr>
<tr>
<td>Dry mouth</td>
<td>3-1</td>
</tr>
<tr>
<td>Tightening the legs under the seat</td>
<td>3-1</td>
</tr>
<tr>
<td>Crossing the arms</td>
<td>3-1</td>
</tr>
<tr>
<td>Finger movement by tapping the table</td>
<td>2-1</td>
</tr>
</tbody>
</table>

| Other observations                               |                     |
| Dilated pupils                                   | Greater dilatation of pupils in liars |
| Body self-contact                                | The liars touch themselves more |
| Blinking                                         | The liars blink more often |
| Smile and position movements                     | The liars **DO NOT** smile or move significantly more/less comparing to other people |

And why not ... the coach can use the technology called “transdermal optical imaging” (Lee, 2016), which allows revealing hidden emotions associated with lying (based on changes in facial blood flow coupled with various hidden emotions), and therefore detecting lies non-invasively and even from a distance (based on video), with an accuracy of 85%. The importance of using computerised programs in managing/modelling athletic behaviour has been underlined many times (for example, Murărețu, Petre, & Teodoru, 2018). The use of different devices, simulators, virtual reality and augmented reality in modelling athletes’ behaviour is also discussed (Mihăilă, 2018). At the same time, researchers have highlighted the relevance of computerised testing in shaping junior athletes’ behaviour (Predoiu et al., 2017; Tüdös, Predoiu, & Predoiu, 2015; Grigore et al., 2017; Predoiu et al., 2017).

Figure 5. Example of a change in facial blood flow
When people lie, the flow of facial blood in the cheeks decreases, and at the level of the nose, it increases. Researchers called this phenomenon the Pinocchio effect (Figure 5). Verifying the compliance between the athlete’s lifestyle and training program is now an increasingly easier task, even in the other part of the world.

Conclusions

In an attempt to answer the question “How can we manage the athletes’ behaviour to maximise performance?”, we have presented a number of techniques that coaches can use during training to develop effective behaviours in the case of athletes, but also to stop inappropriate conduct manifested during training or competitions.

If a particular behaviour occurs in a specific situation, this means that the situation concerned includes a set of factors favouring that behaviour. Through the functional analysis of behaviour, specialists can identify the elements of a situation with the highest information value (Miclea, quoted by Mitrache, Tüdös, & Predoiu, 2015):

- background – refers to the set of factors and situations preceding the occurrence of the behaviour (where, when, in what context the athlete was before expressing that behaviour). The background provides information about “where, when, in what context/conditions a specific behaviour is likely to occur” or, on the contrary, not to occur.
- biography elements – include information about one’s personal history, data about the starting point of the problem, the recurrence of episodes and relevant experiences of the athlete in relation to the issue in question.
- the socio-cultural and physical environments.

In terms of behaviour, its observable and measurable characteristics are:

- frequency – how many times a particular behaviour occurred in the time unit;
- duration – the time interval between the beginning and the end of behaviour;
- intensity – the power, “magnitude” of behaviour;
- latency – the time elapsed between the occurrence of a stimulus (or the situation/context inducing a particular behaviour) and the emergence of the behaviour.

The techniques provided in this paper support the work of specialists in the fields of sports science and physical education, who, having the necessary “weapons”, will more easily generate efficient behaviours in performance athletes.

Everything that an athlete does outside of the playing field (nutrition, hydration, rest, hobbies, recreational activities, sex life etc.) inevitably influences his/her competitive performance, and the coach/ the multidisciplinary team members/ sponsors/ representatives of sports federations, will be able, using the latest technology (presented in this present paper), to manage, even from a distance, the behaviour of athletes on the road to great performance.

Authors’ Contributions

All authors contributed equally to this article and should be considered as main authors.

References


TACTICAL THINKING IN THE HANDBALL GAME

Cristina ROMILA¹, Sabina MACOVEI¹

¹National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania

Abstract. The handball game has developed a lot from the beginning of its practice until today and is constantly looking for improvement by introducing or modifying the rules of the game so that it becomes more spectacular or offers much more opportunities in both the attack and defence phases. In the sports field, thinking gets special connotations, because players are sometimes put in extreme situations for which they must quickly find the best solutions. From this perspective, the game of handball, as a heuristic and team sports discipline, requires the players to think and to respond quickly and promptly to the tactical situations that occur during the game. The player’s motivational reactions must be creative to defeat the opposing team and collaborate with the teammates. Players are required to be heuristic, sociable, with spirit of cooperation. This paper is a theoretical study that deals with the role of tactical thinking in handball.

Keywords: tactical thinking, tactical training, handball.

Introduction

The handball game has developed a lot from the beginning of its practice until today. It permanently seeks to improve the rules so that the game becomes more spectacular and/or offers much more opportunities in both the attack and defence phases. All of this directly concerns the tactics of the game.

We can give as an example the 7 against 6 in the attack phase, when the coach can take advantage of the situations during the attack phase by obtaining numerical superiority. The negative side is the risk of receiving a goal if the attack does not end with scoring a goal because the player who had to come to exchange could not manage to enter the goalkeeper position in due time.

Another rule is signalling the passive game, the attackers having the right to six passes after the passive play is signalled. In such situations, players must manage the game well and select the best solution to exploit both the attack and the score.

Another aspect is the 30-second rule at the end of the match or the use of the three timeouts in the match, which can determine the result of the game.

In fact, the number of scored goals has become a criterion in assessing the value of the team. The question we ask is: how many goals should a team score in order to score more than the opponent to win the match? And how good is the defensive tactics to deal with the attack tactics? (Pokrajac, 2009).

Handball has become very dynamic. Handball rules do not define the number of changes that the coach can make in the game. There are players who perform in the defence phase, others only in the attack phase. This can be used in a match as a tactical method to solve certain situations (Tůma & Vozobulová, 2010).

In the modern handball game, there is an evolution of the actions used in the attack and defence phases: the time of the ball possession is shorter; the transition systems are faster; the players’ profile is homogeneous; the variability of offensive and defensive collective actions requires very good physical training; for the effectiveness of the game plan, the systems must use the capabilities of each player involved in the game; in addition to good physical training, action and attitudes, personal wishes and motivation are also needed (Daza, 2012).

In near-level teams, the difference in the match is usually given by the tactical preparation.

The trend of the handball game in terms of tactical training refers to:

- individual tactical actions by using different slopes to determine the player to easily cross the opponent at different times of the game and to choose the most suitable method for taking advantage of the situation;
- using the player’s intellectual capabilities to solve the game situations at any time;
- developing the physical qualities that support and are the basis for the achievement of individual actions;
- simplified attack game based on the collaboration between players to ensure the offensive phase of the action;
- surprising the opponent through rapid attack phases before they organize the defence phase in the system (Balint, 2005, pp. 14-16).

The state of knowledge

Thinking can be defined as the action of using one’s mind to produce thoughts (Merriam-Webster Dictionary, 2017). From a psychological perspective, thinking is a mental process reflecting the general and essential attributes of the objects and phenomena of reality, as well as the relationships between them. It includes notions, judgments
and reasoning, and also a system of operations represented by comparisons, analyses, syntheses, abstractions, generalisations, concretisations (Epuran & Holdevici, 1993).

In the field of handball, thinking gets special connotations, because players are sometimes put in extreme situations for which they must quickly find the best solutions. From this perspective, the game of handball, as a heuristic and team sports discipline, requires the players to think and to respond quickly and promptly to the tactical situations that occur during the game. The player’s motivational reactions must be creative to defeat the opposing team and collaborate with the teammates. Players are required to be heuristic, sociable, with spirit of cooperation. This paper is a theoretical study that deals with the role of tactical thinking in handball.

Leon Teodorescu, the father of the sports games theory in Romania, consider that most individual and team actions are performed according to the rules and sports ethics in order to win (Teodorescu, 1967, p. 17).

In different situations, thinking is responsible for solving the problems that arise from the player’s perceptions. The solution for momentary tactical situations is also based on the principle of anticipating the next moments and future effects.

Tactics should be regarded as a complex cognitive-affective-volitional process where thinking plays a priority role. Through tactics, the player takes full advantage of the technical, physical and mental possibilities to defeat the opponent (Epuran, Holdevici, & Tonaţă, 2001, p. 145).

The theorists of sports games consider tactics as a real system of actions selected, planned and implemented in order to be properly used during the game. Actions are adjusted according to the opponents and the competitive conditions to achieve the performance goals (Colibaba-Evuleţ, & Bota, 1998, p. 78).

Tactics is based on psychological training aimed at organizing the players’ behaviour according to the concrete situations during the matches. The players’ tactical behaviour is supported by mental activity and thinking. In the training, players learn to stabilise their tactical skills on the basis of technical knowledge.

Tactical skills and the behavioural movement of players depend on their knowledge of the game and their practical experience.

Under these circumstances, tactical thinking can be developed through the following paths: effective participation in the game, training, use of a log control system in which to record and analyse the level of tactical training (Epuran, Holdevici, & Tonaţă, 2008, p. 153).

In preparing a team, it is important that the physical, technical and tactical training is done very well. If properly taught, then, at the mental level, by the player’s attitude in the match, the acquired skills will be applied (Czerwinski, 1999).

**Topic addressed**

This paper is a theoretical study that deals with the role of tactical thinking in handball. As a method, the bibliographic method was used.

Thinking is an important factor in the tactical preparation. Rene Descartes identifies thinking with any “mental act”, such as wanting, understanding, imagining or feeling. These aspects are considered ways of thinking and they belong to the spirit. So, we can say that, in this sense, thinking can be identified with self-consciousness: “Cogito ergo sum”, by translating it from Latin into English, “I think, therefore I am” (Popescu-Neveanu, 1978, p. 291).

In the handball game, thinking has a very important role in solving game situations, such as the ability to implement an idea at a certain stage, depending on the player’s situation. During the handball game, choosing the optimal solution (according to the knowledge gained) quickly and accurately can make the difference between you and your opponent. The ability to give an optimal response in a timely manner leads to increased efficiency and provides minimum expenditure of nervous energy.

Bompa (2002, p. 57) sees tactical thinking as one of the main components of tactical training, but which depends on the players’ tactical knowledge and the tactical skills learned. According to this specialist, tactical thinking is made up of several abilities: the ability to objectively evaluate the opponent and the player; the ability to remember instantly the acquired skills, including the tactical combinations that can be used in certain game situations; the ability to anticipate and annihilate the opponents’ tactical actions; the ability to hide the team’s tactical intentions, so that opponents do not know and realise the tactics prepared for them; the ability to coordinate individual tactical actions with team tactics.

According to Dragnea (1996), the tactical training components are the following: tactical conception, tactical plan, tactical action and the game system, the last one being specific only to team sports games. In the tactical training methodology, the purpose is to build a set of methods, attributes of knowledge, skills and tactical skills, as shown in Figure 1. The theoretical knowledge specific to tactics refers to the intellectual training of players. Based
on it and the technical skills, practical tactical skills are formed. Through them, the player can solve a tactical situation with confidence, accuracy and in time. Acquiring tactical skills requires the player’s intellectual activity and heuristic ability. The automatic application of tactical skills will commonly lead to failure. For this reason, the skills become skilful, and the player can creatively use them in match situations (Dragnea, 1996, pp. 153-161).

![Figure 1. Tactical training methodology (Dragnea, 1996)](image)

In the handball game, there is tactics for the attack phase and tactics for the defence phase. During the attack phase, according to the players participating in the tactical action, one can use: individual tactics, partial team tactics or collective tactics. In the defence phase, the tactics is individual and collective (Balint, 2005, p. 42, 155).

The individual tactics of each player is very important because it includes the actions that each one carries out in relation to the game situations and in collaboration with teammates, both in attack and defence, or when they are in the situation to get rid of the opponent or attack the opponent possessing the ball.

Taking action in time is based on tactical thinking. The development of tactical thinking depends on the tactical, theoretical and technical knowledge gained by the player, as well as on each one’s individual conception.

Tactical thinking involves rapid phase analysis. It is based on the ability to recognize and frame the situation you are in at that moment. The ability to choose the best solution, both theoretically and practically, will also lead to fast actions, according to the adopted solution.

In high performance training, there are similarities between players in terms of physical, technical and tactical levels. Due these similarities, it is very difficult to detach them from each other. A large number of players can make a difference in the game through their attitude and decision-making. Their distinct responses can make the difference (Casimiro et al., 2010).

Conclusions

Tactical thinking is a major component of tactical training in the handball game. It is influenced by the level and amount of knowledge gained by each player with regard to hereditary physical and mental abilities.

Players face different situations when, with reason, they can choose the solutions that are favourable to the moment of play. They have to select and apply their knowledge during the game, exploiting the acquired technical and theoretical skills and abilities, the physical and mental abilities developed in the preparation process.

The set of skills that each player possesses should be maximised during the games by choosing effective solutions throughout the match so that the attacking team scores, and in the defence phase, to cause problems to the opposing team so that it does not score.
References


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ASPECTS REGARDING THE CHARACTERISTICS OF CONCENTRATION TIMES IN HIGH-PERFORMANCE FEMALE WEIGHTLIFTERS

Daniel Constantin MURĂREŢU1*, Răzvan-Liviu PETRE1, Marian Daniel TEODORU1

1 National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
*Corresponding author: danmuraretu@yahoo.com

Abstract. Changes in the weightlifting regulations in terms of shortening the time required to approach and lift the barbell has also led to major changes in the training strategy. Attention is highly important in the training process and has a significant impact on achieving performance. The barbell lifting occurs simultaneously with the selective participation of attention and especially one of its features, namely concentration. In full agreement with the latest discoveries in the field of weightlifting, it is thought that both the duration and moments when the athlete focuses are very important elements for reaching superior results. Identifying the characteristics of concentration in the periods before and during the specific effort is a necessity. Modern technology supports the sports science, providing the opportunity of using computerised assistance connected to video equipment, which allows the recording and processing of athletes’ actions. Given the particularities of this sport, where there are categories of age, weight, gender, competitive level, but also the athletes’ anthropometric and psychological particularities, it can be stated that the optimal concentration time is largely variable (in compliance with the regulations, as regards the maximum duration of an attempt - 60 seconds). This research presents the recording and analysis of concentration times in the snatch event for some female weightlifters participating in the 2018 European Weightlifting Championships held in Bucharest, Romania. The research includes seven top women athletes aged 21-30 years, from different countries, two from Italy and one from Bulgaria, Poland, France, the United Kingdom and Romania, respectively.

Keywords: attention, weightlifting, imaging, performance sports, concentration time.

Introduction

Major international competitions are attended by athletes who have about the same physical, technical and tactical level of training. Under complex struggle conditions, the results are decided by the psychological qualities, the ability to fully mobilise one’s strengths and be prepared to maximally exploit one’s own possibilities in competitions. Outstanding athletes are usually characterised by the ability to actively fight in the most important competitions, where the level is very high. Practice demonstrates that the athletes’ mental stability, their ability to mobilise themselves to the limit in challenging competitions are largely determined by their natural skills and are improved through hard work. Such tone ensures the state of concentration, the preparation for the competitive struggle (Platonov, 2015, p. 314). The state of concentration and mobility of attention play an important role in producing behaviours, thoughts and adaptive decisions (Predoiu et al., 2017). Studies mention the significant connection between focused attention (when tasks are carried out quickly) and sports performance, reflected in the official ranking (Tüdös, Predoiu, & Predoiu, 2015).

The development of information techniques, computers, has also led to a real revolution in the technology of obtaining and processing data through devices that Epuran (2005, p. 328) calls “extensions and amplifiers of our senses”. This technique, which allows displaying images on the monitor screen, is commonly used in the current scientific literature under the name of “imaging”. The digitisation of photo cameras and camcorders is one of the latest innovations in imaging information processing, offering the great advantage of using the electronic computer to store, reproduce and process this information in diverse ways through very ingenious software programs (Epuran, 2005). Due to the efficiency and speed of modern technology applications such as computers, cameras, laptops, television satellites and new printing methods, the latest discoveries, ideas, facts and theories come into our homes every day. It is increasingly difficult for us to keep pace with this, but even more difficult to understand what they mean (Spangenburg & Moser, 2001, p. 196). In this context, the sport of weightlifting, through its high performance standards, requires to reconsider the training. In this regard, we propose computerised assistance and video equipment as technical means of research within the specific training. When modelling behaviour through computer programs derived from observations, the research process underpinning the program starts from observing behaviour, and such an observation can generate a theory (Paraschiv, Tânase, & Manea, 2014, p. 107).

If in certain individual sports, athletics for example, the concentration time for the shot put or long jump can be measured very precisely for each athlete, in the sport of weightlifting, we can talk about an optimal concentration interval as a statistical construct. Given the particularities of this sport, where there are categories of age, weight, gender, competitive level, but also the athletes’ anthropometric and psychological particularities, it can be stated that the optimal concentration time is largely variable (in compliance with the regulations, as regards the maximum duration of an attempt - 60 seconds). This variability entitles us to consider that the concentration skill
formation, within the limits of an optimal interval, also determines good performance of the athlete. The study of the weightlifter’s action is complemented, in neuroscience research, with information on the activation level of the cerebral cortex, heart rate and electrodermal response. Such a program leads to hypotheses on the variation of attention concentration in the performed action (Collet, 2002, pp. 171-172). Hiskia (1997) used a system to measure and analyse performance in weightlifting, including technical execution, namely the V-Scope VS-120 system based on infrared and ultrasound signals from the sensor attached to the end of the bar. Through special software, real-time 3-D analysis of the trajectory, motion, speed, acceleration in the action of lifting the barbell etc. is achieved. Due to this technique, specialists in the sport of weightlifting benefit from the multimedia advantages, as shown by Jentsch (2002):

- accessing video sequences in both training and competitions;
- using images as real-time feedback to analyse different executions during training;
- the transfer of images to the computer provides the coach the opportunity to perform real-time analysis in the training room and even during the competition;
- making a CD-ROM database allows disseminating the information to other beneficiaries too, namely the different executions during training and competitions, with the possibility to compare them for a qualitative analysis. Baroga (1973) conducted a first research study on the concentration time in the barbell lifting (for the three styles existing back then).

Materials and methods

**Purpose.** The research aims to investigate weightlifters (of both genders and different classes) as regards certain moments relating to the analysis of concentration times that characterise the weightlifting styles. This study focuses on the recording and analysis of concentration times (from the moment when the feet are fixed under the barbell axis - T2 - until the moment when the barbell is lifted off the competition platform - T4). In this respect, the research presents the recording and analysis of concentration times in the snatch event for some top female weightlifters in the value group “A”, 48 kg weight class, participants in the 2018 European Weightlifting Championships held in Bucharest, Romania.

**Objectives.** 1. Checking the possibilities to use computerised imaging in the barbell lifting technique for the snatch style. 2. Identifying concentration times in weightlifters using the snatch style by means of records and measurements performed with the AviSynth software.

**Hypothesis.** The identification of concentration times for the snatch style provides the opportunity to compare weightlifters, establish relationships and make observations on the achieved performances.

**Participants.** The research includes seven women athletes aged 21-30 years, from different countries, two from Italy and one from Bulgaria, Poland, France, the United Kingdom and Romania, respectively. The most experienced competitors in this weight class are the 30-year-old athletes from Italy and France, while the second Italian competitor, aged only 21, will be ranked third in the final (Table 1).

**Equipment.** This research uses the imaging technique. The main research method is computerised technology connected to video equipment. The recording and measurement were performed with the AviSynth program consisting of: electronic computer, JVS digital camera, tripod, laptop, video monitor and mini videotapes.

**Procedure.** The research was conducted in two main stages: Stage 1, carried out between 26 March and 01 April 2018 at the Polyvalent Hall within the “Sydney 2000” Olympic Complex of Izvorani, where the selection and video recording of athletes took place; Stage 2, when the results were processed and analysed using the AviSynth program - the processing of recorded data (data ordering: number of frames per execution, frame conversion into seconds etc.), drawing conclusions and making observations (based on the obtained results).

Results

To facilitate the identification of the terms mentioned in the tables below, we give the following explanations: Time 1 (first contact of the foot with the competition platform); Time 2 (feet are fixed under the barbell axis); Time 3 (hands grasp the barbell); Time 4 (barbell is lifted off the platform); Time 5 (barbell is fixed overhead); Kg (lifted kilograms); F (failed attempt).

At these Senior European Weightlifting Championships, Romania was represented by a group of 16 athletes, 8 women and 8 men, whose target was to win four medals. The representative of Romania in the 48 kg weight class, Andrieș Elena Ramona, managed to win three gold medals for the snatch (79 kg), clean and jerk (100 kg) and the total of the two styles (179 kg).
This research is part of a broader study, as shown in Tables 2, 3 and 4 that reveal the value of concentration times for each of the seven female weightlifters in the value group “A”.

Analysing the technical performance behaviour (Tables 2 and 8), we can note, for the first attempt in the two-hand snatch event, that: the average result of the concentration time for the first attempt is 10.23 seconds. The difference between the highest concentration time and the lowest concentration time for the first attempt is 9.73 seconds. The percentage of success in the two-hand snatch technique for the first attempt is 90% (Table 5). The average result of the concentration time for the second attempt is 10.39 seconds (Tables 3 and 9). The difference between the highest concentration time and the lowest concentration time for the second attempt is 11.4 seconds. The percentage of success in the two-hand snatch technique for the second attempt is 80% (Table 6). The average result of the concentration time for the third attempt is 9.95 seconds (Tables 4 and 10). The difference between the highest concentration time and the lowest concentration time for the third attempt is 10.6 seconds. We mention that the percentage of success for the third attempt is very low, only one of the seven female athletes managing to lift the proposed weight, being finally ranked third in the snatch style (Table 6). The concentration time in the two-hand snatch event for the first competitive attempt of our representative, Andrieș Elena Ramona, was 5 seconds, and therefore she had a successful attempt (Table 8). For the second attempt, her concentration time was 5.93 seconds (Table 9), a successful attempt that placed her on the top of the ranking in the snatch event – one can see the constancy of concentration times. The approximately identical or identical concentration times lead to very good results. Our athlete failed the third attempt, her concentration time being 9.5 seconds (Table 10) – the large differences between concentration times lead to failure. The concentration time value increases with the weight of the barbell.

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<th>Time 2</th>
<th>Time 3</th>
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<th>Time 5</th>
<th>Barbell weight</th>
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Table 4. Structure of the two-hand snatch technique and duration of times – third attempt

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Table 5. Difference between the sole fixing under the barbell axis (T2) and the barbell lifting off the competition platform (T4) – first attempt

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<th>Initials</th>
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Table 6. Difference between the sole fixing under the barbell axis (T2) and the barbell lifting off the competition platform (T4) – second attempt

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Table 7. Difference between the sole fixing under the barbell axis (T2) and the barbell lifting off the competition platform (T4) – third attempt

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Table 8. Subject identification and results achieved for the concentration times – frame conversion into seconds, first attempt in the snatch event

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<th>Attempt</th>
<th>Frames</th>
<th>Concentration time</th>
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Average concentration time: 71.65/7=10.23 seconds

Table 9. Subject identification and results achieved for the concentration times – frame conversion into seconds, second attempt in the snatch event

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Average concentration time: 72.78/7=10.39 seconds

Table 10. Subject identification and results achieved for the concentration times – frame conversion into seconds, third attempt in the snatch event

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Average concentration time: 69.7/7=9.95 seconds
A1+A2+A3=10.23+10.39+9.95=30.57/3=10.19 seconds

Conclusions

After analysing the research results, some issues relating to the concentration time in the snatch event have been revealed, and among them we mention: the average concentration times for the three statutory attempts; the average concentration times for each attempt; the ratio between barbell weight and concentration time.

As regards the research results, we mention the following: the average result of the concentration time for the first attempt is 10.23 seconds. The average result of the concentration time for the second attempt is 10.39 seconds. The average result of the concentration time for the third attempt is 9.95 seconds. The average result of the concentration time for the three attempts is 10.19 seconds.

Increasing the weight of the barbell leads to increased concentration time.

Authors’ Contributions

All authors contributed equally to this article and should be considered as main authors.
References

PREVENTING SHOULDER INJURIES USING PROPHYLACTIC PROGRAMS FOR VOLLEYBALL PLAYERS

Dan Alexandru SZABO1*, Ioan Sabin Sopa2

1 University of Medicine, Pharmacy, Sciences and Technology, 38 Gheorghe Marinescu Street, Târgu Mureș, Romania
2 “Lucian Blaga” University, 5-7 Ion Rațiu Street, Sibiu, Romania
*Corresponding author: dan.alexandru.szabo@umftgm.ro

Abstract. By prophylactic kinesiology, we understand all the methods and means specific to kinesiology, which are aimed at maintaining and strengthening health, and the word “prophylactic” refers to using all necessary ways to prevent the aggravation or occurrence of functional and morphological complications or the pathologies of a chronic disease. The study focused on designing and implementing two programs in order to prevent shoulder injuries through prophylactic exercises. As methods, we used the bibliographic study, statistical analysis, questionnaire, observation, assessment and testing methods. The research was conducted in the E-ON Gaz Sports Gym over a period of 9 months, and the testing took place in the “Anton Pongratz” Sports Gym within the University of Medicine and Pharmacy of Târgu Mureș. The research included a sample of athletes registered at the Torpi Club Târgu Mureș, members of the male volleyball team, cadet players aged between 14 and 16 years. The research results showed an increased percentage of 17.72% for the 2-kg medicine ball throw without steps, an improvement of 19.56% for the 2-kg medicine ball throw with 3 steps, 13.43% for the 3-kg medicine ball throw without steps and 9.45% for the 3-kg medicine ball throw with 3 steps.

Keywords: prophylaxis, volleyball, injuries, shoulder.

Introduction

The notion of movement has different meanings, depending on the domain to which we refer. In the field of practicing physical exercise, it means changing the position of a body segment relative to other segments or of the entire body relative to the environment in which it is. Human movement is manifested in motor acts, motor actions and motor activities. The motor act is a simple fact of behaviour performed by the skeletal muscles, usually on a voluntary basis, to perform an action or motor activity. A special motor act is a physical exercise (Hântiu, 2013).

The modern volleyball game has higher motor levels, where motor qualities, skills and abilities are used predominantly. Motricity is the ability of an individual to perform movements in order to change the position of the body or different body segments, to move, interact with other individuals and act in the (physical or social) environment (Neagu, 2012, p. 15). In our view, motor ability refers to the development and manifestation levels reached by an individual due to the two fundamental components of individual global motricity, namely the genotypic and phenotypic ones.

It is unanimously acknowledged that motor skills are those manifestations of an individual that are always the consequence of motor education, the motor learning act being represented by motor behaviours formed through multiple exercises. They also designate the ease, efficiency and precise control in the execution of some movements, the control being total, partial or absent in relation to their difficulty, complexity and degree of automation (Neagu, 2010, p. 42).

The sequence of behavioural attributes is common to all human beings, and what differentiates them from one another only concerns the rate at which it succeeds during the ontogenetic evolution. Determining the development coefficient is done by highlighting the ratio between chronological age and motor maturity. The analysis of this development coefficient only refers to the general development rate, without including the way the patient will evolve psychologically (Albu, 2012, p. 38).

A correct interpretation of the ways of acting towards the motor and psychomotor education and re-education should be based on a comparative analysis of the large figures resulting from national research. Strictly from the perspective of kinesiotherapy, the initial position has to meet the basic requirements mainly related to the patient’s functional reluctance, in close connection with his or her state of health.

In the process of motor education or re-education, the therapist has the task to determine the movement direction according to certain aspects. The goal is to form a more accurate picture of how the patient should be guided by the movements he or she performs, as they are related to fixed markers. This way of acting contributes to increasing the impaired motor efficiency, giving the patient the opportunity to choose the best way to meet the therapist’s requirements.

The general theory of learning states that learning is a very complex process that takes place throughout several steps or stages. Regardless of the type of learning that is referred to, the process is carried out in the same logical sequence of stages that, in the case of volleyball, acquires a series of particular nuances. These steps are as follows: initiation, fixation, consolidation, improvement, valorisation (Dina, 2009, p. 18). From the beginning of
the training, throughout its course, the emphasis should be placed on the overall practice of the actions, which presents some advantages, for instance, it accelerates the process of learning the actions and favours the detection of individuals with special skills, who can be promoted faster to higher value groups (Dina, 2009, p. 22).

**Defects at the shoulder level**

Given the complexity of the shoulder, it is surprising that this is one of the areas most predisposed to pathology. At the shoulder level, joint geometry, capsular-ligament structures, muscles and the neural network contribute together to joint stabilisation, being independent and intrinsically linked to good functionality. The most common shoulder pain is caused by scapulohumeral periarthritis. In this syndrome, a clinical manifestation encountered more and more frequently in the differential diagnosis of the painful shoulder refers to the rotator head; it is thought that the cause of this action, in addition to the degenerative causes, can also be a professional one expressed by the physical activity or an accentuated curvature of the dorsal spine, which means that the shoulders should be repositioned forward.

In scapulohumeral periarthritis, clinical forms such as painful shoulder, mixed shoulder and blocked shoulder are distinguished. The painful shoulder is the consequence of an inflammatory process that is often located in the muscle tendons. The blocked shoulder is discovered by a joint redraw, where the level of active and passive movements is limited and accompanied by pain, especially in the initial phase.

Trauma to the shoulder is a major issue primarily requiring focused attention on preventing stiffness of the rotator cuff, which includes, in addition to the scapulohumeral joint, those associated with the acromion-collarbone joint and chest bone joint. They are added, by the function it performs, the muscular-thoracic joint, which ensures that the shoulder is fixed to the chest.

The purpose of this study is to design and implement the two programs developed by us in order to improve motor and functional abilities.

The overall objective of our activity is to optimise functional and motor abilities, as well as to improve physical fitness. The reference objectives are: increasing muscle strength, harmonious physical development, increasing joint mobility, improving aerobic and anaerobic endurance and increasing the functional capacity of the body.

In establishing our hypothesis, we started from the assumption that, following the implementation and practice of the two prophylactic training programs, one for toning the upper muscle groups, predominantly of the shoulder, and the other for the development of these groups, we would get better results in the final test, namely the medicine ball throw tetrathlon.

**Material and methods**

In our research, we used the following methods: bibliographic study, statistical analysis, questionnaire, observation, assessment and testing methods.

The research tasks were: testing the components of physical condition and strength in the upper body of volleyball players, cadets; establishing the most efficient means of acting to develop the upper body muscles; increasing the efficiency of the means and methods used in the specific physical training of volleyball players; performing the final testing of the research sample.

**The research sample**

The research comprised a sample of 12 male athletes registered at the Torpi Club of Târgu Mureș, members of the male volleyball team, cadet players aged between 14 and 16 years.

**The research place**

The research was conducted in the E-ON Gaz Sports Hall, Barajului Street, over a period of 9 months, and the testing took place in the “Anton Pongratz” Sports Hall within the University of Medicine and Pharmacy of Târgu Mureș. The research was carried out between August 2016 and May 2017, with a 2-week break, from 22 December 2016 to 5 January 2017. For the first training program, three weekly training sessions of 45 minutes each were conducted between August 2016 and September 2016. For the second training program, two training sessions per week, lasting 40 minutes each, took place between October 2016 and May 2017.
The work program

Program 1 - Prophylactic work program for toning the upper body, predominantly the shoulder muscle groups

Exercise 1. The athlete, in the initial orthostatic position with the upper limb flexed at 90 degrees, holds one side of the elastic band, executes the retouching movement, and then returns to the initial position; Dosage: 3 series, 8-10 reps.

Exercise 2. The athlete, in the initial orthostatic position with the upper limb in abduction and 90-degree flexion, holds one side of the elastic band, executes the ante-pulsion movement, and then returns to the initial position; Dosage: 3 series, 8-10 reps.

Exercise 3. The athlete, in the initial orthostatic position with the upper limb in 90-degree flexion, holds one side of the elastic band, executes an internal rotation movement, and then returns to the initial position; Dosage: 3 series, 8-10 reps.

Exercise 4. The athlete, in the initial orthostatic position with the upper limb in 90-degree flexion, holds one side of the elastic band, executes an external rotation movement, and then returns to the initial position; Dosage: 3 series, 8-10 reps.

Exercise 5. The athlete, in the initial orthostatic position with the upper limb close to body, holds a weight of 0.5 kg; the athlete performs, with the right upper limb, the flexion movement of the forearm on the arm, and then returns to the initial position; the same movement is performed with the left upper limb; Dosage: 3 series, 8-10 reps.

Exercise 6. The athlete, in the initial orthostatic position with the upper limb in ante-pulsion and the elbow in 90-degree flexion, holds a dumbbell of 0.5 kg; the athlete performs the elbow extension movement, and then returns to the initial position; Dosage: 3 series, 8-10 reps.

Exercise 7. The athlete, in the initial prone position on the bench/mattress, with the upper limbs close to body, performs the internal belly movement, and then returns to the initial position; Dosage: 3 series, 10-12 reps.

Exercise 8. The athlete, in the initial prone position on the bench, with the upper limb hinged, executes the abduction movement to the bench level, and then returns to the initial position; Dosage: 3 series, 8-10 reps.

Program 2 - Prophylactic program for developing/maintaining the upper muscle system, namely the shoulder muscle groups

Exercise 1. Isometric exercise – Flexion. The subject, in the initial orthostatic position facing the wall at a distance that allows the shoulder flexion between 30 and 40 degrees, performs the forward movement of the upper limb while pushing it into the wall for 7-10 seconds; Dosage: 10 repetitions, 7-10 seconds.

Exercise 2. Isometric exercise – Extension. The subject, in the initial orthostatic position with the back to the wall at a distance that allows the shoulder extension between 30 and 40 degrees, performs the extension movement while maintaining the elbow extended for 7-10 seconds; Dosage: 10 repetitions, 7-10 seconds.

Exercise 3. Isometric exercise – Abduction. The subject, in the initial orthostatic position near to one side of the wall and the upper limb in slight abduction, with the dorsal face of the palm in contact with the wall, performs the abduction against the wall with the extended elbow for 7-10 seconds; Dosage: 10 repetitions, 7-10 seconds.

Exercise 4. Isometric exercise – Internal rotation. The subject, in the initial orthostatic position facing the door and the elbow in 90-degree flexion, with the distal part of the forearm on the surface of the door frame, performs the internal rotation movement for 7-10 seconds; Dosage: 10 repetitions, 7-10 seconds.

Exercise 5. Isometric exercise – External rotation. The subject, in the initial orthostatic position facing the wall and the elbow in 90-degree flexion, with the distal posterior part of the forearm on the surface of the door frame, executes the external rotation movement for 7-10 seconds; Dosage: 10 repetitions, 7-10 seconds.

Exercise 6. The subject, in the initial orthostatic position with the upper limb close to body, with a 1-kg disk in each hand, performs the shoulder lift movement; Dosage: 4 series, 12-15 reps.

Exercise 7. The subject, in the initial lateral decubitus position on the right side, with the right upper limb under the head and the left upper limb flexed at 90 degrees with a 1-kg dumbbell, executes the external rotation movement, and then returns slightly to the initial position. The same on the left side; Dosage: 4 series, 12-15 reps.

Exercise 8. The subject, in the initial lateral decubitus position on the left side, with the right upper limb close to body and the left upper limb in 90-degree flexion on the mattress surface, performs the internal rotation movement, and then returns slightly to the initial position. The same on the right side; Dosage: 4 series, 12-15 reps.

Exercise 9. Muscles in contraction: Deltoid. The subject, in the initial orthostatic position with the upper limb holding the dumbbells, performs the abduction movement up to the shoulder, and then returns to the initial position; Dosage: 3 series, 8-10 reps.
Exercise 10. Muscles in contraction: Deltoid. The subject, in the initial orthostatic position with the upper limb holding the dumbbells, performs the antepulsion movement to the shoulders, and then returns to the initial position; Dosage: 3 series, 8-10 reps.

Medicine ball Javelin Quadrathlon

Testing and measurement are means of collecting information based on which subsequent performance assessments and decisions are made, but in the analysis, we should take into account the factors that can influence the results. There are several authors that have discussed about this test in the literature (Bizley, 1994; Chu, 1996; Beashel & Taylor, 1996; Beashel & Taylor, 1997; Davis et al., 2000; Galligan et al., 2000; McArdle et al., 2000).

The objectives of this test are to monitor the strength development in the upper body and the development of athlete’s fitness and upper body strength.

To perform this test, we needed the following resources:

- 1.5-kg, 2-kg and 3-kg medicine balls;
- 30-m tape measure;
- assistant (coach/physical therapist).

How to conduct the test (BrianMac Sports Coach, 2018):

- The athlete warms up for 10 minutes;
- The athlete performs the 1st standing throw with a medicine ball (men 2 kg/ ladies 1.5 kg);
- The assistant marks the point where the medicine ball lands;
- The assistant measures and records the distance from the front foot (on release) to where the ball lands;
- The athlete performs a 2nd standing throw with a medicine ball (men 3 kg/ ladies 2 kg);
- The assistant marks the point where the medicine ball lands;
- The assistant measures and records the distance from the front foot (on release) to where the ball lands;
- The athlete performs the 1st three-step throw with a medicine ball (men 2 kg/ ladies 1.5 kg);
- The assistant marks the point where the medicine ball lands;
- The assistant measures and records the distance from the front foot (on release) to where the ball lands;
- The athlete performs a 2nd three-step throw with a medicine ball (men 3 kg/ ladies 2 kg).

Explaining the throws

Standing throw

- Face forward with the medicine ball held overhead in two hands;
- Feet should be parallel and toe on the measuring line;
- Throw the ball for distance;
- A follow through step is allowed.

Distance is measured from the front foot (on release) to where the ball lands.

Three-step throw

- Start with both feet together in a stationary position;
- Take three steps forward with the medicine ball held overhead in two hands;
- Throw the ball for distance;
- A follow through step is allowed.

Distance is measured from the front foot (on release) to where the ball lands.

Results and discussions

The analysis of the test results consists in comparing them with the athlete’s previous results. The analysis is expected to indicate, with appropriate training between tests, an improvement in the athlete’s upper body strength. This test is suitable for throwers (e.g. javelin, discus), but not for individuals to whom the test is contraindicated.

Reliability refers to the degree to which the test is consistent and stable in measuring what is intended. It will depend on how strictly the test is conducted and the individual’s level of motivation to perform the test.

Validity refers to the degree to which the test actually measures what it claims to measure and the extent to which inferences, conclusions and decisions made on the basis of test scores are appropriate and meaningful. This test provides a means to monitor the effect of training on the athlete’s physical development.

The advantages of this test are the following:
Minimal equipment required;
Simple to set up and conduct;
Can be conducted almost anywhere.

The disadvantages of this test are the following:
Specialist equipment required;
Assistant required to administering the test.

The protocol for the points awarded is found in Table 1. According to Table 4, all 4 throws of the medicine ball are required to calculate and record the results. The best result for this test is 76 points, and in the UK, the record is 66 points.

Table 1. Scoring protocol for the medicine ball throw tetrathlon

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<th>The 3-kg medicine ball throw (UM = meters)</th>
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<th>The 3-kg medicine ball throw with 3 steps (UM = meters)</th>
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To calculate faster and more efficiently the results for the “medicine ball throw tetrathlon” test, we used the online computer from a specialised site (BrianMac Sports Coach, 2018), as shown in Figure 1.

![Figure 1. Online calculation of the test results (BrianMac Sports Coach, 2018)](image)

Table 2. Results for the 2 and 3-kg medicine ball throw without steps

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Subject</th>
<th>The 2-kg medicine ball throw without steps (m)</th>
<th>The 2-kg medicine ball throw without steps (m)</th>
<th>Differences Final test and Initial test</th>
<th>The 3-kg medicine ball throw without steps (m)</th>
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**Figure 2.** Results for the 2-kg medicine ball throw without steps

**Figure 3.** Results for the 3-kg medicine ball throw without steps
Table 3. Results for the 2 and 3-kg medicine ball throw with 3 steps

<table>
<thead>
<tr>
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<th>2-kg medicine ball throw with steps (m)</th>
<th>3-kg medicine ball throw with steps (m)</th>
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Figure 4. Results for the 2-kg medicine ball throw with 3 steps

Figure 5. Results for the 3-kg medicine ball throw with 3 steps
Table 4. Points obtained at the calculation of the 4 throws

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<th>Item no.</th>
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<th>Points obtained for the 2/3-kg medicine ball throw – Final test</th>
<th>Differences between Final test and Initial test</th>
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<tr>
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<td>M.C.</td>
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<td>+2</td>
</tr>
<tr>
<td>4.</td>
<td>G.A.</td>
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<td>+2</td>
</tr>
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<td>17</td>
<td>+3</td>
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<td>G.R.</td>
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<td>17</td>
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<td>+5</td>
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<td>19.5</td>
<td></td>
<td>+3.4</td>
</tr>
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</table>

Figure 6. The mean of the results

Figure 7. The mean of the results (points at the Initial test and Final test)
For the 2-kg medicine ball throw without steps, the subjects recorded, in the initial test, an average of 7.9 meters compared to the final test, where they had an average of 9.3 meters, with an increase in performance of 1.4 meters (Table 2, Figure 2).

For the 2-kg medicine ball throw with 3 steps, the subjects recorded, in the initial test, an average of 9.2 meters compared to the final test, where they had an average of 11 meters, with an increase in performance of 1.8 meters (Table 3, Figure 4).

For the 3-kg medicine ball throw without steps, the subjects recorded, in the initial test, an average of 6.7 meters compared to the final test, where they had an average of 7.6 meters, with an increase in performance of 0.9 meters (Table 2, Figure 3).

For the 3-kg medicine ball throw with 3 steps, the subjects recorded, in the initial test, an average of 7.4 meters compared to the final test, where they had an average of 8.1 meters, with an increase in performance of 0.7 meters (Table 3, Figure 5).

The group of subjects performing the 2-kg medicine ball throw without steps had a total percentage increase of 17.72%. The group of subjects performing the 2-kg medicine ball throw with 3 steps had a total percentage increase of 19.56%.

The group of subjects performing the 3-kg medicine ball throw without steps had a total percentage increase of 13.43%. The group of subjects performing the 3-kg medicine ball throw with 3 steps had a percentage increase of 9.45%.

Conclusions

As a result of our research, we can state that the two programs developed by us, one aimed at toning the upper body and the other aimed at developing the upper muscle system, have proved their effectiveness, which confirms the hypothesis of the research. Thus, we found that the level of strength in the upper body and shoulder muscle groups has improved, and this aspect is revealed by the results achieved in the medicine ball throw test - tetrathlon.

These results recommend the regular practice of our programs in volleyball – the physical training of cadets in order to tone muscle groups, but also to develop them.

The results obtained in the final testing of the two programs lead to the idea that their implementation for the toning and development of muscle groups in the sports training of volleyball players aged between 14 and 16 years determines the improvement of motor skills and has a prophylactic role, because we would like to mention that, throughout the competition year 2016–2017, no shoulder injury occurred.

The subjective sensation of these programs among the athletes was a pleasure, except for the first two exercises, until the body adapted to the specific effort.

Comparisons between initial and final testing highlighted the improvements recorded by the subjects for all tests included in the medicine ball throw tetrathlon.

References

STUDY ON THE DEVELOPMENT OF MOTOR QUALITIES BY PRACTICING CROSS-COUNTRY SKIING AT JUNIOR LEVEL

Bogdan-Iulian PELIN¹*, Ioan TURCU¹, Dragoș TOHĂNEAN¹

¹Transilvania University, Faculty of Physical Education and Mountain Sports, 1 Universității Street, Brașov, Romania
*Corresponding author: bogdanpelin1989@yahoo.com

Abstract. Cross-country skiing is a sport whose technique is not very complex. That is why the competition level is mainly due to the development level of motor qualities, especially those that this sport requires, namely strength endurance and maintaining balance. The training program proposed in this paper was selected and rationalised following the pedagogical observation activity on several junior students of the same level. The purpose of this research is to determine the level of development of motor skills as a result of practicing a program of initiation into the practice of cross-country skiing. Starting from the assumption that the levels of physical development (biological particularities) and motor ability (motor skills) have a fairly large distribution line, it is assumed that approaching the development of motor skills through the modern methods and means of cross-country skiing can lead to an increase in motor performance indexes and, implicitly, to increased sports performance.

Keywords: cross-country skiing, motor qualities, initiation program, sports performance.

Introduction

Sports performance has been much appreciated and continues to evolve. Sports races have established and specified their working methodology. Physical training in cross-country skiing is an extremely important component. Due to this fact, motor skills must be developed with great care in order to reach high performance in national and international cross-country competitions (Pelin, Gaspar, & Lungociu, 2008).

Motor qualities are attributes of the body that give the individual the possibility to execute various motor acts linked to both the daily activity and sports activity. In the learning process, an important place in the teacher’s concerns is taken by finding and using in preparation the most efficient methods and means to ensure the development of these qualities. In the development work (which is permanent), the coach has to set certain priorities in the education of qualities. It is recommended that their programming is made with a different weight depending on the content of the lessons, the existing sports materials, the seasonal conditions and the pupils’ motor background at a certain stage (Pelin, 2001a).

The purpose of this research is to determine the level of development of motor skills after implementing a program of initiation into the practice of cross-country skiing.

Accordingly, the research tasks consisted in:
- providing conceptual definitions of the basic motor qualities and their specificity in cross-country skiing;
- the practical application of a research model;
- presenting the coded content of the methods and means used in the study;
- recording the initial and final measurements and tests in order to compare their evolution and make reference to the baseline anthropometric indices and the manifestation level of motor qualities;
- the statistical processing and centralisation of the results obtained.

Motor qualities in cross-country skiing

In cross-country skiing, endurance is what determines or limits performance progress. Endurance has a predominantly aerobic character, but, by the occurrence of the skating step (sprinting), the anaerobic effort has increased. By introducing the sprint test, the alactacid component has increased substantially.

In this event, motor ability is 65%, mental ability is 20%, and the somatic type is 15%. Depending on the different distances, we presented the long-distance events - 30-50 km and highlighted the sprint distances - 800-1500 m. The percentage of aerobic and anaerobic energy is as follows (Pelin, 2001b) (Table 1):

Table 1. Percentage of aerobic and anaerobic energy in cross-country skiing

<table>
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<tr>
<th>Distance</th>
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<th>200 m</th>
<th>400 m</th>
<th>800 m</th>
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<th>1500 m</th>
<th>5000 m</th>
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<td>5/4%</td>
<td>10/6%</td>
<td>25/8%</td>
<td>45/30%</td>
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<tr>
<td>Anaerobic</td>
<td>95/96%</td>
<td>90/94%</td>
<td>75/92%</td>
<td>55/70%</td>
<td>50%</td>
<td>35/51%</td>
<td>10/27%</td>
<td>4/13%</td>
<td>1/8%</td>
</tr>
</tbody>
</table>
Development of endurance in cross-country skiing

Endurance is the most important quality for beginners, being characterised by resistance to the fatigue factor. General endurance develops with all physical exercises included in the training. It is the support on which special endurance develops. The development of general endurance is done in the early stages of the period for beginners and juniors; it can take up to snow.

General endurance primarily develops under the influence of exercises practiced for a long time, such as (Dragnea, 1991):
- a) walking and running at a medium or low speed;
- b) treadmill, sand, water;
- c) cycling, canoeing and swimming;
- d) sports games etc.

Increased volume and low intensity contribute to the development of general endurance. Walking and running will be done cross-country or in the forest. The running speed depends on the skiers’ readiness and the distance they run. For beginners, the speed will be 6-7 min/1 km - for women 7-8 min/1 km, and for advanced skiers, 5-6 min/1 km. Running can be done over time (ex. 30’-1 h etc.) or km (1-2-3-5-10 km). It is good to make the dosing over time, indicating the number of miles that must be covered.

Training for general endurance development will be performed at the end of the weekly cycle. Inside, the running will take place with short accelerations, walks, exercises, jumping, relaxation exercises etc.

Strength in cross-country skiing

Improving sport results in ski competitions is substantially dependent on the development level of strength in athletes. During the race, the skier repeats many times movements of the same type, performing them with optimum strength, and the results do not depend only on the degree of absolute strength, but also on the duration of maintaining its optimum level. The free technique of cross-country skiing needs higher strength compared to the classic one, which requires developing and maintaining it throughout the entire training year, especially in the lower limbs, arms and trunk.

The main criteria for achieving strength training are:
- overcoming the high resilience of competitions;
- bringing the training methods closer to the structure of exercises used in competitions;
- developing the muscular groups used in the specific effort;
- developing psychological qualities (will, combativeness, mobilisation capacity);
- combining strength training with training to ensure mobility, flexibility and relaxation.

The duration of a workout is generally 90-120 minutes. Specialists’ views on the application of strength training during the prepuberatal period are different. With the accelerated growth of boys at the age of 14, the muscular strength develops, but, under the influence of training, it can be further increased. From a physiological point of view, it is imperative that the strength training performed at the age of childhood and puberty is achieved without a special load, laying the basis for a specific workout with maximum effort and speed. The use of weight lifting is recommended only after the age of 14 years (Forțu, 1989).

Development of strength in cross-country skiing

Strength is one of the main qualities of the ballistic skier, without which they will not be able to cope with the competitive effort. In order to build strong legs and arm pushing, to maintain a relatively low position throughout the race, the long-distance skier needs proper strength in all muscle groups, especially the muscles of the arms, legs and back. At the same time, the long-distance skier must have the ability to execute with equal intensity all pushes with their legs and arms, which, with the free technique, occurs throughout the event. This means that, in addition to the proper development of muscle strength, the long-distance skier must have good overall strength.

For the development of strength, loads will oscillate between 2/3-1/1 of maximum strength, and for the development of endurance, the load will be less than 2/3. This method is used after a previous warm-up of at least 5-10 minutes and will be placed at the end of the fundamental part of the lesson, being inserted between isometric exercises (Balint, 2003).

Speed in cross-country skiing

Speed development is a major concern in all stages of the preparatory phase. The purpose is to create a speed reserve, without which good results cannot be achieved over middle and long distances.
Methodology:

- by repeated scrutiny, with a high intensity over the distances of 30-200-300 m, and by developing the leg muscle strength with the help of well-chosen exercises;
- in the first stages of the preparatory period, short distances in combinations of 2-3 portions varying between 30 and 200 m, summing up to 1500-2000 m.

In the autumn stages, short distances are used only uphill, the 200-300 m sections being predominant (Pelin, Gaspar, & Lungociu, 2007).

Materials and methods

A set of tests was performed to conduct the study, once at the beginning of the research, and the second at the end of this period. The participants’ reactions to the specific and nonspecific set of exercises were tracked. The group of athletes who took part in the research were 10 juniors (males) aged between 15 and 18 years.

Assessments:
1. Speed running - 50 m;
2. Long jump;
3. Throwing the ounce ball;
4. Endurance running;
5. Matorin test (general coordination).

To objectively assess the evolution of the group during the study, we used the same samples at the end as in the first test.

The final test, as the initial one, was performed over the course of three days in order to avoid over exhaustion in students, otherwise the results might have not been conclusive. Students were supposed to be rested before testing and not to have another assessment on that day.

Methods and means for the development of endurance

Alternative cross-country skiing:
6 x (500 m + 500 m)
5 x (1000 m + 1000 m)
- in the first part of the run, the intensity will be 80-85%, and in the second part, 65-70%;
- the running speed will not drop below 60% of possibilities, and the pulse will be 150-170 beats/minute;
- the break between repetitions will be 3-4 minutes.

Methods and means for the development of strength

Imitation - special exercises
On slope terrain:
- intensity = 14-15 (heart rate: 181-205)
- volume = 6 x 50 m
- pause: 1’
Character: submaximal and maximal anaerobic
Note: They can be performed with and without ski poles.
- exercise with back straps (sandbag or rubber plates): 5-10% of the weight of the athlete.

Methods and means for the development of speed

Low slope running:
4 x 30 m downhill
5 x 50 m downhill
2 x 50 m uphill, released
2 x 60 m uphill, released
Each workout starts with 10 minutes of warm-up:
- gentle run with footwork - 3 minutes
- gymnastics with emphasis on mobility - 5 minutes
- 3-4 accelerations over 10-15 m
The training ends with calm walking, breathing exercises and relaxation - 5 minutes.
The exercises were performed 3 times a week for six months.

Results

Below, we present the tables with the initial and final results.

Table 2. Results of the initial testing

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Test</th>
<th>Arithmetic mean</th>
<th>Standard deviation</th>
<th>Coefficient of variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Speed running - 50 m</td>
<td>7.42 sec</td>
<td>0.45 sec</td>
<td>6.06%</td>
</tr>
<tr>
<td>2</td>
<td>Long jump</td>
<td>1.795 m</td>
<td>0.10 m</td>
<td>5.57%</td>
</tr>
<tr>
<td>3</td>
<td>Throwing the ounce ball</td>
<td>43.6 m</td>
<td>4.96 m</td>
<td>11.37%</td>
</tr>
<tr>
<td>4</td>
<td>Endurance running</td>
<td>4.09 min</td>
<td>43.40 sec</td>
<td>17.42%</td>
</tr>
<tr>
<td>5</td>
<td>Matorin test</td>
<td>308 degrees</td>
<td>21.35 degrees</td>
<td>6.93%</td>
</tr>
</tbody>
</table>

Table 3. Results of the final testing

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Test</th>
<th>Arithmetic mean</th>
<th>Standard deviation</th>
<th>Coefficient of variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Speed running - 50 m</td>
<td>7.08 sec</td>
<td>0.50 sec</td>
<td>7.06%</td>
</tr>
<tr>
<td>2</td>
<td>Long jump</td>
<td>1.895 m</td>
<td>0.14 m</td>
<td>7.38%</td>
</tr>
<tr>
<td>3</td>
<td>Throwing the ounce ball</td>
<td>46.6 m</td>
<td>5.53 m</td>
<td>11.86%</td>
</tr>
<tr>
<td>4</td>
<td>Endurance running</td>
<td>3.47 min</td>
<td>38.53 sec</td>
<td>16.97%</td>
</tr>
<tr>
<td>5</td>
<td>Matorin test</td>
<td>326.5 degrees</td>
<td>27.11 degrees</td>
<td>8.30%</td>
</tr>
</tbody>
</table>

1. **Speed running - 50 m** - we can see an improvement in the arithmetic mean of the initial results; thus, all subjects have improved their speed performance. The homogeneity is very good in both the initial and final stages, the sample being homogeneous with a value of 7.06% after final testing.

2. **Long jump** - progress is not so important in this event. An improvement of 110 cm in the arithmetic mean compared to the initial test can be observed. The variation score for the research subjects initially was 5.57% and increased to 7.38%, demonstrating that the group had a high degree of homogeneity in both initial and final testing.

3. **Throwing the ounce ball** - at baseline, the mean value of the group members under study was 43.6 m, with a standard deviation of 4.96 m. The variation score for the research subjects was 11.37%, demonstrating that the group was relatively homogeneous in initial testing. The final mean value of the group was 46.6 m, with a progress of 3 m and a standard deviation of 5.53 m. The calculated coefficient of variation is 11.86, which shows that the group has maintained its homogeneity.

4. **Endurance running** - in this event, the average value of the group members was 4.09 minutes, with a standard deviation of 43.4 seconds during initial testing. The variation score for the research subjects was quite high, 17.42%, the sample being relatively homogeneous. The final mean value of the group was 3.47 minutes, with a standard deviation of 38.53 seconds. The coefficient of variation calculated for this group after final testing remained high - 16.97%. We noticed an excellent 22-second average progress compared to initial testing. The most important progress was 40 seconds.

5. **The Matorin test** - at baseline, the mean value of the group members under study was 308 degrees, with a standard deviation of 21.35 degrees. The variation score for the research subjects was 6.93%, demonstrating that the group had a high degree of homogeneity in initial testing. The final mean value of the group was 326.5 degrees, with a standard deviation of 27.11 degrees. The calculated coefficient of variation was 8.30%, which demonstrates that the group has maintained its high degree of homogeneity.

Conclusions

Current conditions in the Romanian cross-country skiing do not allow the use of extremely expensive means or a number of simulators that improve sports performance and eliminate the dead-time technical training due to the annual structure of training. This imperative need is felt especially for the groups of children, where the foundations of sports performance are laid, but also the need to implement better technologies in conducting the training, the use of such means being required for the technical deepening.

The selection of the school group should take into account the children’s motor qualities, motor propensities and their level of physical and mental training.
For the training of groups in cross-country skiing, it is necessary to train or improve the specific qualities needed in this event with more emphasis on strength, endurance and speed. It is also very important to choose the materials and work area for the specific skiing activity.

If organized and well-defined (mixed) periods are used, together with modern means, the motor qualities specific to skiing are improved and, implicitly, the basic technique.

Our proposals are: mountain ski schools need to tackle winter sports disciplines, including cross-country skiing, because they create relaxation in the development of motor qualities, and classes are more enjoyable in mountain areas; these cross-country skiing classes should be combined to have better efficiency in improving motor skills and technical procedures for non-specific and specific work.

Following the research, it is necessary to increase the number of hours allocated for these activities to prepare the representative school team. The use of specific materials and dry-land work is required with a high weight in cross-country skiing and non-specific skiing.

References
CONSIDERATIONS ON ALTERNATIVE METHODS AND THEIR APPLICATIONS TO PHYSICAL EDUCATION AND SPORTS

Alina Gabriela RUSĂNESCU¹*

¹ National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
*Corresponding author: alina_rusanescu@yahoo.com

Abstract. Rapid changes in society are defining elements of the 20th century. These changes have repercussions and are also reflected in the educational process. Education should help students by guiding the education system towards a new form of education that provides them with the opportunity to cope with the new social changes and the ability to respond to unforeseen events. Parents and students need a modern education system, one that guides the educational process towards the children’s need to be listened to and encouraged to express their views, to be allowed to experiment and to look for solutions on their own. The education system, namely the whole process of teaching-learning-evaluation, contributes to the transformation of the child into an adult through training and self-training, development and self-development of the personality. The instructive-educational process is dominated by the student’s own activity, the direct contact with the reality throughout the whole study period, as the student is allowed to see, observe and discover, whether it is intellectual or physical work. These characteristics meet within some of the alternative pedagogy methods and can be adapted to math classes, Romanian language and literature classes and so on, but also as practical activities during physical education and sports classes.

Keywords: physical education and sports, alternative methods, education system.

Introduction

At the beginning of this century, traditional education was challenged in Europe in view of its renewal through teaching-learning-evaluation methods and the elimination of the rigid theoretical content. This trend is seen around the world under different names: the Reformation Method (Germany), the New Education (France, Switzerland, and Belgium) and the Progressive Education (USA).

This trend reached Romania as well through initiatives at central, regional and local levels. After 1990, many educational alternatives, including Waldorf, Montessori and Step by Step, were introduced.

Physical education and sports have an elementary status in the National Curriculum, 2 hours per week being compulsory for grades from 0 to 7 and 9 to 11, and one hour per week for grades 8 and 12. Lately, there have been an increasing number of absences and refusals to attend all classes of physical education and sports. Therefore, various alternatives should be developed in order to motivate the participation of students in classes through new methods of teaching, learning and assessing.

Society requires that all levels of traditional education adhere to the particularities of educational programs, including alternative education, as ways to improve the education system (Barton, 2006). In this context, teachers have to actively engage in an ongoing effort to create alternative programs that offer long-term benefits (Quinn et al., 2006).

Generally, educators and researchers have used the phrase “alternative education program” to refer to a training program that is different and separate from the usual classroom instruction (Foley & Pang, 2006).

The concept of alternative education can be traced back to the 1930s and in the teachings of John Dewey (Neumann, 1994). According to Neumann, the progressive education movement of that time admitted that some students had a direct and active involvement in their own education.

Early limited data has made it difficult to determine the effectiveness of alternative education programs (McGee, 2001), and investigators have increasingly begun to develop assessment tools or rubrics to assess the effectiveness of alternative education programs (Jackson, 2002; Morley, 2002).

The basis for designing alternative education models was to create an environment conducive to learning and able to respond to the student needs (Quinn et al., 2006).

In some alternative educational programs, the instruction plans focused on the student’s personal experiences were accomplished, most of the times, as a result of the teacher-student collaboration (McGee, 2001). According to Neumann (1994), another type of alternative educational program focused on the redefinition of a fundamental approach regarding the academics. Neumann considered the educational subject as an essential part of the curriculum which should be taught in schools. By analysing other educational practices, the alternative educational schools have placed great emphasis on the remedial process even since 1980 (Raywid, 1998). Moreover, such alternative schools have developed programs meant to educate students who were not allowed to attend classes due to indiscipline or academic failure (Lehr & Lange, 2003).
Given the descriptions of the alternative educational programs that have been developed in recent decades, it can be noticed that alternative education programs are as various as the population they serve (Powell, 2003; Tobin & Sprague, 2000).

Topic addressed

In recent years, there has been a growing interest among field specialists in identifying new concepts applicable to physical education and sports lessons, other than the traditional approaches. In terms of lessons focused on student-centered learning, the specific characteristics of the alternative methods offer teaching-learning solutions of the specific content that are in accordance with the affective and cognitive development of children (Moy et al., 2015)

The Montessori method debuted in Italy, then spread to other countries. This method was proposed by Maria Montessori, the first female medical doctor in Italy. Maria Montessori states freedom is not about letting a child do what he/she wants, but to eliminate any obstacle that might hinder the child’s normal development. According to the Montessori method, an adult must not impose on the child what activity they should perform. Freedom means that the child is free to choose the activity on their own, but in a prepared environment.

Using objects to get children invested in the learning process ensures manual involvement. In addition, learning with the help of objects is rather active, not passive, and the activity is also associated with better learning (Glenberg et al., 2004). Research on preschool programs in seven countries has found that learning involving a variety of manipulable objects favors cognitive development (Montie, Xiang, & Schweinhart, 2006). It has been shown that there are a number of specific advantages when hands are involved in the instructive-educational process (Beilock & Goldin-Meadow, 2010; Sobel & Kushnir, 2006; Cook, Yip, & Goldin-Meadow, 2010).

The Waldorf method was proposed by the Austrian philosopher Rudolf Steiner. He was employed to teach the children of employees working for the Waldorf-Astoria cigarette factory in Stuttgart, Germany, in 1919. Waldorf schools are all about child development, the best education being the one that always expects students to be active thinkers and use their imagination, create tasks and show originality in what they do.

In Steiner’s method, cognitive development must be intertwined with the development of the child’s emotional life, including fantasy and imagination, dealing with behavior, morality and action in the world (Ginsburg, 1982). People from outside recognize the health benefits due to the high levels of physical activity in the Waldorf classes (Sobo, 2013).

The Step-by-Step method, originally named Head Start, was a social program aimed at preparing young children from low-income families. This could be noticed due to the large number of children who were part of disadvantaged families (Fujiura & Yamaki, 2000). Besides promoting school education by strengthening the social and cognitive development of children by providing educational, health and social services, this program also provides health services and encourages parents’ involvement in every activity of the program (Deming, 2009).

Alternative methods are distinguished by some common features: they are flexible, very open to communication and collaboration with all the educational partners (especially parents), promote a holistic development of children, the process is individualised stimulating social relations between the members of the educational community, evaluation does not involve grades or marks but skill books, thus eliminating subjectivity. In addition, they use modern learning methods. The alternative methods mentioned above are based on a substantial theoretical argument, which legitimises the current practices and differences in the didactic process.

These methods are applicable to all other school subjects, except physical education and sports, where the teaching method remains traditional. The exception, however, is the Waldorf method, as it has implemented its principles in the physical education and sports classes, bringing innovation to the lesson by introducing the Bothmer gymnastics.

In our opinion, some of the alternative methods presented in the literature and referred to above could also be implemented in the physical education and sports lessons, with the necessary adaptations to the specifics of the curricular area. Thus, according to Montessori, a child learns at his/her own pace and is free to choose whatever material he/she wants, works as long as he/she wants for a project, without deadlines, and then puts it back after use, under the same conditions, ready for the next child who wants to do the same job. In the Step-by-Step method, teaching is done by work carried out in activity centres (similar to physical education and sports circuits). The child works where he/she wants, and the time available varies depending on the themes, which are proposed by the teacher.

The implementation of these features in the physical education and sports lessons - taking into account the need to reduce the number of absences and to motivate students to take part in age-specific sports activities, to
Conclusions

Alternative methods are forms of school organization that propose other methods of organizing and functioning for the instructive-educational activity; some are different from those used in the traditional school. Ideas, goals or objectives are different, but they are all advocating for new ways of achieving the scope of education.

Regarding the physical education lesson, in recent years, there has been a decrease in the level of biomotor potential of the school population, coupled with a growing lack of interest in it.

The implementation of such alternative methods in Physical Education and Sports can be achieved by using an action-oriented type of teaching focused on students, depending on their particularities, by problem-solving, experimenting and self-discovery. This kind of implementation may lead to increased levels of interest in the physical education and sports classes in traditional education.

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References


RELATIONSHIP POSSIBILITIES BETWEEN CHILDREN WITH SPECIAL EDUCATIONAL NEEDS – KINETOTHERAPIST – PARENTS

Aurora-Liliana COJOCARU1, Ioan C. NEGULESCU2

1 Special School no. 2, 31 Popa Petre Street, Bucharest, Romania
2 National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
*Corresponding author: aura_liliana26@yahoo.com

Abstract. The theme of the study, an integral part of a preliminary research that analyses several aspects about the education of psychomotricity to the child with mental deficiency, aimed at improving the relationship between child - kinetotherapist - parents. The research purpose was to identify the nature of the relationships between the child with mental deficiency - kinetotherapist - parent and to find ways to maintain/improve the relationships between them. The research was carried out at Special School no. 8, Bucharest, the group of subjects being made up of 5 pupils with mild and moderate mental deficiency, the parents of these children and the kinetotherapy teacher. The observation, conversation and questionnaire were the main research methods. Conversation consisted in a dialogue with the pupils and their parents, focusing mainly on aspects of activity and opinions of the interviewee. Registration was used through the AUQUEI questionnaire. The scores obtained by children in the applied questionnaire show that all children in the group of subjects love their parents and grandparents, brothers and sisters, and want to spend more time in their families, these children being in a boarding school (weekly or semesterly). For efficient kinetotherapy activities, it is necessary to create and maintain a pleasant affective climate, with positive influences on the child - kinetotherapist - parent relationship.

Keywords: child, parent, kinetotherapist.

Introduction

“For a long time, it has been found that interhuman relationships essentially influence the mental performance of individuals, that relational ambiance and psychological climate have importance in organizing and conducting human energies, in work group productivity, in education” (Mărza, 2006, p. 205).

“Communication is social interaction through the system of symbols and messages” (Gerbner, quoted by Negulescu, 2007, p. 18). “Words, images, facial or body expressions, signals or gestures are symbols of communication” (Zorlentan, quoted by Negulescu, 2007, p. 27).

In the therapeutic-educational activity carried out with children with special educational needs, the following types of relationships are established: between the kinetotherapy teacher and the pupil, between the kinetotherapy teacher and the parent of the child, between the parents (family) and the child.

The relationship between kinetotherapy teacher - pupil with special educational needs

The kinetotherapy activity in special schools is carried out within therapeutic-educational relations that are part of the broad framework of social relations and involve the existence of at least two members, the kinetotherapist and the child with special educational needs.

The therapeutic-educational relationship has an intentional character, with a definite purpose, being a relationship of cooperation, collaboration and communication. The relationship between kinetotherapy teacher - pupil is based on affectivity, understanding, respect and mutual trust (Ciocă, 2012, p. 34).

“Affective relationship is an area where you cannot cheat. It implies a real interest of the educator for the pupil person. Thus, we must perceive, feel what the pupil feels, what he/she wants, why he/she fears and what echoes have for him/her the events of life in and out of school. We have to decipher emotions, intuit feelings, listen to their silent calls ... we must live with them their tensions, hesitations, the joy of success and the bitterness of failure” (Ștefan, 1999, quoted by Ciocă, 2012, p. 36). In other words, the teacher must have a great empathic ability.

In kinetotherapy, the relationship of the teacher with the pupil presents specific aspects given by both the repetition of exercises during the activities and the means used.

In the kinetotherapeutic intervention, interpersonal communication is used to describe, explain, correct, warn and observe the activity carried out, but also to encourage, stimulate, motivate and convince the child to perform certain motor tasks (Ochiănă, 2006, p. 138).

The relationship between kinetotherapy teacher - parent of the child with special educational needs

When a deficient child comes to a specialist in kinetotherapy, communication between kinetotherapist and family is important and, in this respect, the family and the child should be explained the main difficulties that the
latter will encounter and how overcoming them (partially or totally) can contribute to the development of child’s personality (Stănescu, 2006, p. 261).

The kinetotherapy teacher will explain to the parents the objectives of the kinetotherapy activity, the steps the child will follow until their achievement and the content of the activity (Stănescu, 2006, p. 262).

*The relationship between parents (family) - child with special educational needs*

Deficiency affects not only the person concerned, but also his/her family members, and therefore, for the development of the person affected by a deficiency, the family attitude has an important role: accepting the child as a full member and accepting the disability itself.

When parents create and maintain positive perceptions of their child with disabilities, his/her growth and development are favourable; instead, parents’ negative perceptions of the child’s deficiency have negative effects on the child (Stănescu, 2006, p. 268).

*The theme* of the study, an integral part of a preliminary research that analyses several aspects about the education of psychomotricity to the child with mental deficiency, aimed at improving the relationship between child - kinetotherapist - parents. Thus, the *purpose of the research* is to identify the nature of the relationships between the child with mental deficiency - kinetotherapist - parents and to find ways to maintain/improve the relationships between them.

*The research hypothesis* - knowing as many aspects of the life of the child with mental deficiency helps to find certain characteristics of the child’s relationship with the family and as many possibilities of relationship, with positive influences, between child - kinetotherapist - parent.

**Materials and methods**

*Participants*

The group of subjects was made up of 5 pupils with mild and moderate mental deficiency, from primary education, in a boarding school (weekly or semesterly), the parents of these children and the kinetotherapy teacher.

*Instruments*

Capturing various aspects of the relationship between child - kinetotherapy teacher - parents was achieved over time, during the initial evaluations (when we applied various psychomotricity tests), in the course of kinetotherapy activities, but also by deliberate actions, such as the application of the AUQUEI questionnaire (Pictured Child’s Quality of Life Self Questionnaire) and the discussions with parents.

We used a questionnaire for assessing the child’s quality of life - AUQUEI - Pictured Child’s Quality of Life Self Questionnaire (Guirlet-Vibert, 2016, p. 12; Lemétayer & Gueffier, 2006, pp. 68-69; Eyraud et al., 2004, p. 16; Manificat & Dazord, 1997). The assessment of the child’s well-being is based on the drawing of a child’s face in four instances: a very sad face with a tear, a sad face, a face with a small smile and a very smiling face, the child having to colour the round below the face that corresponds to their state (Figure 1).

![Instances of the child’s well-being](image)

Figure 1. Instances of the child’s well-being

The questionnaire contains 32 closed items grouped into seven areas of the child’s everyday life: family, health, school, leisure, autonomy, functions and self-esteem; the quotation of items is done by giving points from 0
to 3, depending on the face chosen by the child: 0 - very unfavourable subjective assessment, 3 - very favourable subjective assessment.

**Procedure**

The research was carried out at Special School no. 8, sector 1, Bucharest, between December 2016 and April 2017.

The research methods used were: bibliographic study method, observation method, conversation method, the recording method and technique, statistical-mathematical method and computerised graphical method.

In order to obtain data about the relationship of the child with the family, we paid great attention to the following items of the questionnaire:

1. How do you feel when you are having dinner with your family?
2. If you have brothers and sisters, how do you feel when you play with them?
3. How do you feel when you think about your father?
4. How do you feel when you think about your mother?
5. How do you feel when you play with your grandparents?
6. How do you feel when you spend the night away from home?
7. How do you feel when you are far from your family?
8. How do you feel when you are with your grandparents?

Also, to determine the child-family relationship, we discussed with the parents of each child.

The conversation method consisted in a dialogue as natural as possible with both pupils and their parents and mainly focused on aspects of activity and opinions of the interviewee. This method was also used to clarify some misunderstandings that the children faced while completing the questionnaire.

The statistical-mathematical method was used to summarise, process and compare data on the relationships between child - kinetotherapist - parent.

**Results**

The results obtained at the items of the AUQUEI questionnaire regarding the child-family relationship were summarised in Table 1 and represented in Figure 2.

Table 1. Average scores obtained on items corresponding to the child-family relationship (from the AUQUEI questionnaire)

<table>
<thead>
<tr>
<th>Item</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How do you feel when you are having dinner with your family?</td>
<td>2.8</td>
</tr>
<tr>
<td>3. If you have brothers and sisters, how do you feel when you play with them?</td>
<td>1.8</td>
</tr>
<tr>
<td>10. How do you feel when you think about your father?</td>
<td>2.2</td>
</tr>
<tr>
<td>13. How do you feel when you think about your mother?</td>
<td>2.4</td>
</tr>
<tr>
<td>16. How do you feel when your parents are talking about you?</td>
<td>3.0</td>
</tr>
<tr>
<td>17. How do you feel when you spend the night away from home?</td>
<td>1.2</td>
</tr>
<tr>
<td>24. How do you feel when you are far from your family?</td>
<td>0.6</td>
</tr>
<tr>
<td>26. How do you feel when you are with your grandparents?</td>
<td>3.0</td>
</tr>
</tbody>
</table>

As shown in Table 1, maximum scores (3.0) were obtained at the items: “when your parents are talking about you” and “when you are with your grandparents”; high scores were also obtained at the items “when you are having dinner with your family” (2.8), “when you think about your mother” (2.4) and “when you think about your father” (2.2); an average score (1.8) was obtained at the item “when you play with brothers/sisters”, a small score (1.2) was obtained at the item “when you spend the night away from home” and the lowest score (0.6) was obtained at the item “when you are far from your family”.
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Figure 2. Average scores on each item corresponding to the child-family relationship

Figure 2 illustrates the children’s responses to the AUQUEI questionnaire – Pictured Child’s Quality of Life Self Questionnaire, regarding their relationship with the family.

Discussions and conclusions

Regarding the relationship between parents - child with special educational needs, after applying the AUQUEI questionnaire, we can state that: the children were sincere in their answers, expressing, without hesitation, their emotional state related to their relationship with the family; all children in the group of subjects love their parents and grandparents, brothers and sisters, and want to spend more time in their families, these children being in a boarding school (weekly or semestery).

Within the relationship between kinetotherapy teacher - pupil with special educational needs during the research, we had the opportunity to find out that children in the group of subjects were eager to communicate and showed attachment to the teacher, striving to respond to all requests as well as possible.

We also encountered issues with a negative impact on communication/relationship, which we aimed to manage and remedy. Children encountered difficulties when performing tasks, because of misunderstandings (completing the questionnaire, performing tests or playing games). We solved the problem by giving explanations in an appropriate language and providing examples of concrete situations. We also found some reservations in action and noticed difficulties of attention and execution in the activity. As a solution to overcome the situation, we had a sincere discussion with the child, telling and showing him/her what he/she did good and wrong, advising him/her to be more careful in the future; we encouraged him/her, creating the prospect of success in the future. We have noticed the tendency of these children to quit sometimes when they encounter some difficulties. As a way of managing and remediating, we adopted a warm, patient, encouraging attitude, advising them to be more attentive, more diligent to succeed.

When we noticed some inappropriate attitudes towards colleagues, we asked the children to have a fair-play attitude.

The relationship between kinetotherapy teacher - parent of the child with special educational needs was more difficult, because the parents of these children rarely came to school and had some reservations in communicating or collaborating.

In order to obtain the consent for the children to participate in this study, we gave parents additional information about the activities, answered questions and gave them time to think. At the same time, we sought to find out as much as possible about the children, information that was useful to us in this research. In the discussions with parents, we explained them that closer collaboration with school is to the advantage of the child.

We can say that there is a close interdependence between the three types of relationships described above, which is illustrated by the following graphical representation (Figure 3).
For efficient kinetotherapy activities, it is necessary to create and maintain a pleasant affective climate, with positive influences on the child - kinetherapist - parent relationship.

References


MODEL OF STANDARDISED TACTICAL ANALYSIS OF A BASKETBALL GAME THROUGH VIDEO ANALYSIS

Cătălin Aurelian ŞTEFĂNESCU

1 National University of Physical Education and Sports, 140 Constantin Noica Street, Bucharest, Romania
*Corresponding author: catln_arln@yahoo.com

Abstract. In recent years, the interest in sports analysis systems has significantly increased, mainly due to specialised TV channels that, given the competitive media system, want to capture the attention of sports fans through various attractive means. There are a number of specialised systems, especially as regards the means of providing statistical data, but even in the case of these existing programs, it is necessary to interfere with the human factor in collecting information and integrating it into a computerised data processing system. Our research aims to develop a data processing and analysis model meant to highlight, on the one hand, the quality of the athletic training and, on the other hand, to assist coaches in the process of building the practice schedule with training means and methods adapted to the real needs, multilaterally assessed according to individual particularities and the game formula. The analysis is carried out on five main directions: detailed statistics, determining the throw efficiency, pace of the game, space-time analysis and offensive game system analysis. From this point of view, the opportunity to access the synthesised data is capitalised by the fact that the coach has the possibility to adapt the game system and the tactical plan to the particularities of the game using a standardised analysis system.

Keywords: basketball, analysis, tactics, statistics, efficiency.

Introduction

In the basketball game played at senior level, statistical parameters such as minutes played, assists, rebounds, balls won, turnovers, blocked shots etc. were introduced among the conventional means of statistical interpretation. Each of these data has made an important contribution to providing valuable information in the context of basketball. Similarly to this development of the information level, the same thing happened to the need for specialists to receive more detailed data than those available up to now.

If we can say that the statistics has been known for over 60 years, things are different when it comes to analysis, a relatively modern term. Analysis means more than summing up the number of scored points, the decisive steps or the recoveries made by a player or a team. The notion of analysis is known on a relatively small scale and usually involves the interpretation of statistical data and viewing the recording of a game by the coach, which is only possible after completion of the game.

Topic addressed

Since effective analysis involves accurate and advanced statistical data, and statistical tapes have been the most important provider of such quantitative data for a long time, the most important step in optimising sports analysis would be exceeding the limits imposed by them. According to Hollinger (2005), a benchmark for the scored points is achieved through the analysis of both the offensive and defensive efficiency that results from the ratio between the scored points and the number of possessions. It is worth noting that the offensive recovery is not considered as the beginning of a new possession, but merely the continuation of the previous possession. An obvious tendency to overcome these borders is reflected in the implementation of the video analysis program used by the NBA beginning with the 2013-2014 season, a revolutionary software system that uses high-precision information about the athletes’ trajectories and the object of the game.

The aim of this paper is to propose a standardised basketball game analysis system to make basketball teams more efficient. The analysis of a game will take place in five main directions: detailed statistics, determining the throw efficiency, pace of the game, space-time analysis and offensive game system analysis. The program used was the Tactical Basketball Analysis (NBA, 2018).

Good teams win games and competitions, and the player efficiency is the one that determines team efficiency. An efficient and objective analysis of the basketball game is based on the synthesis of concrete data that numerically reflect different parameters specific to the sports industry. The most important element in player analysis is to determine their efficiency. To make this possible, we will suggest different indices to show their effectiveness, will identify the favourable game situations for each player and determine the profile of the opposing team. The statistical indices that we propose and are not to be found in the statistical program used by the Romanian Basketball Federation and FIBA are the following:
1. Indices of tactical actions completed by shooting:
   a) Finishing situation - the number of shooting attempts and the number of shots made will be quantified: as a result of a 1-to-1 individual tactical action (noted in Table 1 in the “1:1” box), as a result of a pick-and-roll tactical action (indicated in Table 1 in the “P’n’R” field), as a result of a collective action of screening the man without ball (noted in Table 1 in the “II ob” field), as a result of a collective action in which the positioning and movement of the players without ball created a finishing situation (noted in Table 1 in the “spacing” column), as a result of an offensive rebound (noted in Table 1 under the “2nd chance” heading).

   b) Shooting distance - counts the number of shots attempted and made in the following situations: within the paint (“3”), 2-point shots out of the paint (“1/2 dist.”), 3-point shots (“dist.”).

   c) Finishing area - the number of shots attempted and made will be quantified according to the area where the throw occurred or the tactical action was initiated: on the left side of the attacking team shooting (“left”), on the right side of the attacking team shooting (“right”), from the centre of the court (“centre”).

   d) Finishing period - the number of shots attempted and made will be quantified depending on the remaining attacking time at the moment of the individual or collective tactical action: in the first 6 seconds of the attack - fast break (“<6”), between seconds 6 and 14 of the attack - transition (6-14”), in the last 10 seconds of the attack - set offence (“14-24”). In situations when shooting takes place after an offensive rebound not executed by the shooter or after an action sanctioned with a foul by the referee, according to the basketball game rules, the attacking time resets to 14 seconds and any shot will be considered as a result of a set offence (“14-24”).

2. Indices on other statistically recorded parameters:
   a) Rebounds - the number of defensive and offensive rebounds will be quoted in separate sections and, for each of them, the number of rebounds, according to the position of the player who succeeded in catching the ball; it will also be recorded, in separate columns, the area from which the shot was executed, as follows: the player is on the side of the court where the shot was performed (“s.s.”), the player is on the side of the court opposite to the area where the shot was performed (“w.s.”), the player rebounds the ball during the game as a result of the own shot (“o.s.”), a situation that can be encountered only in the case of offensive recoveries.

   b) Turnovers - the number of turnovers will be quantified according to the area in which it occurred: in the first two thirds of the basketball court (“1st 2/3 c.”), referring to the defence area, and the first 5 meters of the attack ground (outside the area where the attack may create individual or collective tactical actions that may result in shooting), in the last third of the basketball court (“2nd 1/3 c.”), the area of the court from which the attacking team may create individual or collective tactical actions followed by a shot.

   c) Assists - on the one hand, the number of recorded assists will also be quantified in the statistical box that the program uses at the moment in the basketball competitions organized by the Romanian Basketball Federation or FIBA, which we will name direct assists (“direct”), and on the other hand, the secondary assists (“2nd-ry”) will be quantified, represented by the technical passing, a technical element that precedes and positively influences the direct assist. Thus, the secondary assist is in a relationship of direct dependence with the direct assist.

   d) Personal fouls - defensive personal fouls and offensive personal fouls, each of them containing two secondary criteria: screening or positioning (“sc/pos”) and personal fouls accumulated as a result of misconduct in the 1-against-1 tactical action (in the case of offensive fouls); defensive personal fouls accumulated at the time of a shot (“finish”) and personal fouls accumulated as a result of misconduct in the 1-against-1 tactical action (in the case of defensive fouls) (Table 1).

3. Determining the efficiency of the shots, the offensive system and setting the pace of the game

The third stage of the analysis is based on the principle that we will use in our project, namely that of calculating the efficiency of the team’s offensive system not according to how many points are scored, but to the points scored against the number of ball possessions. Similarly, the efficiency of the defensive system will be reflected in the resulting numerical index of the points received/possession of the opponent.

The notion of possession is explained by Panaggio (2005) as the playing situation in which a team has the ball. This team retains possession until the other team gets the ball or the game time expires. The same author differentiates between the notion of possession and the attack phase, in the sense that there may be several phases of attack within the same possession (as a result of an offensive rebound). In general, possession alternates, and the only situation when the rule is not followed is when the quarter ends with a team in possession of the ball, and the next quarter starts with the same team in possession of the ball. Taking into account the alternation of possession, we can say that, if a team has a higher average score/possession, then it is equivalent to winning the game.
Table 1. Proposed statistical indices

<table>
<thead>
<tr>
<th>Player</th>
<th>Finishing situation</th>
<th>Shooting distance</th>
<th>Finishing area</th>
<th>Finishing period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1:1</td>
<td>P’n’R</td>
<td>o.b.</td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spacing</td>
<td>o.r.</td>
<td>3”</td>
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<tr>
<td></td>
<td>Defensive Rebounds</td>
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<td></td>
<td>½dist.</td>
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<tr>
<td></td>
<td>s.s.</td>
<td></td>
<td></td>
<td>Dist.</td>
</tr>
<tr>
<td></td>
<td>Offensive Rebounds</td>
<td></td>
<td></td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td>o.s.</td>
<td></td>
<td></td>
<td>Right</td>
</tr>
<tr>
<td></td>
<td>Turnovers</td>
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<td></td>
<td>Center</td>
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<tr>
<td></td>
<td>2/3</td>
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<td></td>
<td>&lt;6”</td>
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<td></td>
<td>c</td>
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<td></td>
<td>6”-24”</td>
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<td></td>
<td>1/3</td>
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<td>24”</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Assists</td>
<td></td>
<td></td>
<td>1:1</td>
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<tr>
<td></td>
<td>Offensive Fouls</td>
<td>s.c/pos</td>
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<td></td>
<td>1:1</td>
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</tr>
<tr>
<td></td>
<td>Defensive Fouls</td>
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</tr>
</tbody>
</table>

Quantifying the succession of possession gives us important information about the pace of the game. The higher the number of possessions (during a game in which there are no additional extra rounds), the higher the pace of play. Depending on this index, we can see whether a team is more efficient at a higher playing pace or, on the contrary, is advantaged by a lower playing pace, by comparing the percentages of the two situations. This information can be important in the context of establishing the style of play, especially as most coaches, mainly in Romania, want their teams to play modern basketball at a high playing pace. This kind of analysis will answer the question if this style of play is the most efficient for a particular team, referring to individual and group particularities. Considering that generally the higher the pace of play, the higher the number of points scored, the predictability of a game’s success according to a fixed index is hard to predict.

One of the coach’s main roles is to increase team efficiency. Maximising team efficiency is made possible by adapting game systems, tactical plans and methods and means of preparation to the player profile and group peculiarities. A general rule is that finishing is even more difficult as the distance to the basket is longer. The statistics provided by the NBA reflect that the teams have the highest percentage of 3 shots in the paint (3-second zone) with a 56% index. In each of the other areas, the percentages are similar, ranging from 35 to 41% (Figure 1). We will see in the same picture that the EFG index shows the higher efficiency of 3-point shots, despite the percentages compared to those of the 2-point shots, except for those in the paint. The reason is that we have calculated the EFG by multiplying the percentage (FG) of 3-point attempts by 150%, because the actual efficiency of a shot is reflected in the number of points awarded for the success of such a shot. Another important aspect with regard to maximising team efficiency relates to the procedures used by athletes and the success rate of each.

Figure 1. NBA statistics on the efficiency of throws in different areas of the basketball court (FG - field goals, meaning percentage of shots scored and EFG - effective field goals)

We will use as a landmark the 2- and 3-point jump shots. In the case of 2-point jump shots, the NBA provides us with the following data: off the dribble (38%) and spot (42%). With regard to 3-point shots, the data are as follows: off the dribble (32% and 41% with the efficiency index applied), spot (38% and 52% with the efficiency index applied). This type of analysis applied to a single team is efficient in optimising the game systems and tactical plans, on the one hand, and from the perspective of optimising training methods, on the other hand. We have used official statistical data submitted by the NBA, because there is no such data recording in today’s European basketball, and we can see, at least as far as the North American basketball is concerned, that the shots around the basket and the 3-point shots are more efficient than those at the middle range. We also conclude that,
regardless of the area where the throw is performed, if it is preceded by receiving the ball from passing, the efficiency is higher than in the situation when it is preceded by dribbling. This type of information can also be useful to the coach, from a defensive perspective. Knowing the clues presented above, a coach can establish, in the defensive tactical plan, in what situations the defence should be generated and where it should be executed. For example, according to the above data, we can conclude that the areas that need to be protected, in terms of the attack efficiency, are the paint zone and the 3-point corner area. These general data can provide information on defining the defensive tactical concept, but obtaining such data on the percentages of each team can provide valuable information that supports the defensive tactics in each official game.

Unlike football or handball, where the goal of the game is to avoid the game adversely, in basketball, the object of the game must avoid on the vertical plane the adversely players. This difference has the main effect that although it is possible that there are 5 defenders between the offensive player and the ball, if none of them are near him, he may have an open shot. The defence near the rim implies a good development of the defending force, while the defence of the perimeter (the area away from the basket) implies a good development of the speed and the ability of the defender to move laterally in a defensive stance.

“The analysis of the efficiency of individual tactics and collective tactical actions during basketball game” (NBA, 2018) proposes a new approach to solving the problem of basketball game analysis. It is important, in order to interpret the information obtained, to understand how these were obtained. Every touch of the ball by one of the players can materialise in 5 ways: shot made, missed shot, pass, turnover and getting a fault.

Almar (2013) argues that the San Antonio Spurs team was one of the first teams to have a staff member in charge of statistics. His role was to provide specialised information on the acquisition of players. The marketing principle at that time was to buy players at a low price in relation to their efficiency and profile of the team's style of play, because after they have proved their efficiency in the North American basketball championship, to exchange them with more experienced players who can help deliver immediate results.

In general, a team's best markers are defended by the best defensive players of the opponents. In these situations, a percentage of difficulty has to be applied to the efficiency index in order to obtain information close to the reality of the game.

4. Space-time analysis

The fourth stage of our analysis takes into consideration certain elements specific to basketball, different from any other sporting branch. Ștefănescu (2016) says that firstly, basketball court sizes are smaller than most other games, the speed at which the ball changes its trajectory is higher, and all players are near the ball. Secondly, players can mark designing the object of play over defenders, without necessarily having to avoid them horizontally. Another important aspect is the score value for field goal shots (an extra point is given for the successful offsets off the semi-circle at 6.75 meters from the basket), meaning both the areas nearest to the game and the farthest ones are considered high risk areas with regard to the possibilities of attack to mark. All of these considerations indicate that offensive game systems can be built in such a way that all players pose an offensive threat to the defence.

The coaches try to use the offensive game systems, but also through the tactical plans, to place the players so that they have the permanent opportunity to score. This is often difficult to achieve. In building a team, not all players have the same skills to finish a play. There is a need to have players on the field with a very good defensive play, rebounders, passers. For this reason, there must be complementarity between the 5 athletes on the field. At the same time, from a space point of view, a team of 5 cannot contain more than 2 players that have only the capability to score near the ring due to space limitation (considering that in most cases each attacker has a defender in his close proximity). The same cannot be said if we refer to 3 point shooters (space outside the semicircle is more generous). We will present one situation in terms of opportunities to initiate tactical individual or collective action.

This type of analysis has to be done, reported on the profile of the attacking players but also of the defenders and made in advance according to the established criteria. For example, the presence of an attacking player with a high percentage of 3-point shots can positively influence a tactical collective action even if he does not touch the ball. The defensive system will have to adjust, ensuring the optimal distance between the direct opponent and the player in question, in the event that he is the recipient of the pass, the defender to be able to reach a distance suitable for contesting a shot. This can be materialised in the attack by the fact that the help in the event of overtaking will be delayed, the distance that the defending player should cover is higher than if another offensive player with low percentages was in the same position to the "outside shot" method. The influence of the presence
of the offensive player (in the offensive phase) can be quantified by the distance between the defending players (Figure 2).

In order to be able to calculate the efficiency of the defence help, we will construct the polygon with the smallest area containing all 5 players (black colour), the result being, most of the times a pentagon (Figure 2). However, it is not compulsory that the geometric shape be a 5-sided polygon, in exceptional cases, this being a quadrilateral or a triangle.

An analysis of the effectiveness of the defensive or offensive system (there is a ratio of inverse proportionality between the two) will be based on the mathematical resulting polygon: the larger the area, the smaller the offensive system which can offer more opportunities to finish near the rim. We can also analyse individually the attacking players who do not actively participate in an offensive action, but by their profile they can (or cannot) influence a defensive system arrangement favourable to the players directly involved in the tactical action.

The distance between the players and the rim at the time of an attempted shot can facilitate predictability in their chances of getting a rebound (in the event that the shot is missed). At least from an offensive perspective, this data will also provide us with information on the availability of the players on offense to fight for offensive rebounds.

Taking into account that the most effective shots (statistically measured) are those near the rim, defensive systems that can prevent them are most effective. Although defence is generally viewed more in terms of collective efficiency, if we talk about preventing shots near the basket, we can consider that individual input is higher. A team that has a player capable of defending the paint (paint protector) as Jan Vesely (Fenerbahce Ulker Istanbul) has a high predisposition to preventing the most effective basketball shooting process.

5. Analysis of offensive game systems

The fifth stage of the analysis is represented by the identification and graphic representation of the offensive game systems used by the opposing team in accordance with the game tactical plan used during the official game played in the tournament round of the Men’s Basketball League 1.

One of the main features of basketball gameplay is the communication between attacking players. Since an offensive tactical plan comprises a high number of alternating game systems that vary from one possession to another, communication between the player who decides which system will be used in the next attack phase, typically the player position 1 (point guard), and his teammates is essential. For communicating information about the following game system, the point guard uses both verbal means of communication and visual means. So, the name of the game system must be easy to convey verbally (the name should be short) and at the same time be visually transmitted with one hand, given that the point guard that has the ball in his possession.

Another aspect characteristic of senior basketball game in Romania, especially from the perspective of the regulation of the competition for seniors of the Romanian Basketball Federation, is represented by the fact that in Romania there are a large number of foreign players and coaches legalised by the participating clubs, and if we refer to the communication on the basketball court, it is often done in English. For these reasons, with regard to the name of the game systems, coaches opt for alphanumeric symbols from 1 to 5; combinations of alphanumeric symbols and orientation symbols (1 side, 2 down, etc.); symbols that contain segments of the body (head, heart, etc).

As a result of identifying all the game systems used, the most relevant ones will be selected from the perspective of their efficiency (game systems that have facilitated the creation of favourable completion situations).
Each selected game system will be decomposed into a sequence of individual or collective tactical actions (Figure 3) and each player will be presented with defensive tasks corresponding to the tactical actions of the opposing team players. Subsequently, during the training sessions, these cumulative elements represent the defensive tactical plan that will be practiced globally.

![Figure 3. Graphical representation of a game system](image)

The analysis of the offensive game systems of the team is considered the most important of the whole analytical process and it is based on the conclusions resulting from the synthesis of all the information obtained during the first stages of the analysis. The use in the training process of this analytical method allows an effective gameplay prediction of individual and collective tactical actions of the opponent, both according to the predefined tactical plan but also to the individual peculiarities of the advertised players.

**Conclusions**

The innovation element of this theme is the merging of two elements that have so far not been approached in the same context: detailed statistical analysis, the analysis of individual and collective tactical actions.

This model attempts to integrate the most modern means of statistical interpretation alongside with an innovative dynamic tactical interpretation system in order to obtain as varied information as possible about the effectiveness of the athletes analysed both individually and collectively during a basketball game.

We believe that the opportunity to obtain such information can provide coaches a broader, more accurate information perspective and provide significant support for tactical decisions.

**References**


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**Examples:**

- According to Suchilin (2010), the biomechanical criteria are used for dividing the gymnastics elements into parts (p. 5).

- The Publication Manual of the American Psychological Association was first published in 1929 as a seven-page standard of procedure (Bentley et al., 1929, p. 57).

Check each source cited to appear in both the body text and the reference list, while the author and the year are to be identified in terms of spelling. The list of references at the end of the scientific article provides information needed to identify each source. It will mention: **author(s), year, title, city, publisher, pages,** depending on the source of citation (book, journal article, website).

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