SECTION – EXERCISE SCIENCES

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INTELLECTUAL TEACHING – AN EFFECTIVE WAY TO TRAIN YOUNG FOOTBALLERS

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A. Study design/planning
B. Data collection/entry
C. Data analysis/statistics
D. Data interpretation
E. Preparation of manuscript
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Abstract:

Introduction: Learning physical (technical) activity in the colloquial training of young football players is usually carried out by directly feeling the movement, that is, through specific "kinaesthetic instructions" (muscular-motor). Nevertheless, in order for the process of shaping the movement to take place more effectively (creating motor imaginings), it is important to provide specialist knowledge in so-called intellectual training.

Research aim and questions: The study is of utilitarian nature because the main research goals posed, aim at modifying the current concept of teaching methodology in sports games on the example of football, which is related to the visibility of the role of knowledge about the activities being taught and activities in the game. Confirmations of this thesis were sought at institutions training young gifted players (football adepts). The following research questions were posed: 1. Does the knowledge about a player's physical activity influence the effectiveness of learning special techniques? 2. Will mental teaching (intellectualisation) have a positive effect on the effectiveness of the (technical) movement?

Materials and methods: Continuous research was conducted on an annual basis (in 2011-2015) among students of the Football School of Sports Championship in Kraków. The surveyed pupils were a group of senior footballers - the age of the subejcts was 14-15. Forty-eight young players participated in continuous research, divided into 2 subgroups via an organised selection: experimental (E) and control (C), each with 24 players. The experimental group participated in the experimental training session once a week; and theoretical as well as practical classes, lasting 90 minutes. These classes, based on mental teaching in global terms, were characterised by a much lower intensity and volume of practical classes, but greater mentalisation of training compared to the control group.

Results: Analysis of research results confirmed the importance of intellectual training. The experimental group, in relation to the control, had higher values in the level of specialist knowledge, technical skills and, above all, higher parameters for the simulated game.

Introduction

Learning motor (technical) activity in the common training of young footballers usually takes place through the direct feeling of movement, i.e. through specific "kinaesthetic (muscular-motor) instructions". Nevertheless, for the process of shaping movement to be more effective (creating motor images), it is important to provide specialist knowledge [1].

According to Duda [2], this knowledge concerns the scope of knowledge of movement activities, principles of tactical behaviour. These are messages acquired by

a player in the course of planned and systematic training - applicable in practice. Thus, specialist knowledge includes accumulated personal experience of a player and systematically acquired messages to understand the essence of the game. Having the optimal level of specialist knowledge - about efficient operations, the player reflects relationships between events in his/her mind, which greatly facilitates effective operation. In this state, the player knows what s/he can do, and the situations arising during the game take on a fitness nature for him/her (s/he knows what to do and knows how to do it).

The player should expand his/her knowledge, because this is the basis for the development of his/her talent. According to the assumptions of cognitive psychology, the idea of what needs to be done precedes all human activities [3]. This fact indicates that the more diverse information a player receives about the activity being taught, the more accurately and precisely it will become fixed in his/her consciousness. This, in turn, according to Czabański [4], may contribute to the creation of a mental programme anticipating action, increasing the effectiveness of this action.

This process of learning a sports game is based on performing motor activities with full awareness - learning to play with understanding [5], which is related to the player's intellectual learning. The notion of intellectual teaching of activities should be understood as replacing uncontrolled behaviour with intellectual control, i.e. rational, mental control of an athlete. Therefore, it is about consciously receiving motor activity stimuli, i.e. perception of movement - based on thinking, the mental activities of which relate to understanding, anticipating, assessing and reasoning [2, 6].

In teaching a sports game, the intellectual process for efficient operation includes two main directions of impact, i.e. shaping the efficiency of mental processes (perception, intelligence, decision-making) and the process of transferring specialist knowledge [5,7]. In the practical teaching of a sports game, this will mean effectively providing a player with knowledge about action and using this knowledge in teaching actions by activating the athlete's thought processes [2, 8].

In order to achieve the goals of physical activities in a sports game, the intellectualisation of teaching should be based on theoretical learning of the principles of efficient physical activity, taking biomechanical laws accompanying physical acts into account [9]. It has been proved that the better the athlete knows the activities and how to apply these activities (conscious participation in the activity), the easier s/he perceives the situation in the game and more effectively implement its goals [10,2].

Based on the assumption that effective shaping of movement habits in sports games occurs at the level of semantics - movement [11], it is assumed that intellectual teaching increases the process of effective training among young players.

Study aim, research questions and hypotheses

The research presented in this work is of utilitarian nature, because the main research objective is aimed at modifying the current concept of teaching methodology in sports games on the example of football, which is associated with emphasizing the role of knowledge about taught physical activities and activities during the game.

Confirmation of this thesis was sought out at institutions training young talented players (football adepts).

The following questions were posed in the course of research:

1. Does the knowledge of a footballer's motor activities affect the effectiveness of learning a special technique?
2. Will mental teaching (intellectualisation) have a positive effect on the effectiveness of physical (technical) actions?

The positive demonstration of these relationships will allow to look for reserves in other areas of impact in player training. Solving this problem, great benefits can be expected in terms of teaching and health, because the effectiveness of such teaching will allow to increase efficiency in action and reduce burdens in sports training, and this will reduce the risk of exploiting the athlete's body.

Considering the above, the following research hypothesis was formulated:

Players undergoing the intellectual teaching process will be more effective in motor activity.

Research materials and methods

The pedagogical experiment method was used to assess the effectiveness (learning and teaching) of special motor skills. The technique of parallel groups was used: experimental (E) and control (C) [12].

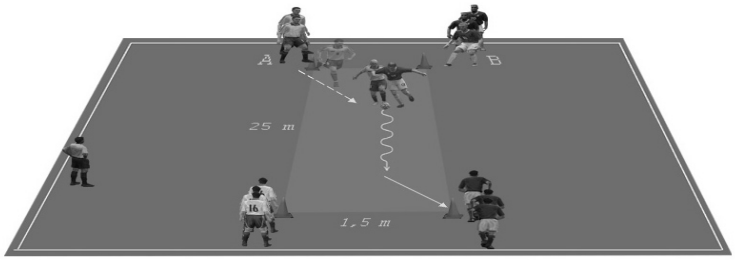
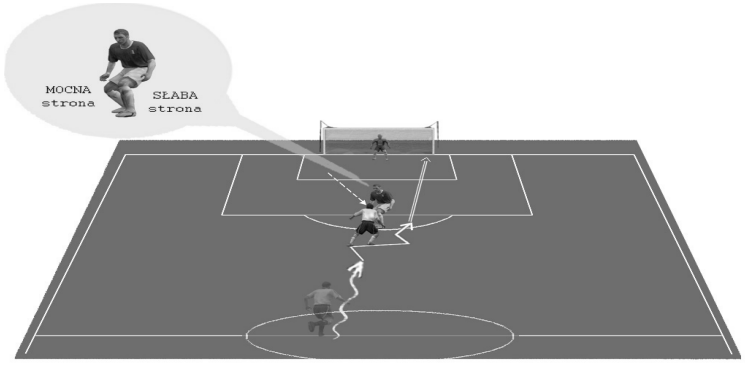
In the experimental research, the independent variable was the method of developing and transmitting information using the method based on the intellectualisation of the player's learning process (special technique).

Dependent variables were measurable results regarding:

1. specialist knowledge about the movement activities of the examined players,
2. the practical mastery of technical activities by players in isolated and game conditions.

Continuous research was conducted in annual cycles (within the years 2011 - 2015) among students of the School of Football Sports Championship in Kraków. The

Outline of training unit: football (teaching motor activities)
Topic: Teaching and perfecting individual actions – **playing with the use of the body**
Knowledge: Understanding the principles of effective action in motor activities when playing using the body
Equipment requirements: video player, instruction video, balls, goals, markers, portable magnetic board

Course	Contents	Comments
Part 1 a Preliminary Theoretical Duration 22.5'	1. Video presentation of playing using body in 1:1 situation. 2. Discussion of motor structure in game using the body in a 1:1 situation (nodal points).	Stages of teaching intellectualisation – didactic film
Part 1 b Preliminary Practical Duration 22.5'	Warm-up with balls, emphasis on the topic of the lesson:	Developing balance
Part 2 Main Duration 40' Teaching and perfecting individual actions – playing with the use of the body	***Game : "Push the opponent out of the corridor"*** Participants are divided into 2 teams (Fig. 1), each pair positioned one after the other. On the pitch, there is a 2-3 m wide corridor, the exercisers are positioned in pairs next to each other side by side about 1.5 m apart on the starting line between markers. At the signal, the first from team A starts leading the ball along the designated corridor towards the row on the other side. Behind this participants, runs a representative of team B, whose task is to "push" the player with the ball out of the corridor using his/her body. A point is awarded for each time the rival is pushed out of the corridor. If the participant leading the ball passes it to a competitor from the opposite row, then the team continues the exercise until all participants in the row finish the competition. Only then does the task change. The winner of the competition is the team that accumulates more points for effective and allowed interventions.  Fig. 1. Exercise diagram in the form of fun and games	Deliberate action when pushing an opponent (assuming the proper position and sensing the moment of attack: "shoulder to shoulder" Controlling whether game plays with the body are carried out in accordance with regulations.
	Exercise name: ***Take a goal shot*** Actions in 1:1 game in the form of a game fragment with the task of stealing the body using the body (Fig. 2):  Fig. 2. Exercise diagram in the form of a game fragment	Consciously realising the objective when receiving the ball. Note "reading of the opponent's game" in positioning, being aware of: "strengths and weaknesses".

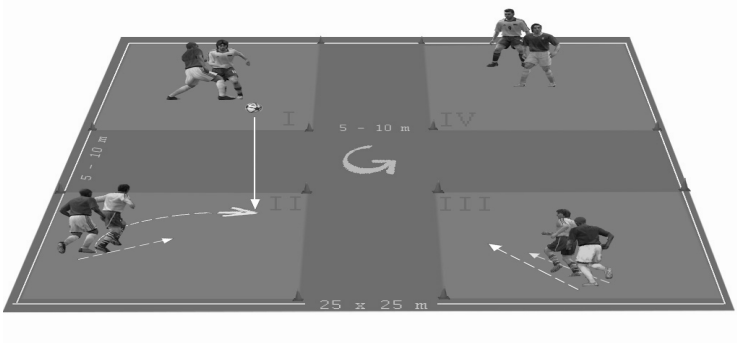
	Exercise name: ***Game in sectors*** The playing field is divided into 4 sectors (zones) with freely modified dimensions (Fig. 3). The game consists of 2 teams of 4 players (in each sector, one from each team, they are not allowed to leave their assigned zones). - Any player in sector one (I) who tries to pass the ball to a partner in the adjacent sector begins the game. The team is awarded a point if each player touches the ball without its loss. The defensive task is to steal the ball through body plays. Variation 1: The ball should be passed in the designated direction or opposite to it. Variation 2: There are 2 players in each team in the sectors (2x2 game).  Fig. 3. Exercise diagram in the form of a game	Deliberate actions in positioning the body to play. Deliberate actions in ball reception via playing with the body.
Part 3 Final Duration 5′	Warm-down exercises in leading the ball, corrective exercises, stretching. Discussion of lesson topic.	

Fig. 1. Example of lesson matrix in teaching motor (technical) activities

examined students were a group of senior footballers - the age of the subjects was 14-15 years.

Forty-eight young players participated in continuous, phased research, divided into 2 subgroups: experimental (E) and control (C), with 24 players in each. These groups in the examined years constituted:

- in 2011, 8 subjects each in the experimental and control group,
- in 2012, 4 subjects in the experimental and control group,
- in 2013, 4 subjects in the experimental and control group,
- in 2014, 4 subjects in the experimental and control group,
- in 2015, 4 subjects in the experimental and control group.

For research purposes, the experimental group took part in the experimental training lesson once a week during the experiment; theoretical and practical classes lasting 90 minutes (Fig. 1). In global terms, these classes were characterised by much lower intensity and volume of practical classes. Generally, 80 intellectual training lessons were conducted for each experimental group.

In the second group - the control, the teaching process was carried out using traditional methods. In this group, knowledge about the player's technical performance was passed on during practical exercises in the form of instructions.

The research was carried out in 2 stages. In the first stage - preliminary tests (pre-test) were carried out to determine the baseline values and to select the most possibly "identical" two research subgroups (statistically insignificant difference) due to the level of specialist knowledge as well as motor and movement skills. The selection of groups was based on organised selection [2], in which players were classified using a rank table. In this way, the experimental and control groups were determined, which for motor, movement and special knowledge dispositions did not show differentiation at a statistically significant level prior to the experiment. In the second stage, re-tests (post-tests) in the area of specialist knowledge and mobility were conducted.

The didactic activities used in the experimental and control groups were based on the following assumptions:

1. the learning objectives pursued during training lessons were identical,
2. the number of training lessons in E and C groups was the same,
3. the duration of the training unit in both groups was the same and amounted to 90 minutes,

4. the difference in didactic behaviour with the experimental group was the way of transferring knowledge about motor activity,
5. in the control groups during the annual training cycle, 80 training units more were allocated to practical teaching than in the experimental groups,. in the experimental groups during the annual training cycle, theoretical teaching (intellectualisation of the teaching process) was allocated 80 training units more than in the control groups.

During the experiment, in both groups (E and C), the following were assumed:

1. implementation of teaching content according to the adopted programme,
2. conducting classes by the same trainers,
3. participation of the same students in the group - players in training classes. In both groups, the same attendance was taken into account for the calculation of study results (overall attendance in the groups was 90%),
4. the intensity of conducting classes in both groups was the same (teaching individual and group activities in an exact form (oxygen transformation zone, mixed transformation zone), teaching in the form of a game (mixed transformation zone, anaerobic transformation zone),
5. teaching technical activities in both groups was in line with the SMS-PN training programme in Kraków.

In the experimental training, intellectual teaching of motor activities (special technique) was used, the purpose of which was to shape the level of motor imaginaries about the technique of movement. In the process of intellectual teaching, verbal and visual methods were used, treated as didactic reinforcement - they included the stages of teaching football technique [2]:

Stage 1: Introductory information about the structure of movement regarding a given activity, about the biomechanical principles occurring in a given task (presentation of pictures and graphic diagrams).

In the implementation of this stage, it was necessary to introduce the subject of teaching movement techniques, providing information on biomechanical activities, show the meaning of a given element during a sports competition and create an image of the movement structure in the player's mind [13].

Stage 2: Presentation of an isolated technical element on film material (didactic film) at a normal playback rate, and then, for more detailed analysis and more permanent memorisation, a fragment of the action was repeated in slow motion.

According to Czabański [4], this way of transmitting information increases the athlete's activity for independent analysis of the presented elements of the movement, causing an increase in skills through careful observation.

Stage 3: Model practical demonstration and an attempt of the player to perform a technical element taught by him/herself.

The overall performance of the technical element by the player from the correct movement structure is of great motivating importance [13]. The correct performance of a technical element has strong emotional impact and encourages mastery of sports fitness, although it makes it difficult to recognise how one can master this activity. In this sense, it is a very important component of the entire learning and teaching process [4].

Stage 4: Practical mastery (methodology of teaching physical activity), analytical teaching supported by visual means (e.g. programmed learning or a series of photos showing individual movement sequences while performing a technical element).

At this stage of teaching, the trainer conducting the classes carried out a detailed analysis of a given technical element - this concerned thorough discussion of individual motor phases in technical operation.

The student-player tries to practically master individual stages of the technical element. It was noted that the motor activities were performed symmetrically (with both legs – the better and worse one).

Mastering the activity performed with one, most often more efficient part of the body, causes the stimulation of motor centres and the creation of a dynamic stereotype in the opposite cortex of the cerebral hemisphere. When performing the same activity with the help of the other parts of the body (leg), the appropriate center in the other hemisphere are stimulated, which extends the repertoire of performance capabilities and, at the same time, improves the performance of a given activity using a more efficient body part. And vice versa: we have an analogous situation, but this time, regarding the less-functional part of the body, when we start to perform this activity with a more efficient leg.

Activities at this stage should lead to comprehensive mastery of the technical element. Learning at this stage was supported by verbal and visual information (trainer's commentary, graphic diagrams) enriching the imagination. This method of teaching eliminates errors and ensures faster learning of a given element [4].

Stage 5: Showing on the film material (work with a camera) the method of performing the taught technical element by the exercising player (observation of the movements of one's own body demonstrated by the film material).

The development of comparative material should provide the opportunity to slow down the image to increase the reception of visual information. This way of teaching gives the player a critical look at his/her own shortcomings in the performance of a given technical element. According to Duda [2], the image presentation motivates learning and eliminating errors.

Stage 6: Correct description of a given technical element (motor ideas - ideomotorics) - mental training.

Mental imageries concerned not only the learner's performance of a particular element in isolated conditions, but it was explained to the learners that these images also concerned the performance of this element in various pitch-related situations.

Imageries play a very important role in teaching sports techniques. Psychologists believe that an athlete is not able to do something s/he has never imagined before, every conscious action must be preceded by a more or less conscious idea of for what we are striving. Images supplemented with words evoke bioelectric activity similar to that which occurs on the field [13].

Stage 7: Creative teaching, using creative methods.

The task methods in which the trainer formulates the problem, and players try to solve using various movements (technique), e.g. the independent performance of a movement task in the form of a fragment of the game.

Such a task means that in these exercises, using previous practical and theoretical experience, the competitor heuristically tries to effectively solve the physical task. The goal to which this aims is individualised, flexibly performed, enabling effective play in constantly changing conditions. According to Counsilman [14], the coordinating structures of the neuromuscular system

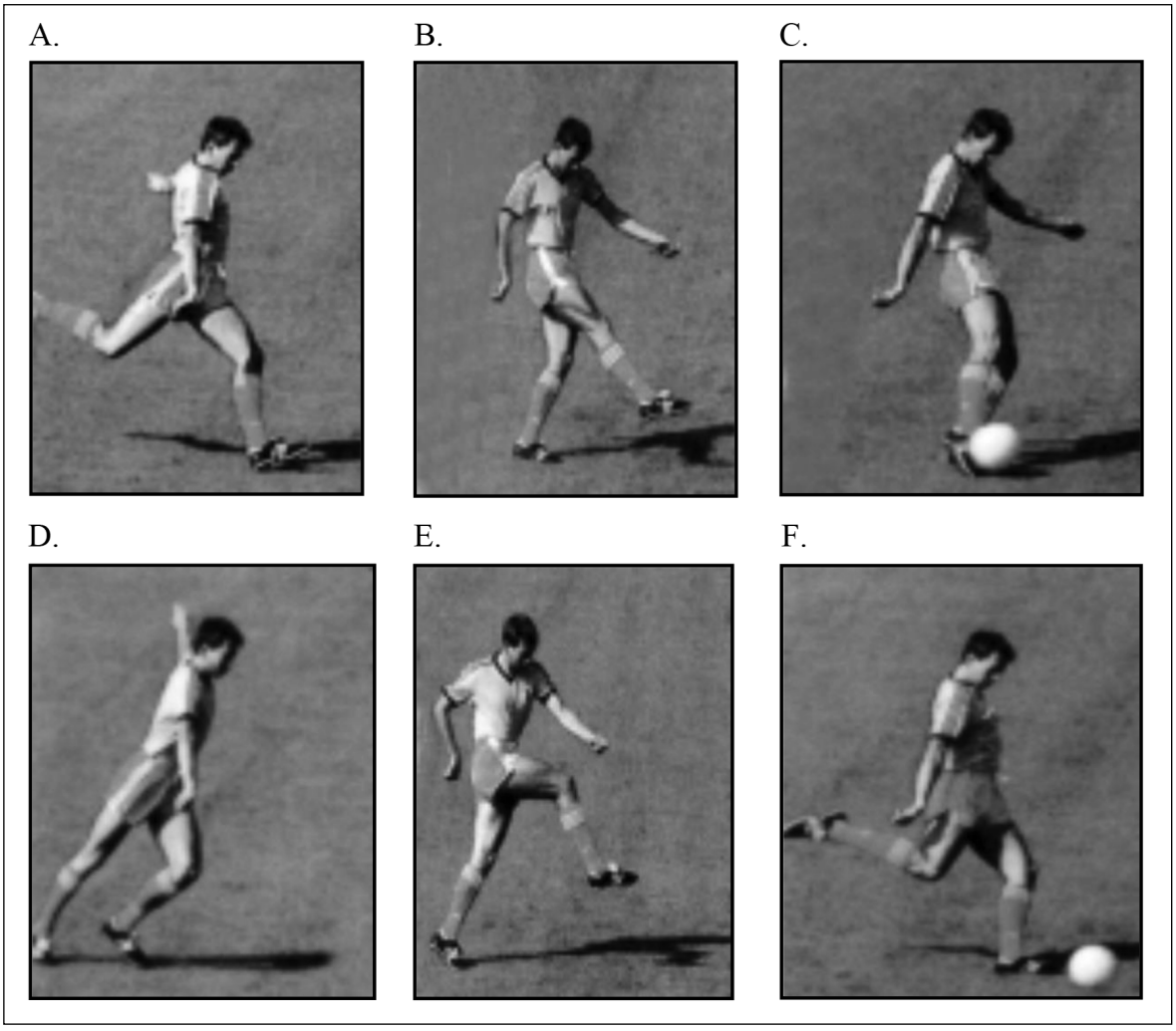


Fig. 2. Example of task in knowledge test about motor activities (according to [9])

The figure presents the movement sequences of a player hitting the ball with a lace strike, arrange the photos in order: A-F.

should be given the opportunity to independently master a given motor task and find individual correct solutions. This method of motor activity allows the player to search the main resistance points - [15], which means searching for such elements in the whole activity, which are critical to the task. These tasks may also show individual predispositions allowing for effectively solving motor activities, e.g. speed, coordination abilities or certain habits, facilitating the efficient performance of a motor task (e.g. unconventional feint or collective structure predispositions).

Such activities actively and consciously strengthen motor activity with its effective performance, thus, additionally increasing the motivation to learn specific motor activities [13].

Stage 8: Collective assessment of the performance of the motor task by the student and the trainer (self-assessment).

Analysis of the motor situation (indication of positive and negative factors) not only practically enriches the motor habit, but also provides greater awareness in the performance of this activity by the learning player. Collective analysis of the motor task creates feedback [16], i.e. a two-way communication between the trainer and the player, significantly increasing the effectiveness of the game teaching process.

To check the level of information about the motor activity of football players, a standardised ($t = 0.95$, $r = 0.87$) technical knowledge test was used [2], containing closed, open-ended and demonstrative questions of a problem nature, which, similarly to actions during the game, concern an alternative choice when solving a given physical activity. The issue of questions concerned the correctness of movement (technical) activities, including analysis of movement, biomechanical principles and principles of effective performance of the game action (Fig. 2.).

To assess the motor fitness of young players, a standardised ($t = 0.88$, $r = 0.87$) technical (special) fitness test was used [2]. Selected technical fitness tests were used in the test, which took into account: feeling the ball (juggling with legs and head), speed of slalom ball leading, striking the ball with head and leg at a distance, accuracy of passing the ball at a distance, accuracy of striking - a shot in designated sectors of the goal. Assessment of players' performance in the game (defensive and offensive activities) was made with objectified observation sheets ($t = 0.93$, $r = 0.86$) in 4x4 simulation games, where players in teams selected in an organised manner (according to rank ratings for special fitness) were evaluated by competent judges [2].

The assessment of technical efficiency tests in isolated conditions and in a simulation game was converted into a standardised 10-point scale (point tables). Experimental teaching was conducted with the participation and control of employees of the AWF Football Theory and Methodology Team in Kraków.

While assessing the examined groups, the level of information on the footballer's physical activity and the players' physical fitness were analysed. Basic statistical operations were used to calculate the test results: arithmetic mean, standard deviation, Student's *t*-test, which determined the level of significance of differences. The determination of the relationship between the measured features was examined using Pearson's linear correlation coefficient [17].

Research results

The research assumptions of the work were that players subjected to experimental (intellectual teaching of movement activities) will achieve better values in terms of specialist knowledge, mobility and during-game activities. Therefore, to verify these assumptions, detailed tests of the parameters listed were carried out in two groups: experimental and control.

Tables 1-3 present the results of research for significant parameters regarding the research issue: the level of knowledge about motor activities, technical skills and effectiveness of activities in the conditions of sports competition of the above-mentioned groups in 2 stages of research - preliminary and final.

When analysing the test results of selected dispositions of effective football player action, it should be noted that before the experiment, as a result of organised player selection, neither of the groups (experimental and control) demonstrated significant differences in this area of research.

Significant changes can be seen by analysing the results obtained by the competitors of both groups during Test 2. In the values of knowledge about motor activity (Tab. 1), which can significantly affect the efficiency of learning and action during sports rivalry [18, 2], significant differentiation can be seen (3.95***) - significance level of $p < 0$ 01. Although a significant difference between the first and the second test (measurement in a given group) in both groups, these parameters are more favourable in the experimental group - a greatly significant difference (5.24***), significance level of $p < 0.001$. In the control group, this value was much lower (3.25**), the significance level of $p < 0.01$.

Similar results can be seen by analysing the progress in mastering the players' motor activities in isolated conditions (Tab. 2) - these parameters testify to the level of technical sophistication of the players. In Test 2, an increase in motor activity scores can also be seen - more

Table 1. Evaluating the level of significance of differences for Technical Knowledge Index (TKI) values in the studied groups

Test 1	Experimental group (TKI – pts.)	Control group (TKI – pts.)
Arithmetic mean	40.68	40.86
Standard deviation	3.64	2.10
Coefficient of variation	8.95	5.14
Significance of differences between groups	0.82	
Test 2		
Arithmetic mean	46.52	42.88
Standard deviation	3.84	2.37
Coefficient of variation	8.25	5.54
Significance of differences between groups	3.95***	
Level of significance of differences between Test 1 and 2 in given group	5.24***	3.25**

Significance of differences: *** - strong significance, ** - significant, * - weak significance

favourable for the experimental group, differentiation at the level of $p < 0.01$ [17].

The confirmation of the significant differentiation between the experimental and control groups in motor (technical) activities is also the progress in these groups between the first and the second tests. It can be seen that the experimental group obtained a much higher value in Test 2 than the control group (3.29 ** > 1.94).

Interesting results can be seen by analysing the progress in mastering the movement (technical) activities of the players under study in the simulated game (Tab. 3) - these parameters testify to a higher level of technical advancement among football players in conditions similar to the game proper. Although no significant differences were found in Test 2 ($t = 1.98 < 2.06$) - [17], the difference between the results of the first and the second tests - in a given group, is more favourable for the experimental group that has achieved significant progress in mastering motor activities (3.24 ***) - significance level of $p < 0.001$. There were no significant differences in the control group ($t = 1.93 < 2.06$). These results, in the applicative aspect, are very important, because they show the fact that the intellectualisation of the process of teaching motor activities provides significant benefits for trained players. According to Williams and Ford [20], Memmert [21] and Sołek-Borowska [22], learning how to play affects not only a player's motor sphere, but also his/her mental sphere, which by shaping creativity, greatly facilitates decision-making in a player's actions.

Table 2. Evaluating the level of significance of differences regarding the scores for motor actvities in isolated conditions (technical test) in the studied groups

Test 1	Experimental group (TKI – pts.)	Control group (TKI – pts.)
Arithmetic mean	56.59	56.27
Standard deviation	3.85	2.75
Coefficient of variation	6.80	4.89
Statistical significance between groups	0.90	
Test 2		
Arithmetic mean	60.04	57.55
Standard deviation	3.74	2.70
Coefficient of variation	6.24	4.69
Statistical significance between groups	2.83**	
Level of significance of differences between Test 1 and 2 in given group	3.29**	1.94

** - $p < 0.01$

Table 3. Evaluating the level of significance of differences regarding motor activies in simulated games in the studied groups

Test 1	Experimental group (TKI – pts.)	Control group (TKI – pts.)
Arithmetic mean	55.38	54.86
Standard deviation	2.79	3.08
Coefficient of variation	5.03	5.61
Statistical significance between groups	1.11	
Test 2		
Arithmetic mean	58.03	56.41
Standard deviation	3.12	3.55
Coefficient of variation	5.37	6.30
Statistical significance between groups	1. 98	
Level of significance of differences between Test 1 and 2 in given group	3.24**	1.93

** - $p < 0.01$

The above analysis of the obtained research results allows to state that the applied experimental teaching of motor actions based on intellectualism (conscious participation of a player in the training process) deserves special attention, because young players from the experimental group obtained not only better values in the level of special knowledge, but above all, higher values in assessment of their movement dispositions and in the game itself, which is a measurable indicator of the effectiveness of the methods used for training progress. The obtained research results also confirm the correct direction in the process of learning to play a sports game (comprehensive impact), hence, it can be concluded that mental methods should play an important role in organised football training.

Conclusions:

1. Providing information about the game in laboratory conditions can be the basis for gaining experience about a player's effective actions in real conditions of sports competition.
2. Methodical behaviour based on intellectual support of a player's movement activities accelerates the teaching of elements of football technique.
3. On the basis of the results obtained and the analysis of decision-making processes and broadly understood modelling in sport, it can be concluded that this research direction seems to be an important source of progress in achieving sports championship.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Ethics Committee

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