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# Cognitive support in teaching football techniques

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## Summary

*Study aim*: To improve the teaching of football techniques by applying cognitive and imagery techniques.
*Material and methods*: Four groups of subjects, n = 32 each, were studied: male and female physical education students aged 20 - 21 years, not engaged previously in football training; male juniors and minors, aged 16 and 13 years, respectively, attending mastery School of Sports (football); their training experience amounted to 6 and 3 years, respectively. Every group was divided into two subgroups (n = 16 each) – control and experimental. All subjects underwent a course consisting of 40 sessions lasting 90 min each, once weekly. Before and at the end of study period the participants were subjected to 3 specific tests assessing their knowledge, motor fitness and game skills.
*Results*: Subjects from all experimental groups achieved significantly (mostly $p<0.001$) better results than the respective control groups in all three areas – knowledge, motor fitness and game skills. The levels of acquired knowledge significantly ($p<0.05$ – 0.001) correlated with specific motor fitness and game skills in all groups of subjects.
*Conclusions*: Cognitive approach improves the results teaching football techniques and may serve as a valuable tool in training.

**Key words: Cognitive teaching – Specific knowledge – Training efficacy - Football**

## Introduction

The objective of teaching methodology in football is in improving the didactic efficacy in acquiring knowledge and specific motor skills. This is closely related to shaping cognitive features, i.e. the engagement of mind, knowledge and abilities [13]. In other words, the point is in a conscious motor perception, i.e. of motor stimuli, understanding, predicting, assessing and reasoning. It seems that making mistakes in a direct competition with the opponent is due to insufficient basic knowledge about individual actions during a match. That issue has not been often presented in a form easily perceivable by field players [15,16,20], hence discussions about methodological insufficiencies in teaching motor skills [5,14].

Knowledge of the efficacy of managing various situations has been transmitted to the players in the conventional way occasionally, usually during training or a match; players often improve their skills by the trial-and-error method, performing subconsciously and automatically, which may limit training efficacy and is thus considered a methodological mistake [14]. It was postulated that learning and perfecting motor actions should be associated with perfecting practical thinking, as the training would be efficient only when supported intellectually [8]. Audiovisual means are thus of great importance in e.g. teaching under laboratory conditions; in other words, theoretical knowledge gives ground for practical performance [12]. These elements are highly important in training as the trainees ought to be aware of all his/her activities and have appropriate knowledge.

In the attempts at improving the teaching process particular attention was paid to the coach-player relations and, especially, to the transmission of theoretical and practical knowledge. It was assumed that the bare field practice in football was insufficient to produce good players and that the traditional training should be substantially enhanced by introducing modern, more efficacious methods of acquiring theoretical knowledge supporting the practice. The aim of the study was thus to reveal the effects of knowledge on the efficacy of learning motor activities with ball by diverse groups of subjects in order to suggest ways of modifying the existing concepts of teaching team games.

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## Material and Methods

Four groups of subjects (n = 30 each) participated in the study: male and female physical education students aged 20 - 21 years, not engaged previously in football training; male juniors and minors, aged 16 and 13 years, respectively, attending mastery School of Sports (football); their training experience amounted to 6 and 3 years, respectively. Every group was divided into two subgroups (n = 15 each) – control and experimental. All subjects underwent a course consisting of 40 sessions lasting 90 min each, once weekly.

The knowledge of specific motor actions and technical skills exhibited during a real or simulated match were recorded twice: before starting the course and at its end. The initial results served to assign subjects into subgroups by the randomised blocks design [2].

In control subgroups, the conventional teaching methodology was applied; this consisted of practical training associated with instructing. In experimental subgroups, visual and imagery techniques were additionally applied. Teaching in both kinds of subgroups was based on the same targets contained in the curricula and was conducted by the same instructors. The field exercises, both individual and in teams, were in all subgroups of the same intensities with respect to metabolic zones.

The objective of the experimental sessions was to shape motor imagery of various actions by applying verbal and visual techniques as an enhancement of teaching. The curriculum included the following stages of teaching football techniques [5,7]:

1. Introduction to motor structure of given action and of the respective biomechanical principles (presentation of drawings and diagrams);
2. Presentation of selected technical elements from videotape at normal speed and in slow motion (detailed analysis and better memorising);
3. Exemplary demonstration of given element followed by reproducing that element by participants;
4. Skill mastering – analytical teaching supported by visual means (programmed teaching – serial pictures of consecutive motions when performing given technical element);
5. Videorecording the performance of given technical element by participants for a detailed motion analysis;
6. Correct description of given element by participants (motor imagery, mental training);
7. Creative teaching – the instructor formulates the problem and participants strive to solve it using diverse motions (techniques), e.g. individual performance of a fragment of football game;
8. Collective (participant and instructor) assessment of participant's performance of a motor task.

Teaching methodology in experimental subgroups is presented in Table 5 as example of one session.

Own, standardised test of technical knowledge [10], contained questions about executing specific motor tasks [7] and alternative answers. The results were presented in a 100-point scale.

Motor fitness of participants was assessed by a specific, standardised test [10,20] containing such elements as ball feeling (juggling ball with legs or head), dribbling speed, accuracy of long passing the ball, accuracy of shots at various goal sectors. Game skills were assessed by recording events on standardised sheets; in simulated games 4×4 [11] the players were selected by randomised blocks design according to ranking in specific fitness, experimental against the control ones. The following individual actions were rated: defensive (shoulder-to-shoulder, clearance, intercepting ball by advance) and offensive (dribbling, feinting, kicking, shooting). Efficacy indices were computed by relating efficient actions to all actions of given type executed by individual players [16]. The results of rating simple, isolated actions, as well as simulated games, were combined and presented in a 100-point scale [10,20].

Between-group differences were assessed by Student's *t*-test for independent data, the training-induced changes within groups – by *t*-test for dependent data, the relationships between variables were presented as Pearson's coefficients of correlation; the level of $p \le 0.05$ was considered significant.

## Results

The results are presented in Tables 1 – 4 and Fig. 1. Mean values (±SD) of all variables studied in all categories of subjects are presented in Tables 1 – 3, percent changes vs. the 'Pre' value in Fig. 1, and coefficients of correlation between those variables in Table 4. No significant differences were found between the experimental and control subgroups in the initial mean values ('Pre') while in all experimental and in some control categories of subjects significant improvements were noted following the 10-month training ('Post'; cf. Tables 1 – 3).

As shown in Fig. 1, the conventional training brought about significant improvements in knowledge (except in male PE-students) and in motor fitness (male PE-students and minors), but not in game skills. On the other hand, experimental groups attained significantly better results than the control subjects in all three areas – knowledge, motor fitness and game skills.

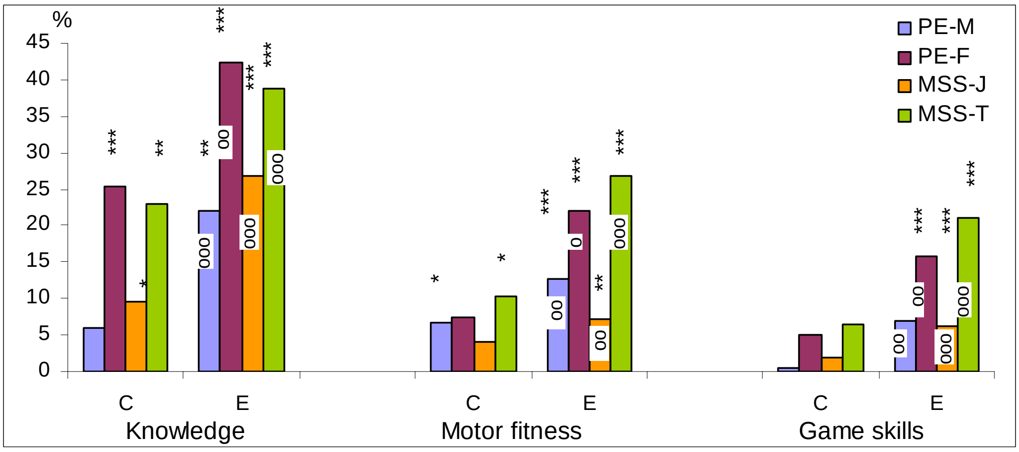


**Fig. 1**. Percent improvement ('Post' vs. 'Pre') in studied variables following a 10-month training period
For explanation of symbols see Table 1; Significant post-pre differences: * p<0.05; ** p<0.01; *** p<0.001; Significant E-C differences: $^{o}$ p<0.05; $^{oo}$ p<0.01; $^{ooo}$ p<0.001

**Table 1**. Mean (±SD) point scores of knowledge about motor activities in 8 sets of subjects, n = 15 each

| Group | Category | | Pre | Post |
|---|---|---|---|---|
| E | PE | M*** | 38.7 ± 3.4 | 47.3 ± 4.7** |
| | | F*** | 32.9 ± 3.8 | 46.8 ± 4.3*** |
| | MSS | J*** | 40.4 ± 5.0 | 51.2 ± 5.9*** |
| | | T* | 15.2 ± 3.7 | 21.1 ± 4.7*** |
| C | PE | M | 38.9 ± 3.5 | 41.3 ± 3.5 |
| | | F | 32.0 ± 3.0 | 40.1 ± 3.5*** |
| | MSS | J | 39.0 ± 3.1 | 42.7± 3.6* |
| | | T | 14.4 ± 3.4 | 17.7 ± 3.5** |

Legend: E – Experimental groups; C – Control groups; PE – Physical education students; MSS – Schoolboys attending Mastery School of Sports; M – Male subjects; F – Female subjects; J – Male juniors (16 years); T – Male minors (13 years); * Significantly different from the 'Pre' value: * p<0.05; *** p<0.001

**Table 2.** Mean (±SD) point scores of technical motor test in 8 sets of subjects, n = 15 each

| Group | Category | | Pre | Post |
|---|---|---|---|---|
| E | PE | M*** | 51.2 ± 5.9 | 57.7 ± 5.5*** |
| | | F*** | 22.1 ± 5.9 | 26.9 ± 5.6*** |
| | MSS | J** | 57.7 ± 4.0 | 61.8 ± 4.6** |
| | | T*** | 26.2± 6.6 | 33.2 ± 5.6*** |
| C | PE | M | 50.1 ± 8.2 | 53.5 ± 7.1* |
| | | F | 21.8 ± 6.2 | 23.4 ± 5.6 |
| | MSS | J | 56.5 ± 4.0 | 58.8± 3.3 |
| | | T | 26.5 ± 5.6 | 29.2 ± 6.1* |

Significantly different from the 'Pre' value: * p<0.05; ** p<0.01; for other explanations see Table 1

**Table 3.** Mean (±SD) point scores of performance in game skills in 8 sets of subjects, n = 15 each

| Group | Category | | Pre | Post |
|---|---|---|---|---|
| E | PE | M | 54.5 ± 4.3 | 58.3 ± 3.8 |
| | | F* | 28.3 ± 5.6 | 32.8 ± 4.3* |
| | MSS | J** | 56.2 ± 3.4 | 59.6 ± 3.4** |
| | | T** | 30.0 ± 4.4 | 36.2 ± 3.1** |
| C | PE | M | 54.9 ± 4.1 | 55.2 ± 3.9 |
| | | F | 28.4 ± 5.9 | 29.9 ± 5.2 |
| | MSS | J | 56.8 ± 4.3 | 58.2± 4.3 |
| | | T | 30.8 ± 4.4 | 32.8 ± 3.2 |

Significantly different from the 'Pre' value: * p<0.05; ** p<0.01; for other explanations see Table 1

**Table 4**. Coefficients of Pearson's correlation between knowledge about motor activities and the results of technical test or game skills

| Correlated variable | Category | E | C |
|---|---|---|---|
| Technical test score | PE, M | 0.803*** | 0.891*** |
| | PE, F | 0.824*** | 0.912 *** |
| | MSS, J | 0.564* | 0.513* |
| | MSS, T | 0.561* | 0.586 * |
| Game skills score | PE, M | 0.728** | 0.695** |
| | PE, F | 0.785 ** | 0.763** |
| | MSS, J | 0.546* | 0.524* |
| | MSS, T | 0.587* | 0.514* |

* p< 0.05; ** p< 0.01; *** p<0.001

Coefficients of correlation between knowledge about motor activities and the results of technical tests or game skills (Table 4) were in the experimental and control groups alike and did not significantly differ between senior and junior groups.

**Table 1**. Example synopsis of a training session – cognitive approach to teaching individual actions

**Subject**: Teaching and improving individual actions – shoulder-to-shoulder
**Objective**: Acquiring the knowledge of efficacious shoulder-to-shoulder motor actions
**Required equipment**: Video player, instructive film, balls, goals, markers, magnetic board

| **Session part and duration** (min) | **Tasks** | **Comments** |
|---|---|---|
| **1a**: Theoretical introduction (22.5) | Video record – shoulder-to-shoulder motor actions 1:1; comments and discussion – principal items | |
| **1b**: Practical introduction (22.5) | Warm-up with balls; emphasis on the leading subject of the session. | Shaping body equilibrium |
| **2**: Core part (40)<br><br>Teaching and perfecting individual shoulder-to-shoulder actions | "Push the opponent out of corridor" game<br>Participants in two teams (Fig. 2a), standing in a corridor marked in the field, 2 – 3 m wide, pairs (in single file) side-to-side 1.5 m apart, on starting line between markers.<br>On a signal, the first player (Team A) starts dribbling ball along the corridor towards the other file; he is followed by a player from Team B who tries to push him out using the shoulder-to-shoulder technique, every push-out gaining one point. When the dribbler passes the ball to his mate from the other file, the team continue game until all players from that file complete the competition, then the teams change over. The team that scored higher observing the rules is the winner. | **Drill 1**: Targeted actions to push out the opponent (taking appropriate position and sensing the moment of shoulder-to-shoulder attack.<br>Observing the rules of shoulder-to-shoulder actions. |
| | 1:1 Actions – element of game; objective – stealing the ball using the shoulder-to-shoulder technique (Fig. 2b). | **Drill 2**: Conscious realising the objective – ball reception; pay attention to sensing opponent's actions, his weaknesses and advantages. |
| | Game field divided into 4 zones of modifiable dimensions (Fig. 2c). Two teams, 4 players each, every zone occupied by one player from each team; they must not leave their zones. Game is started by a player from Zone 1 who aims at passing the ball to his partner from neighbouring zone. Team scores a point when every player touches the ball without ball loss. The opponents aim at stealing ball using the shoulder-to-shoulder technique.<br>*Option 1*: The ball is to be passed in the right or reverse preset direction;<br>*Option 2*: Two players from each team occupy every sector (2:2 game). | **Drill 3**: Taking right positions for shoulder-to-shoulder actions.<br>Stealing ball using shoulder-to-shoulder technique. |
| **3**: Final part (5) | Relaxing, corrective and stretching exercises; discussing tasks. | |

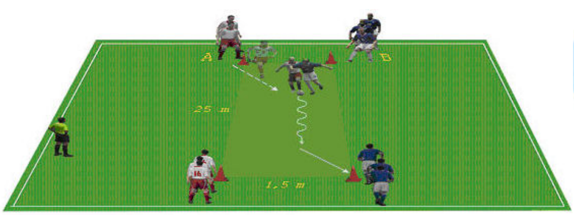

**Fig. 2a**. Outline of a drill in play mode

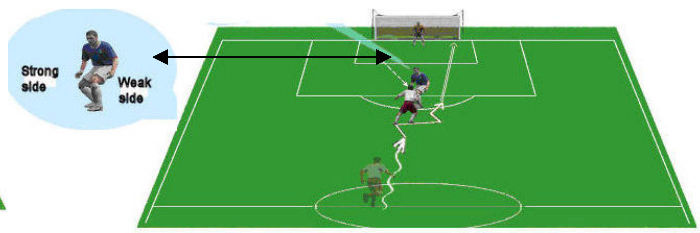


**Fig. 2b**. Outline of a drill performed as game element

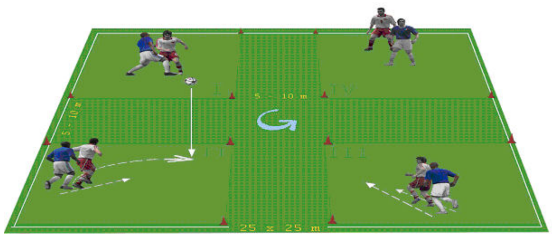

**Fig. 2c**. Outline of a drill performed as game

## Discussion

The presented results supported the view that the knowledge about execution of motor activities, i.e. their intellectual support, significantly improved the efficacy of players as demonstrated by close relationships between knowledge and motor performance in tests as well as under field conditions. These results confirmed the report of Bunker and Thorpe [6] and of others [14,16] who stated that a good player knows what and how to perform. A specific knowledge enables noticing the essential stimuli which speeds up responses [17]. In addition, poorly known and/or unexpected circumstances and actions carry many pieces of information, thus their processing and taking decision require much time [9]. Experienced and having good specific knowledge players, are capable of directing the opponent towards following their intended plans [21]. On the other hand, as young children as 7 – 8 years are capable of consciously anticipating their actions [18], thus an intellectual support may be efficacious in game learning.

The specificity of football calls for a specialist knowledge as a foundation for motor activities [14,16] since anticipating situations and taking decisions as to the mode of executing motor tasks requires knowledge [19]. Moreover, sport competition as an intentionally organised activity implies knowledge-based game teaching [15], hence the requirement to teach heuristically, the objective being a harmonious bodily and mental improvement [1,14]. The subject has not been much discussed in the literature despite its conceptual importance [6] with emphasised decisive proficiency of players as dependent on their specialist knowledge [16]. Intellectual support in game teaching was broadly discussed and presented by Turner and Martinek [23] who constructed a game model.

The presented results, together with views and recommendations of other authors discussed above, point to the importance of cognitive processes in an efficient solving of motor tasks. The didactic value of knowledge-based game teaching has been strengthened by the diversity of studied subjects – they were of both genders, represented a fairly wide age range and experience, yet the overall outcome was unequivocally positive.

Summing up, the striking differences between experimental and control groups detected in all studied areas may be attributed to the technique of intellectual support of training used in this study. Such approach may thus significantly improve the efficacy of teaching motor tasks. That view is supported by high correlations between the level of knowledge and motor performance found in all studied subgroups. The usefulness of that issue in sport practice calls for continuing and expanding research on intellectual support of teaching motor activities.

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