

MOTOR LEARNING IN ADVANCED SPORT

Dr. Kamlakar K. Kadam

Head

Depr. of Physical Education and Sports.,
Nutan College, Selu (M.S)

Abstract:

Motor learning is characterized by specific features and it incorporates laws that have to be observed throughout the various manifestations of an athlete's motor activity. It is the process of acquiring, completing and using motor information, knowledge, experience and motor programs. Performing a certain movement is only possible if a suitable motor programme for it exists. The motor process starts with a definition of the desired result and consists of three interconnected phases: the phase of basic movement coordination, the phase of accurate movement coordination and the phase of movement coordination stabilization under changeable and difficult circumstances. A precondition for efficient motor learning is an optimally accurate notion of movement which is based on the visual followed by the kinesthetic processing of information.



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Key words: *motor learning, learning phases, motor programmes, motor memory, movement scheme.*

INTRODUCTION:

The official definition of learning (UNESCO/ISCED 1993) reads as follows: "Learning is any permanent change in behavior, acquaintance, knowledge, comprehension, viewpoints, skills or abilities that cannot be ascribed to physical growth or development of inherited behavioral patterns." Learning – in various forms and situations – is a part of man's everyday life. Learning changes our personality; it is a process of receiving, acquiring, recognizing, developing and expanding our horizons. Questions such as: what is the essence of learning, what are the basic forms of learning, what are the necessary conditions for learning to take place, what are the most successful learning methods etc., have been dealt with by many psychologists in the past decades, during which time over fifty learning theories have evolved.

THE MOTOR LEARNING PROCESS:

Motor learning is a process of acquiring, completing and using motor information, knowledge, experience, and motor programmes (Adams, 1976). It is closely connected with mental abilities, motor abilities, foreknowledge, the cognitive and combative characteristics of an individual as well as his familiarity with the theoretical bases of movement technique. Based on Hay's biomechanical studies (1985), it may be ascertained that running, as the most elementary manifestation of human motor abilities, involves more than 80 muscle groups and 46 bones of the locomotor system. To facilitate the correct performance of a motor action, optimal coordination of movements is necessary. Abernethy et al. (1997) distinguished between three phases in the process of motor learning: the verbal-cognitive phase during which a new movement structure is first identified and then understood; the associative phase during which several elements of the movement structure are integrated and adapted to the changing circumstances; and the autonomous phase during which movement becomes automatic and results in few errors.

Magill's (1993) definition of motor learning divides muscle activity into seven phases:

- The selection and innervation of those muscles necessary for the efficient execution of a movement;
- Sequencing (the correct sequence of muscle activation);
- Time structuring of the movement (the duration of the activity of an individual muscle during the entire movement);
- Gradation (varied application of the power of the engaged muscles);
- Timing (adapting the structure of the movement to external conditions);
- Alternative movements (selection of the optimal movement structure in view of the current situation);
- Movement control (movement automation and movement adaptation in non-standard circumstances).

Motor learning of a given sports technique requires a plan which Schmidt (1977) defined as a "scheme" being stored in the motor memory. The movement scheme has four elements:

- Initial conditions such as information about the environment, the position of body parts, position of the tool (e.g. club, racquet, ball), the grip and balance of the body;
- Information about the speed, amplitude and force of the swing;
- Information about movement transmitted by kinesthetic receptors;
- Information about the reaction outcome in view of the set goal.

THE PHASES OF MOTOR LEARNING:

The process of motor learning is long-lasting and, in terms of its effects, it consists of three basic phases: the phase of basic movement coordination, the phase of accurate movement coordination and the phase of movement coordination stabilization under changeable and difficult circumstances.

The Phase of Basic Movement Coordination

In this phase of learning, an individual first learns about basic movements and is able to execute them only under favorable conditions and with sustained conscious concentration. The results are quite modest as the technique is poorly developed and uneconomical. The notion of movement and motor sensations are vague, dull, incomplete,

The Phase of Accurate Movement Coordination

During this phase an individual is capable of executing high-quality movement in regards to optimal technique pattern, provided that the circumstances are normal. Errors still occur but they are less obvious and less frequent. As the player repeats the movement, his results improve. Movement becomes more coordinated, individual motor phases are interconnected, leading to a good and refined movement coordination. Progress in learning the technique is not continuous and depends on the characteristics and abilities of an individual. After many very successful executions of a technique, a momentary standstill may occur that is usually of short duration. Performing incorrect repetitions may have long-term consequences such as an unwanted consolidation of errors.

LEARNING METHODS:

Learning methods are conventional procedures or sequences of procedures used for acquiring knowledge (Marentič Požarnik, 1980). In motor learning methodology various learning methods are used and combined, depending on the exactness and character of the motor task and on the learner's age and stage of motor learning. The most important characteristic of a motor task in terms of choosing the learning method is its integration. The more the individual parts intertwine, the more significant the synthetic and combined methods are. If an individual is completely unfamiliar with the components of movement and considers them very demanding, the method of learning part by part is more appropriate

The Method of Instruction

Verbal instruction is one of the most elementary forms of human expression and communication. It is important during the initial phase of motor learning, when an individual is

becoming familiarized with the basic movements. It may include descriptions of the basic characteristics of movement, explanations of concepts, rules, inferences, definitions of models and the like. An instruction may be in the form of a conversation, where questions and answers are not determined beforehand. It may also be a discussion, a debate or an argument where different opinions, viewpoints, attitudes, arguments and counter-arguments are put forward. When giving instructions, the instructor should present objective facts, adhere to the principle of gradual progress from the easy to the more difficult, from the familiar to the unknown, from the relevant and vital to the less important.

The Demonstration Method

The initial notion of motor learning is primarily based on a sensory signal system which provides optical information (sight). The demonstration method has to be combined with other learning methods, especially the method of instruction. The demonstration must be absolutely correct, clear and suitable to the learner's age and level of maturity. The instructor must always evaluate the effect of the demonstration and its applicative value. The demonstration must be in line with the learner's mental and motor abilities, and suitable for practical application. The demonstration of only one ideal movement is not desirable. Movement technique mirrors the concrete effects of a learner's motor abilities and morphological characteristic with wide variety.

The Situational Method (Synthetic Method)

It is one of the most frequent and most natural methods of motor learning, which is usually used for less demanding movements. The method is more suitable and effective for beginners, as they have a higher ability of understanding movement as a whole rather than its individual parts. The concept of learning movement as a whole is not to be understood literally, since learning is demanding and in the case of complex movements one should not start with all the details right away. In terms of difficulty and composition, not all movements are the same; nevertheless, each movement has inherent basic and vital elements. Beginners have to learn these very basic elements as soon as possible. The situational method enables athletes to display their abilities and characteristics on two levels. The first consists of replication – repeating the motor task which has been demonstrated in its entirety.

The Analytical Method

The essence of this method is to divide the movement technique into individual fractions, teach these fractions one by one, and in the last phase, gradually combine the learned fractions with the basic movement. It is generally used for very complex movements, which cannot be learned as a

whole. In this method, difficulties occur due to the long-term learning of certain fractions, and problems arise in the process of combining the learned fractions into a whole. The overly repeated fractions, which sooner or later become automatic, may completely alter the overall movement scheme and rhythm. Therefore, the order of learning individual fractions is important. The basic movement scheme has to be preserved throughout the process. Experience teaches that it is reasonable to teach individual elements in the same order in which they appear in the kinematic and dynamic structures of the basic technique.

The Complex Method

This method is a combination of the situational and analytical methods. In motor learning both methods intertwine and complement each other. First, individual elements are practiced, then there is a gradual shift to practicing the entire technique and, finally, some elements are practiced again to perfection. In the case of beginners, a stronger emphasis is placed on the situational exercise, while the analytical exercise is merely complementary.

Irrespective of the applied method, care should be taken throughout the process that the incorrect notions of movement do not consolidate and produce errors. Only a sufficient quantity of movements may produce an adequate quality of movements. It should be noted that there is no universal method to be applied under any circumstances and by anyone. When applying any of the methods, the following has to be considered:

- The application of a learning method depends on biological and calendar age, foreknowledge, movement experience and information regarding movement;
- Attention has to be focused on the causes of incorrect movements, instead of their consequences;
- Causes of incorrect movements may be: incorrect notions, a lack of motor abilities (agility, strength, coordination), an unfavorable morphological constitution;
- First, gross errors have to be eliminated, as the minor ones often stem from them;
- The sooner the errors are corrected, the lesser the chance of them becoming automatised;
- One-time errors should never be corrected if they occur by coincidence;
- Errors and shortcomings should be rectified in the order in which they appeared;
- The correction process should not emphasise only the shortcomings, but also positive thinking, progress and trust;
- Instructions have to be in tune with the learners' motor sensations;
- Instructions have to be adapted to the learners' age and maturity;
- A variety of words, codes, illustrations, demonstrations, imitational exercises should be used

to influence the movement patterns;

- The instructor should commend successful technique execution;
- The instructor should evaluate the technique from various angles and perspectives;
- When correcting errors, the instructor should protect the learner's privacy and should never admonish a learner in front of his colleagues.

The Ideomotor Method

The basis of successful motor learning is a good notion of movement. When it comes to beginners, the notion of movement is vague, incomplete, sometimes even wrong and not in harmony with the real dynamic and temporal parameters of movement technique. A correct notion is formed on the basis of the instructor's explanation and demonstration. By means of visual and verbal information, a beginner can easily form a basic notion of movement and enhance it by the already existing motor programmes stored in his motor memory. In the ideomotor method, movement is performed inside one's mind, which makes it an example of mental learning. Only the motor cortex is activated and is responsible for the planning of motor structures. The athlete "executes" the movement technique in his mind, particularly the key elements of the technique. This method may be used in different situations. In the concentration phase, the athlete may take a mental leap and seemingly perform certain movement phases. The ideomotor method may help consolidate the movement pattern, as the number of imaginary repetitions is greater than the real movement frequency. Thus, the movement pattern consolidates because the memory traces before the next repetition are fresher and stronger. This method is highly effective, even when the athlete is injured, does not train and cannot execute the movement technique. Ideomotor training may help the athlete to concentrate on the crucial moments of his performance. An athlete should be capable of "getting rid" of stress and competitive pressure and should prepare himself for the decisive moments of a competition.

The Iterative Method

During the phase of automated and highly adaptable movement, when the athlete is able to execute optimal technique in changeable circumstances, the iterative method (Latin *iteratio* from *iterum* – repetition, doing anew) is one of the most common exercise methods. It involves repetition of a movement in a series over a period of short intervals. Each execution leaves a trace in the motor memory and paves the way for another trace. The effect of this method depends on the degree of technique automation, the athlete's motor abilities, movement complexity, the number of repetitions, concentration and motivation. When applying this method attention has to be paid to the correct technical execution of movement, otherwise the incorrect movements will become automated.

CONCLUSION:

Motor learning is a complex and continuous process consisting of several phases. The margins between the phases are usually not clear. The basis of motor learning is a specific motor programme, which is created by the motor cortex based on external and internal information. The essence of efficient motor learning in sport is a correct notion of movement. In the case of beginners, the notion of movement is vague, incomplete, sometimes even wrong and not in harmony with the real dynamic and temporal parameters of movement technique. The use of motor learning methods depends on the athlete's biological and calendar age, foreknowledge, motor experience, and the information he has on movement. Attention has to be focused primarily on the causes of incorrect movement, and not their consequences. The most common causes of irrational movement are incorrect notions, a lack of motor abilities and an unfavorable morphological constitution of the athlete.

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