

DETERMINATION OF THE ESSENCE OF CONCEPTS MOTOR LEARNING, MOTOR SKILL, MOTOR HABIT, MOTOR STEREOTYPE

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Abstract

In automatization of movements and their transformation into habits the structure of activities undergoes numerous transformations. First of all automatized movements form one continuous act that we denote as skill or knowledge (for example, a complex system of human movements to perform an exercise, to write, to make some objects and the like). In the course of time excess movements are lost and the number of mistakes decreases. Control of process shifts from the process towards the result, and the external sensory control is exchanged by the internal proprioceptive one. Speed of movement performance is increased aspiring to the optimal or maximal one. This comes as a result of exercising. Development and perfection of movements can be understood as a passage from the knowledge to the level of habit. This incorporates the notion of motor stereotype that denotes stable system of conditioned nervous paths that provide for some intensity and the order of body reactions to the external conditions.

1. Introduction

Basis of movement abilities of man is physical ability and its form of manifestations is reflected in motor knowledge and incorporated motor habits. Varied motor actions are performed during lifetime twofold and are influenced by many factors, passive ones influenced by living and working conditions and active ones aiming to meaningfully exert influence through physical exercising. Significant part of motor activities and movements in his life man performs in a natural way (walking, running, jumping, etc). During his active working life and moreover in his physical activities certain motor skills and motor habits are acquired and they make the basis of his behavior.

In physical exercising existing motor actions are improved and new ones are built. Habit formation goes through many repetitions characterized by minimum

necessary time, high precision and efficiency, focusing on automatized performance. This process was named by I. P. Pavlov (Pavlov, 1951a,b) “dynamic stereotype” stressing foremost stereotypeness of performance and then dynamic movement acquisition by means of exercising, repetition, and precondition of fatigue, emotions, sickness, interruptions, etc (Goncharov, 2008). Optimum of this process is reached by rational programmed training. Man’s skills are evaluated not just by his or her accomplishments during instruction or movement performance but by the easy and quick formation of habits and skills (Ljulina, Lapygina, 2009). Learning rational movement depends on the acquisition of correct knowledge of the essence, regulations and conditions of the movement performance but transforming such knowledge into actions is possible on the basis of practical realizations. When trained in movements or motor activities man must master their kinematic, dynamic and rhythmical parameters. Mastering movement patterns starts with the formation of knowledge of parameters and characteristics of their techniques and variants of their performance. Any activity (professional, military, sports, etc) can be realized successfully only if man possesses not only expertise knowledge but also motor skills and habits (Koc, 1986).

Problem of skills and habits is always present because they are in the bottom line of learning itself, motor learning including, in the course of mastering of any movement during physical activities and exercising. Knowing their essence and the manner of their formation is crucial for the theory and practice of training because knowing their basic characteristics and laws can help us more efficient set goals reaching and achievement of better results in physical education and training.

2. Material and methods

Research problem and aim

The exact meaning of any concept is of paramount importance in order to eliminate ambiguities and misunderstandings in expertise communication.

Correctly defined concepts help expertise people to avoid dissonant tones when drawing conclusions in their considerations of these very concepts. Serbian language in the field of physical education is burdened by quite a number of doubts and illogical assumptions about understanding and use of concepts denoted by phrases motor knowledge, motor skills, motor habit, motor stereotype. Uncertainties are mirrored in determination of identical meanings or differences of these concepts and questioning differences and concepts which mirror them. Non-logic is found in the use of syntagma motor skill when it is used in contexts where it actually denotes motor action, activity or phenomenon and that is not connected with skill. This calls for more systematic considerations of these terms and their more precise defining and interpreting so as to avoid misconceptions.

The aim of this paper is to determine the essence of these concepts.

Memhods

To solve the problems posed in the paper general inductive-deductive approach to the researched material and a method of theoretical analysis were used.

This was done to provide for theoretical basis for this kind of research and to define contents of their basic concepts and to determine the research problem and aim. Research material was chosen on the basis of the relevance to the researched concepts, directly or indirectly. Key words used to choose the research material are the terms of the investigated concepts (motor learning, motor habit, motor skill, and motor stereotype). Material was then processed by means of the theoretical analysis method. This method was used primarily in creation of theoretical basis of the research, to define content of the basic concepts and to determine research problem and aim.

Different expertise contents were theoretically analysed (scientific papers, articles, textbooks, monographies, studies, etc.) and final conclusions were made.

Research problem was perceived in the lack of explicitly defined essential characteristics of the mentioned concepts which creates very often confusion in their use in experts practice and mutual communication.

Research aim was to determine basic features of the researched concepts and to point out their similarities and differences.

Hypothesis

H1: Concepts motor learning, motor habit, motor skill and motor stereotype are mutually interconnected;

H2: Formation of motor habit is a process consisting of different stages which logically follow one another;

H3: Indispensable element both of motor learning and motor skill in all developmental stages is manner of functioning of the CNS in realization of certain movement;

H4: Motor skill is a concept of the highest order.

3. Results and discussions

3.1 Basic characteristics of the given concepts

Any movement can be performed as knowledge based² and habit based. There are different opinions about their correlations.

Motor knowledge is attributed to the most elementary level of movement performance and the mastership of the given area of movements (Boguslavskij, 2000). Some child can be said to know how to swim. But the same can be claimed for the adult person that can swim. The difference between these 'forms of knowledge and skills' lies in many years of practice and exercising of these movement patterns, perfecting motor habits of swimming. These are of course in a said child and the adult qualitatively different types of motor knowledge.

² In the dictionary of Serbian language published by Matica srpska definition of the entry - *umenje*, knowledge, skill reads *solid knowledge of some area, skill*. Serbian language also has another word with the same meaning - *umeće*, skill (author's note.)

Essentially, knowledge means applied knowledge and habits in real actions. Acting in new conditions or using new objects man uses different types of knowledge and already acquired habits. This transfer of habits from different previous experiences is considered to be primal knowledge. Thus the narrow meaning of the term reads acquired manner of action performance determined by the overall knowledge and habits already acquired. Therefore knowledge to habit means action to action's realization. Knowledge is a broader concept than habit and it implies varied variants of acting. One of the realization variants as a result of the *repeated task* appropriateness can become stable and automated, i.e. it can become habit (Boguslavskij, 2000).

One should make difference between *elementary (motor) knowledge* followed by theoretical knowledge and the first experience of the movement performance, *initial (motor) knowledge* as a result of the acquisition of some technique of the motor action/movement and *real (motor) knowledge– skill* (knowledge of a higher order reflecting some degree of mastership of the movement performance appearing after built up of the motor habit or motor habits, necessary for the maximal success of the given movement performance). *Elementary (motor) knowledge* denotes actions that appear based on the knowledge as a result of imitation of the movements or self trials and errors. *Initial (motor) knowledge* emerges as a result of certain number of repetitions and trials to acquire a technique of some movement. *Real (motor) knowledge* (knowledge of higher order, skill, and mastership) emerges on the basis of already formed habits and wide scope of knowledge (Il'in, 1986).

Further in the paper essence and mutual differences between the terms *motor learning*, *motor skill*, *motor habit*, *motor stereotype* will be defined so as to avoid errors in their use as synonyms.

3.1.1. On the content of the concept motor learning (knowledge)

Elementary motor knowledge to perform something emerges as a result of imitation from the random knowledge. For example, a pupil can shoot or perform shot put following the role model of a teacher but the performance technique will probably be irregular. The teacher's task is to build up during the training adequate habits of performance techniques of certain actions and through repetitions to upgrade the performance technique to the highest possible level. The more complex movement the lesser knowledge will be acquired as a result of observation and imitating (Boguslavskij, 2000).

One can say that the essence of motor knowledge is constant upgrading and improving of the manner of action/movement performance in movement management.

The role of motor knowledge in physical exercising can be different. In some cases knowledge leads to habits if it is necessary to acquire high quality mastership of the movement technique. Elsewhere motor knowledge is built up without subsequent transformation into habits. For example, school Physical Education curriculum contents are acquired on the level of knowledge. The wider the data base of the knowledge the easier new knowledge is formed. Motor knowledge has

immense educational value since its main element; creative thinking is focused to the analysis and synthesis of movements. (Holodov & Kuznecov, 2000).

Concepts of motor knowledge and motor habit denote first of all technical side of the ability to perform motor action and reflect a degree of their formation and acquisition. Motor knowledge is a typical form of realization of motor abilities of a man reflected in an ability to perform motor movement on the basis of non-automated (or to some point to automating) targeted operations. As a result of the motor action/movement acquisition emerges *initial (beginning) motor knowledge*.

Initial (beginning) motor knowledge represents a form of realization of motor abilities of a man and mastership degree of motor movement reflected in an ability to perform motor movement by concentrating on the technique, bringing in conscious control and active thinking (Matveev, 1991, Erkomajshvili, 2004).

This is relatively stable system of motor actions but not resistant to distracting factors realized by conscious managing of its elements.

Initial (beginning) motor knowledge is an ability to do something safely but only within the scope of familiar and accustomed to circumstances with focused attention to subject's doings. (Matveev, 1991, Erkomajshvili, 2004).

Characteristics of the initial (beginning) motor knowledge are (Erkomajshvili, 2004):

- Non-automatized managing of the movements with conscious focus. Constant focus of attention during movement to distinctive constituent operations, minimal or relatively small motor automatism in movement management;
- The performer is totally focused on the control of every single movement so central nervous system is fatigued more than in the performance of learned movement;
- Movement is burdened by excessive muscle tensions, it is non-economic with great fatigue and non-alligned mutual elements of movement. Therefore the movement is not yielding expected results;
- There appears non-standard parameters and movement results, there is varied non-targeted change in movement performance techniques all the way to its disturbance under distracting factors;
 - Under-speed of action performance;
 - Instability of movement. Technique is being precised and improving;
 - Operations are discrete without continuation and thus cause time lags and laps;
 - Negative distracting factors are increased (noise, fatigue, different situations, etc.).

In the improving process of motor knowledge by numerous repetitions there appears continuousness and stability of movements, automatized performance so movement grows into motor habit. During movement learning managing movement is changing. As a result level of movement mastership is increased. First (beginner's level) of movement management is motor knowledge, second is motor skill.

Improvement process is infinite. The basic aim is to teach an individual to master habits in different situations. Only then can habit render its practical value (Erkomajshvili, 2004).

3.1.2. Concept of motor skill

Based on previous knowledge and habits motor knowledge of higher order – *motor skills*³ are formed and they reflect *a degree of mastership in movement performance emerging after building up motor habit or motor habits necessary for the maximal success of movement performance.*

These skills are reflected in solving new motor tasks in varied conditions. For example, sports games and competitions skills are tightly connected with the athlete's intellect (Rudenik, 2010). In order to apply knowledge and habits in games it is necessary to possess good observation, orienting, anticipation of the opponent's intentions, quick problem solving, etc.

*Motor skill*⁴ (*real motor knowledge*) – differs from the *initial (beginning) motor knowledge* in the ease of performance in varied situations. When we talk about skill we imply application of adopted way of movement in different situations (transfer). Skill is not acquired if action is performed in clearly determined situation (sometimes artificial one) but when it is performed in varied conditions with solutions for different situations.

A main characteristic of the skill is the ability of a man to apply his knowledge, habits, etc. congruent with the situation. Skill means to perform work productively, qualitatively and timely in new conditions.

Any skill comprises concepts, knowledge, habits of concentration, allotting and transferring attention, self-control and regulating of the action or movement performance. Essentially, *motor skills and real (motor) knowledge* (knowledge of higher order, skill, and mastership) are what we aim to in instruction because they provide for successful performance of movements in different situations with minimal participation of consciousness.

3.1.3. On concept of motor habit

Movement and physical activity are the immanent attributes of man. Movement is performed in different situations and it enables man to do different activities and realize set goals in different positions in space. Success of the realized movement influences the success of the set aims. Therefore it is necessary

³ Skill denotes one person performing certain movement or applying one technique to realize certain activity with aim to gain the highest output of that action or movement (for example skiing is a skill but a skill of the person using the skis, swimming is a skill of a person who performs the technique of swimming because a ball can swim but does not possess the skill for it nor does it need it for it is constituent part of the concept of floating, juggling is a skill of a person who successfully manipulates objects using laws and techniques. Without man these movements and actions would not exist.

⁴ Skill. a. Versatility in actions acquired through practicing, skilful manner of doing or performing something, *skilfulness, mastership*: skilful knitting, skilful playing. 6. Wisdom, versatility, good reasoning (DICTIONARY OF SERBIAN LANGUAGE. (2007)).

for each man to recognize manners and possibilities to successfully realize a given movement.

Nowadays two concepts of movements are prevailing:

1. Conceptualizing technical side of the movement (action);
2. Movement is partially mastered and one conceptualize its aim, i.e. focus is on the result of discrete actions or movements.

Movement repeated in the same conditions slowly becomes usual one: one pays less attention to how the action or element of the movement is to be performed. In time movement is automatized. Conscious control on the level of habit is not lost but is changed: more attention is devoted to the conditions and situation of the movement performance and to the creative solutions to motor tasks. Thus motor habit is formed. (Holodov & Kuznecov, 2000).

When forming motor habit movement performance is conscious, controlled and corrected by central nervous system. But once automatized, motor act does not call for conscious correction. As a result of multiple repetitions of movements a motor stereotype is formed.

One can say that *motor habit is a form of manifestation of motor abilities of man that occurs and is based on automatization of movements and represents optimal level of mastering the technique of movement, action whose feature is automatized (with minimal conscious control) management of movements and high stability of performance.* (Zivanovic, Randjelovic, Stankovic, Pavlovic, 2010).

Automatization of movements enables habit high stability, multiple repetition of learned movement not degrading the quality of performance in case of fatigue, illness, unfavorable conditions such as strong emotions, extraordinary circumstances, etc. Stability means long term preservation of the habit without exercising (bicycle riding, swimming, skiing, and skating) that stays during life time. During habit formation there appears easiness, rhythmical movements, and special feelings for water, for snow, for ball (Huhlaeva, 1984).

With strengthening of the habit the role of movement analyzer is stressed, muscle feeling, control is transferred to performance conditions and some variations of techniques appear depending on the relief of the terrain, resistance to external forces, space limitations, etc. Variety of motor habit is tied to the emergence of new skill – to use the acquired skill in complex changing conditions in overall movement – when it is manifested as skill.

Concept of „motor habit“ does not imply perfect mastering the technique. One can form a habit of imperfect or wrong movement performance. This is inevitable when imperfect movement is repeated many times. Therefore it is necessary to learn the correct performance of the movement at the very start and only then work on the habit formation.

Characteristics of habit (Erkomajshvili, 2004):

Automotized (with minimal participation of consciousness) management of movements, i.e. higher level of motor automatized actions in the realization of some operations that make up movements and their interrelations.

Automotized management of movements in motor habit does not exclude conscious element during performance. Man always consciously performs actions as acts of behavior. A footballer does not think about positioning of his leg to perform kicking, a runner does not focus on velocity control, a skier does not pay attention to different relief, tempo of distance skiing, throwers do not pay attention to final efforts to achieve high efficiency of the movement, a gymnast does not pay attention to continuity (intermittence) of movements.

Intermittence of movement i.e. unified elementary movements to form a unity. It is mirrored in easiness, mutual consecutiveness and firmness of the motor action.

- *High stability* characterized by the ability to preserve movement efficiency in unfavorable conditions: anxiety, fear, diminished physical abilities such as fatigue, illness, harsh weather conditions and active opponent's resistance. Stable habit is less prone to disturbing external factors. In elite athletes with stable habits there is no difference in movement performance during training sessions or competitions. This feature enables an athlete to demonstrate high technique in any situation whether it be state of fatigue, unusual situations, strong emotions, etc (Erkomajshvili, 2004).

- *Continuity of remembrance* Once formed habit is not lost over time (one can swim, ride a bicycle, and row even after long time of non-practice).

- *Lack of muscle tension, excessive movements, high speed, easiness, economy and precision of movements*

Complex feelings. Mastering technique on a level of habit creates so called complex feelings. For a swimmer that means the feeling for water, for a skater a feeling for ice, for weight lifter a feeling for weight, for a boxer a feeling for distance, punch, etc.

3.1.4. *On concept of motor stereotype*

In Pavlov's laboratory it was found that stereotyped occurrence and repetition of varied conditioned stimulus in order and time is being fixed in the cerebral cortex in form of conditioned reflex reactions or "dynamic stereotypes" (stereotype from Greek „στερεός“ – firm and „τύπος“ – impression). Upon formation of dynamic stereotype occurrence of just one stimulus in the same stereotype order causes reflexive reactions attributive to other stimuli (Grigoreva & Hamatov).

Dynamic stereotype⁵ is the expression of the brains functioning principle–systematicity (Bernshtejn, 1966). The principle reads complex influences are conceived by brain not as discrete isolated stimuli but as a whole, as a system. Organism is adapted to external conditions stereotypely repeated by forming the system of reactions. Physical exercising influences the whole body thus perfecting the functioning of all organs and their correlations. Secenov and Pavlov (Milozavrova, 1972) claimed that any movement represents a reflex. Instinctive hand withdrawal from the hot object, breathing, walking, swimming, dancing

⁵ One should discriminate the concepts of motor stereotype and stereotype used in everyday speech meaning always the same, uniformed, cliché.

represents reflexes of varied complexity. Man's movements emerge as responses to visual, audio and other types of stimuli.

Dynamic stereotype is a fixed system of individually built conditional and non-conditional reflexes in long term memory which is formed in certain order of the action of conditioned external stimuli on the organism.

Any life habits, professional habits, sports (movement) habits are not inherited movements. These are acquired during individual's development and their bottom line is dynamic stereotype. One of them is motor stereotype formed in activities connected to movements or human motorics.

During life time man always acquires new movements. A child first learns how to walk, then to run, jump, etc.

Depending on given life conditions and type of men's activities movements they acquire are different. When performing each element of the movement there is alternate activity of different muscle groups.

Repeated movements create in cerebral cortex temporary connections. Once the movement pattern is mastered cerebral cortex confirms the order of destimulating- so dynamic stereotype of given motor habit is formed. Externally, it is manifested in accurate movement performance.

Dynamic stereotype of each motor habit is accompanied by conditioned stimuli. They can vary from oral explanations and remarks, visual ones in form of the gym, watching oneself in the mirror, vestibular change of body part positions, etc. Most important are signals coming from the receptors of the motor analyzer.

Constant repetition of single movements anchors the system of alternating stimulative and inhibitors processes in the cerebral cortex resulting in motor stereotype formation.

Motor stereotype is a stabile fixed system of individually built conditioned and unconditioned reflexes (certain order of stimulation of nervous centers-functional system) formed during movement or motions where movements are repeated in the same order.

Learned order of movements enables switching from one element to the other without conscious control, i.e. automatically.

Motor stereotype formation is more prone to cyclic than to acyclic movements (Krestovnikov, 1985). Stereotype movements can be performed even in disturbing factors. Motor stereotype is formed during all types of physical exercising. Motor stereotype is formed within time interval and cannot be changed with the change of environmental conditions. As a consequence of multiple functioning (repetitions) it is rooted more firmly and is resistant to change.

Man is able to form a lot of new motor stereotypes (because each new movement is a new motor stereotype) and to change the old ones. However, change means a great effort for nervous system. Crash of formed motor stereotype can be reflected in sorrow, nervousness, anxiety, etc. It is especially stabile in older people and those with weak nervous activities and lower level of nervous processes flexibility. Therefore it is necessary to acquire correct performance of any movement and not to hope that badly acquired patterns can be repaired later on.

As much as crashing the old stereotype is complex, new changed conditions will cause formation of new stereotypes (that is why they are called dynamic ones).

4. Conclusions

In the light of all said following conclusions can be reached:

- Concepts motor learning, motor habit, motor skill and motor stereotype are mutually interconnected but they have different conceptual content (this is partially verified by the hypothesis H1);
- Elementary and initial motor knowledge precede motor habit and represent basic line for its formation and the formation of motor habit is an active process and not just passive following of external influences and is composed of different stages which logically follow one another (this is verified by the hypothesis H2),
- Motor stereotype is a basics for the formation of the motor habit and represents the manner of functioning of the CNS in realization of certain movement and it is also indispensable element both of motor learning and motor skill in all developmental stages (this is verified by the hypothesis H3),
- Motor skill is also knowledge (real motor knowledge) but knowledge of higher order which is related to the ability of the individual to efficiently apply acquired habits in different situations and conditions (this is verified by the hypothesis H4),

In motor learning the ultimate aim is to teach real motor knowledge - skills.

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