

**Rado Pišot****LIFELONG COMPETENCY: MODEL OF MOTOR DEVELOPMENT****MODEL MOTORIČNEGA RAZVOJA ZA VSEŽIVLJENJSKO KOMPETENCO****ABSTRACT**

Changes, slowly but persistently occurring in human development, adjustments that are required during the life and work of the modern man, which nature cannot follow at the pace, and the decrease of basic human functional competences are some of the fundamental reasons, due to which profound attention should be dedicated to the sustainability of complete human development. The discussion on sustainable development and ecological awareness should not ignore the efforts to create an environment promoting health maintenance. History shows that human intervention in the natural environment enabled man, motivated by the hunger for development and progress, which considerably simplified his daily life, however, concomitantly made him neglect the very thing that throughout the millennia not only preserved, but also enabled him to evolve as a species – that is physical activity.

Human development that reflects in changes in humans that occur over time, are usually presented and described as a complex system of constant, reciprocal exchanges in basic domains: the physical domain (body size, body proportions, brain development, motor development, etc.); the cognitive domain (thought processes and intellectual abilities including attention, memory, problem solving, creativity, academic and everyday knowledge, etc.) and the social/emotional domain (self-knowledge, self-esteem, expression of emotions, temperament, interpersonal skills, etc.). Motor development is a process that in the individual's life, through different life periods enables the transition to a higher level of motor competences – the development of motor abilities and acquiring more demanding and upgraded motor skills in constant interaction and correlation with the environment.

Among these competencies motor skill is the basis for human motor capital, which in the complete functioning of humans and in the process of preserving and ensuring health presents the fundamental lever and one of the needed skills that significantly contribute to

**IZVLEČEK**

Spremembe, ki se počasi a vztrajno dogajajo v človekovem razvoju, prilagoditve, ki jih od sodobnega človeka zahtevata življenje in delo in jim narava ne uspe slediti, ter upad človekovih temeljnih funkcionalnih kompetenc so le nekateri od tehtnih razlogov, zaradi katerih bi se v trajnostnost človekovega celostnega razvoja veljalo resneje poglobiti. Razprave o trajnostnem razvoju in ekološki osveščenosti ne bi smele spregledati prizadevanj za vzpostavitev okolja, ki spodbuja ohranjanje zdravja. Zgodovina kaže, da je poseganje človeka v naravno okolje, katerega vodilo je bilo hlepenje po razvoju in napredku, ki bi močno poenostavila njegovo življenje, sočasno povzročilo to, da je pričel zanemarjati ravno tisto, kar je skozi stoletja omogočilo ne samo njegov obstoj, ampak tudi razvoj njegove vrste, torej telesno dejavnost.

Razvoj človeka, ki se sčasoma odrazi v spremembah v človeku, je običajno predstavljen in opisan kot zapleten sistem stalnih, vzajemnih izmenjav na osnovnih področjih: telesno področje (velikost telesa, telesna razmerja, razvoj možganov, motorični razvoj itd.), kognitivno področje (miselni proces in intelektualne sposobnosti, vključno s pozornostjo, spominom, reševanjem problemov, ustvarjalnostjo, akademskim in vsakdanjim znanjem itd.) ter družbeno/čustveno področje (samospoznavanje, samozavest, izražanje čustev, temperament, medosebni odnosi itd.) Motorični razvoj je proces, ki v življenju posameznika v različnih življenjskih obdobjih omogoča prehod na višjo raven motoričnih kompetenc – razvoj motoričnih sposobnosti in pridobivanje zahtevnejših in izpopolnjenih gibalnih spretnosti v nenehni interakciji in korelaciji z okoljem. Med temi spretnostmi je motorična spretnost osnova za človeški motorični kapital, ki je v celotnem delovanju človeka in v procesu ohranjanja in zagotavljanja njegovega zdravja temeljni vzvod in ena od nujnih spretnosti, ki pomembno prispevajo h kakovosti življenja in razvoju posameznika v vseh življenjskih obdobjih. Zato lahko obdobje, v katerem danes spremljamo in preučujemo posameznikov motorični razvoj z upoštevanjem

the individual's quality of life and development through all life periods. Consequently, the period that is devoted today to monitoring and studying motor development of the individual, by considering the role of sustainability and ecological perspective, can be named competence-oriented period, an approach that from the start and continuingly by following the set goals of the problem discussion defines motor competencies, the lifelong competency model of motor development. Among three periods of the presented model; i.e. the acquisition of motor competence, the utilization of motor competences and the decline of motor competences; the period of childhood is of substantial importance in the scope of lifelong functional competences as motor competences. Inadequately acquired fundamental motor patterns negatively affect the process of upgrading motor stereotypes, leading to the lack of motor competences, and consequently also result in inadequate and irregular physical/sports activity in adulthood. On the basis of different research findings, the importance of fundamental motor patterns as the foundation for lifelong functional competences will be presented.

*Key words:* children, motor development

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vloge trajnosti in ekološke perspektive, imenujemo obdobje, usmerjeno v kompetence. Gre za pristop, ki že od samega začetka s sledenjem določenim ciljem pri razpravi o problemu opredeljuje motorične kompetence, torej vseživljenjski model motoričnega razvoja. Od treh obdobjih predstavljenega modela – obdobji pridobivanja in uporabe motoričnih kompetenc ter obdobje njihovega upadanja – je obdobje otroštva ključnega pomena za vseživljenjske funkcionalne/motorične kompetence. Neustrezno pridobljeni temeljni motorični vzorci negativno vplivajo na proces nadgradnje motoričnih stereotipov, kar vodi v pomanjkanje motoričnih kompetenc in posledično v neprimerno in neredno telesno/športno dejavnost v odraslosti. Na podlagi različnih ugotovitev raziskav bomo predstavili pomen osnovnih motoričnih vzorcev kot temelj vseživljenjskih funkcionalnih kompetenc.

*Ključne besede:* otroci, motorični razvoj

## INTRODUCTION

Human development comprises of various changes which people face during our lifetime. These changes are the consequence of ageing, environmental impact, different life experiences, genetic potentials and the interaction of all mentioned factors in given time. This is therefore an interaction process that leads to behavioural changes in different periods of life. Development in childhood is much faster and more dynamic; therefore, the consequences of changes that occur during childhood are reflected as more expressive and permanent.

Human development theories set by different authors, depended mostly on general social situation and the level of understanding human organism functioning. The first authors who involved a systematic approach for searching the reasons for the changes of man during growing up and ageing were Jean-Jacques Rousseau (18<sup>th</sup> century) and Charles Darwin (19<sup>th</sup> century), who indirectly impacted the formation of various theories in the 20<sup>th</sup> century, which based on research and systematic examination. Ranging from psychoanalytical (Freud, 1927; Erikson, 1963), behavioural (Watson, Skinner) and social learning theories (Bandura), biological experts have intensively set an individual, individual's characteristics and abilities in interaction with the environment to the forefront. By being aware of the fact that development is a process that leads to behavioural changes in different periods of life, it was becoming clear that behaviour is a structured system of permanent, co-dependent and reciprocal changes between individual's physical, motor, emotional, social and cognitive dimensions. How and until when such dimensions are more co-dependent, what share each dimension has in individual's behaviour and when does, in order to achieve a higher level of development, a certain differentiation level emerge among the dimensions are some of the questions and challenges that researchers try to address. The efficiency of individual's functioning in a specific activity many times depends on understanding this relationship.

## THEORIES OF MOTOR DEVELOPMENT AND MODELS FOR CLASSIFYING MOVEMENTS

In discussing motor development we face many approaches and interpretations of changes, which are, according to the analogy of the above, focused in the changes of motor behaviour. In history, the study of changes in human motor behaviour during lifetime, process which is the basis for these changes and factors that impact these changes (def. according to Payne & Isaacs, 2007) originated from various standpoints. Despite an extensive range of knowledge in the field of anatomy and body functions, which has been formed by scientists and professionals since ancient Greece, profound study of physical and motor development started at the end of the 19<sup>th</sup> century and at the beginning of the 20<sup>th</sup> century. Descriptive observations (Darwin) and the study of biological processes led to the first motor development scales (Bayley, 1969), which in the following normative/descriptive period (Kiphard & Schilling, 1974) present a challenge for determining framework norms of motor efficiency in various development periods. After 70 years a period began which focused more on the process and the abilities of an individual. Process studies focus in studying motor behaviour by considering motor control. Dynamic systems and ecological perspectives which emphasise the relation between an individual, the environment and a task, consider the impact of several simultaneous components and enable the monitoring of motor behaviour in the aspect of various dimensions (Kugler, Kelso, & Turvey, 1980). The progress

of kinesiology, new knowledge in the field of exercise physiology and biomechanics (Glassow, Rarick, & Halverson, 1965), mostly the development and inclusion of the most advanced research equipment in the study of motor behaviour of individuals open the space for new possibilities (Malina, 2008, 2009, 2010; Gallahue, & Ozmun, 1998; Magill, 2011). By considering more profound approaches that emphasise the analysis of motor efficiencies/skills (motor knowledge and abilities) as well as conditions and reasons which determine the latter, various classifications of motor skills are formed. These consider motor skills through one- or multi-dimensional models that determine them from various standpoints of criteria for assessing motor skills.

One-dimensional models mostly focus on *muscle aspect* (rough and fine motor skills – considering the inclusion of skeletal muscle chains); *time aspect* (time definition of the start, duration and implementation of a motor task); *spatial aspect* (Stable or changeable environment of implementing a motor task); *functional aspect* (considering the requirement and goal of implementing a motor task). These could also be joined by the Gallahue's (1985) *developmental aspect* that defines motor skills in four motor development phases (*reflex, rudimentary, fundamental, and specialized*). With the aim of a more comprehensive consideration, the connections between one-dimensional models and two-dimensional models have developed. Changes and upgrades that emerge as the consequence of growth, maturity and development in the most intensive period of childhood and adolescence are being assessed by linking several criteria for assessing motor skills. Therefore, for instance Gentile upgrades the limitations of spatial interpretation (*the aspect of space where an individual performs a motor task*) in such way to include the *functional aspect* in the interpretation, which presents the goals and orientation of the implemented motor task (Magill, 2011). Gallahue offers a more extensive explanation of motor skills in different developmental periods by linking the *developmental and functional aspects* (*in what period the motor skills that follow greater more demanding goals are developed*). Two-dimensional models offer quality determinations of classifications of motor skills, however, new demands arise also due to modern approaches and research in the field of structure of motor space as well as the development of analysis (kinematic and kinetic) of movement and new findings in the field of motor control and motor learning. Understanding human motor skills in the context of factors that determine one of the fundamental human competences, not only in the period of development and establishing predispositions, but also during all life periods, is becoming of key importance for kinesiology.

In order to explain the role and meaning of different factors that co-form human motor skills, in the history of studying kinesiology one important area must be presented, i.e. the area of researching the structure of motor space of humans by defining motor skills. Fleishman (1964) and Zaciorski (1970) defined motor skills as an important factor that contributes to the realisation of each motor task. Motor abilities (strength, speed, flexibility, coordination, balance, precision) and functional skills (endurance) can be described and explained with different parameters as a part of physiological, biomechanical, cognitive and conative mechanisms and can be differed from motor knowledge (motor information), which are realised in dependence of these mechanisms (Zaciorski, 1970). Research implemented in the last 30 years of the 20<sup>th</sup> century significantly contributed to understanding composed, hierarchically determined mechanisms that determine the structure of motor space of man. The phenomenological-functional model of motor space (Kurelić et al., 1975) was studied and upgraded many times (Gredelj, Metikoš, Hošek, & Momirović, 1975; Kurelić et al., 1975; Strel & Šturm, 1981; Rajtmajer, 1993; Šturm & Strojnik, 1994; Pišot & Planinšec, 2005). The development of motor skills evolves continuously in a longer period of time, although occasional periods of stagnation and decline are also typical

(Pišot & Planinšec, 2005). Some motor skills achieve the highest level sooner, others later. It is typical for early childhood that the development of some abilities (e.g. speed and coordination) is very intensive, while the development of other (e.g. balance, strength, flexibility and endurance) is somewhat slower (Malina, Bouchard, & Bar-Or, 2004; Thomas & French, 1985).

The explanation of relations and share which is determined by motor knowledge on one hand and motor abilities on the other hand in the scope of motor competence, and by considering recent research findings, models and theories which were contributed in the field of kinesiology by various experts, already faces complications in terminology (Table 1). Within the scope of kinesiological expressions and terms, various languages differently define motor *knowledge* as a part of fundamental information, and *abilities* as the basic pre-disposition for the realisation of knowledge. Most frequently skills, proficiency or abilities are used for this purpose and they are merged in the context of defining motor behaviour in various factors, therefore, it is difficult to differentiate the role of individual factors. Since we believe that the understanding of the contribution, which is in the determination of motor competence on one hand determined by knowledge and by abilities on the other hand, is relevant from the aspect of the evidence of the phenomenon itself as well as from the aspect of directing the process which can impact the changes, improving motor competences of an individual, we will make further examinations of this problem.

Table 1: Different terminology to define aspects of two basic dimensions of MOTOR COMPETENCE is used in English or Slovenian language

<i>INFORMATIONAL DIMENSION</i>	<i>INTERACTION</i>	<i>ENERGETICALLY DIMENSION</i>
<i>English</i>		
motor knowledge	<b>competence</b>	motor abilities
motor proficiency	skill	physical fitness
information	efficiency	capabilities
quality		functional
<i>Slovenian</i>		
gibalna znanja	<b>kompetenca</b>	gibalne sposobnosti
gibalne informacije	spretnost	funkcionalne sposobnosti
kakovost	učinkovitost	količina
CONTENT / TOOLS		
motor learning	physical activity	training
exercise / motor task	motor behavior	practicing
high cognitive		low cognitive
low energy		high energy

Motor behavior (physical activity) in various situations, with different needs or goals and on different levels (for the realisation of the required energy or quality of movement), always depends on the pre-dispositions of an individual, environmental specifics and the nature of motor problem/task. On the basis of many experiences, individual's pre-dispositions gradually form and upgrade to an appropriate motor competence /motor skill. By developing motor abilities the contribution, which the energy level requires in the realisation of motor competence, increases (quantity, fitness level). New experience and gradual learning (motor learning) as well as upgrade of new knowledge on the other hand increase the information value of motor competence (quality, information, proficiency). However, only the part that presents the share of total section of these two factors can be named individual's motor competence. An individual is able to realise a motor task on the basis of appropriate motor information with such quality, as the individual can be supported by the necessary motor and functional skills. Therefore, in the development of motor competence a harmonised simultaneous development of appropriate motor skills and knowledge is also required. However, the acquisition of skills as well as the upgrade of knowledge do not lead to a higher level of motor competence (Figure 1).

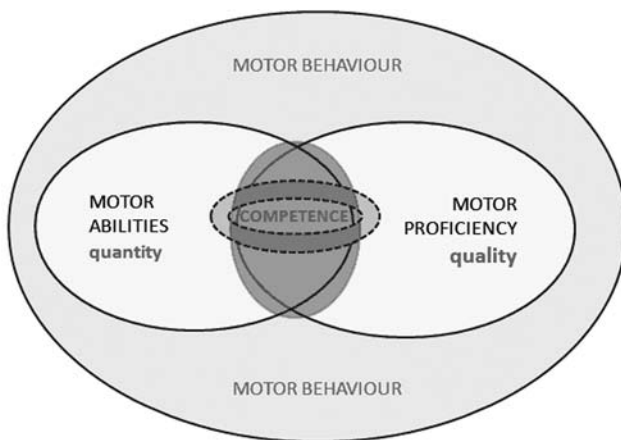


Figure 1: Individual's motor competence is presented by the section of two multitudes of elements – motor knowledge and motor skills.

The curve of development and decline of motor competences during lifetime in a healthy individual depends on developmental specifics and periods of changeable pace of growth and maturity of the structure that is responsible for the realisation of movement and various possibilities of acquiring motor information. An exceptionally intensive period is childhood; however, changes of the structure and function also happen during other life periods – adulthood, late adulthood and old age. Until motor skills enable the realisation of motor knowledge, motor competence/ability is ensured. When, one or the other declines the success, optimality of implementation of motor tasks and motor competence also decline. When motor skills cannot support the realisation of motor knowledge or vice versa (if we have sufficient motor skills, however, we do not possess the appropriate motor knowledge necessary for the realisation of a motor task), the decline of motor competences is initiated. In a healthy individual, this is caused by ageing; however, this stage can also emerge due to a disease, injury or inappropriate lifestyle.

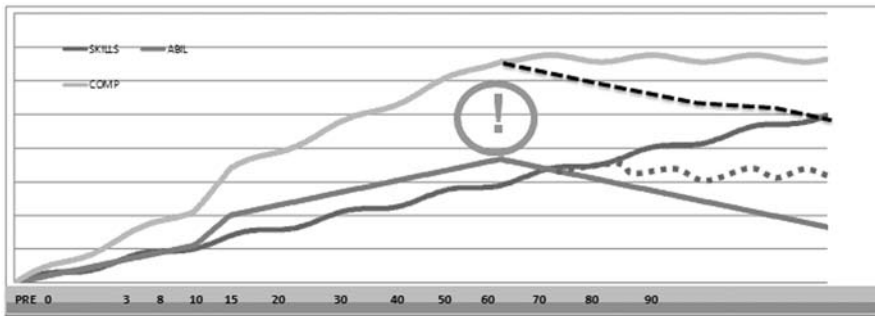


Figure 2: The development of motor skills and the process of learning motor knowledge form the upgrade of motor competences, which evolves differently in different life periods (SKILS – skills, ABL – abilities, COMP – competence).

The changes of structure – growth and maturity, as well as functions – interaction between fundamental areas of motor behaviour (motor development, motor learning, motor control) with the goal of understanding individual's motor competences requires from us a sustainable and comprehensive consideration of man as a multi-dimensional, dynamic and open system. If we want to make profound considerations of developmental and adaptation specialities of motor development, we have to rely on multi-dimensional models of movement regulation. The sand hour model as one of the offered models (Gallahue, Ozmun, & Goodway, 2011) describes the acquisition of motor competences through the phases of motor development by considering personality factors – heredity, and environmental factors at the realisation of individual motor tasks. Childhood and youth are the periods of motor abilities development, and at a certain level of human development the sand hour must be turned. In dependence of the genetic filter and lifestyle, an individual can more or less spend quality adulthood and old age.

The proposed model does not further examine the meaning of the period when motor competences are used to their maximum and the role of changes in the structure and function on the basis of exercise and training during life periods. The field of optimisation of movement as the consequence of motor learning, exercise, training, rehabilitation, prevention and intervention programmes and due to this, the changes of motor competences in different environments and from the aspect of different needs of the modern man still remains open. The modern models of human development in general and in the so called period of ecological systems (Bronfenbrenner, 2005), where the environment and nature along with genetic pre-dispositions have a fundamental impact on individual's development, lay responsibility on us as well as challenge us to study the process of human motor competences development in close interaction with the environment in all life periods.

## LIFELONG COMPETENCY MODEL OF MOTOR DEVELOPMENT

However, in the past 20 years, the environment has with very intensive development of IT that presents an important revolution on one hand and the development and accessibility of health care and pharmaceutical industry on the other hand, changed extremely fast. The intensity as well as the direction of these changes is greatly different from the former changes. There is

less physical activity in general, as well as less use of energy (human organism), on the other hand, there is greater necessity to spend the limited energy resources. Changes which slowly but persistently occur in modern lifestyle and work, require adjustments which the human nature cannot and is not able to follow at the required pace. The decline of human fundamental functional competences is a sufficient reason due to which the sustainability of human development should be further examined. The impact of modern lifestyle factors is even more aggressive and intensive, and since all these factors are in mutual interaction and since life period is prolonging, this impact presents an opportunity, challenge and the need to follow the profound changes and processes of human development with the aim to consider and understand fundamental human functional competences. Motor competences as the basis of human motor capital present one of those necessary human abilities which through life importantly contribute to the quality of life and the development of the individual and the society. Therefore, the period, which we are living, was named **competence-oriented period**, the approach which in its standpoint as well as in following the goals of problem consideration sets motor competences, is called the **multi-dimensional competency model of human motor development** (Figure 3).

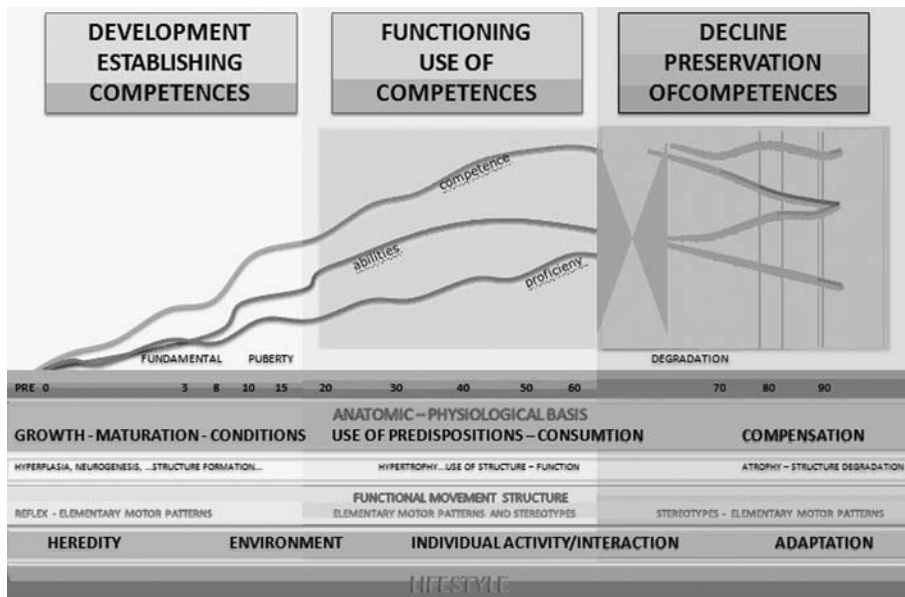


Figure 3: Multi-dimensional competency model of motor development considers an individual in three co-dependent periods of motor development – the period of formation, use and decline of motor competences.

The presented motor development model emerged as the upgrade of preliminary models and anticipates a profound consideration of an individual in various life periods from the aspect of changes in the structure and functions of fundamental physiological bases that are responsible for the realisation of motor competence factors. The consideration – records and standpoints for changes of human motor competences is anticipated in three fundamental periods: *development – formation of skills; active functioning – use of skills and settling down/compensation – reduction of motor skills*. The changes of structure, which in childhood emerge on the basis of growth and maturity, later on as the consequence of development on the basis of exercise/activity, are set in the



centre of discussion. Anatomical and physiological bases of movement by considering the impact of heredity, individual's activity and the environment determine the basic motor structures – *fundamental motor patterns and stereotypes* that present the standpoint of all movements which an individual needs and executes in everyday life in different life periods. The optimisation of FMP realisation with the purpose to achieve harmonised development, top results, appropriate rehabilitation or quality motor learning is set by the model as the orientation to the development of appropriate motor competence. It needs to be emphasised here that the model defines motor competence as the section of necessary motor knowledge and motor skills in every situation and the environment of human action. Therefore, knowledge and skills have to be considered at the starting point of the situation analysis as the basis of designing appropriate interventions and transformation programmes.

## CONCLUSION

An appropriate quantity of motor activity has been many times emphasised in numerous studies as an important lever for ensuring harmonised development and guaranteeing a sufficient level of motor efficiency and health. Motor activity strongly contributes to the compensation of impacts of inappropriate, stressful lifestyle and excessive as well as unhealthy food of humans in today's modern sedentary society. It is true that the quantity of motor activities in everyday lives of the average man who achieves the appropriate level of energy consumption and compensation, is decreasing. It is important to engage systemic measures which will guarantee each individual from child to an elderly in time, space and with required means sufficient possibilities for a more active spending of work and free time. It is extremely important and, on the basis of findings of the latest research we could conclude that it is urgent that we further examine the quality of offered physical/sports contents and incentives in order to achieve sustainable impacts and consequences. The share, which is along with quality (optimal) implementation of movement contributed by motor knowledge (information, motor memory), is in the implementation, rationalisation and repeatability of general motor competence many times much more important than the quantity of movement and the development of basic motor skills. The complete motor competence could much more be ascribed the impact on the formation of sustainable behavioural patterns and patterns of active life in different life periods.

Numerous studies (Ulrich, 1985; Wrotniak, Epstein, Dorn, Jones, & Kindilis, 2006; Okely, Booth, & Patterson, 2006; Stodden et al., 2008; Williams et al., 2008) prove important positive connections between the harmony of movement (better coordination, higher level of motor knowledge/information) and intensity of movement in younger children and adolescents. The results show that those with a higher level of motor knowledge (proficiency) are more often present in sports and spend more time for physical/sports activity per week. It is especially interesting, how this is positively connected with performing more physical/sports activities in adolescence. Research, where the occurrence and characteristics of fundamental motor patterns were studied, has shown that children with more coordinated movement (high coherence) are faster and more efficient (Pišot et al, 2012). These children are better in climbing (Plevnik & Pišot, 2011), crawling (Čeklić, Plevnik, & Pišot, 2011) and jumping (Koren & Šimunič, 2012). The connection between monitored motor patterns (walking, jumping, climbing, crawling) is greater in those children whose fundamental motor patterns are more coordinated (Marušič & Pišot, 2012). Children with more knowledge and motor information (better motor memory) and more experience are more and

have greater interest in being involved in physical/sports activities in adolescence (Malina, 2008). It is interesting that if we frequently offer a child incentive, s/he extremely fast and efficiently learns harmonised fundamental movements (Plevnik, Geržević, & Pišot, 2012).

The role and meaning of motor knowledge and the impact of learned motor programmes on the efficiency of implementation of motor tasks was studied on a pattern of adult and elderly subjects. Most times various studies after the phase of rehabilitation and programmes involving reestablishment of primary condition focus on processes of establishing the same situation of the structure of systems that are responsible for movement (skeleton-muscular system, cardiovascular system etc.) and much less in reinstating the appropriate function. The goal of kinesiology, focusing in the optimisation of movement, is in the appropriate function of physiological systems that are responsible for control and implementation of movement. During the process of rehabilitation after permanent physical inactivity, we have many times found that the reversibility of processes on a structural level is much faster than on the functional level (Di Prampero et al, 2009). Motor control, awakening the motor memory and consequently, information contribution to the entire motor competence is very important despite the complete reversibility of muscle structure. Therefore, in the processes of rehabilitation, protocols and preventive interventions it is necessary to emphasise the quality of movement, motor knowledge and not only the quantity of movement. The demands of the complete approach to realising motor competence have to be individually conditioned and adapted to an individual with regards to his/her needs, abilities and goals, therefore, it is impossible to systemically unify them.

Every period during lifespan – formation, functioning and decline of motor competences has a specific influence on different changes. Knowing and understanding them, we can predict and solve the problems as well as programmed appropriate interventions, exercise and training.

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