PSYCHOPHYSIOLOGY

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Some aspects of A.V. Semenovich's theory of substitutional ontogenesis in the phylogenetic principle of correctional physical education of children with locomotive system disorders

The article makes an attempt to find common evolutional principles of physical development and psychogenesis among the children of early and preschool age having various disorders of the locomotive system. Correctional physical education of children having cerebral palsy and other locomotor disorders is in the basis of research. From positions of the substitutional ontogenesis theory A.V. Semenovich considers correctness of use of the phylogenetic principle of locomotor habilitation of the specified contingent of children by means of physical education.

Keywords: *psychogenesis, ontogenesis, dysontogenesis, physical education, correction, habilitation, preschool children, infantile cerebral paralysis.*

At the present time still there is an acute problem of social adaptation of children with health limitations (HL). Among them the most widespread category is made by children of various nosology having one or another disorders of the locomotive system (LS). The children of preschool age having cerebral palsy are the most indicative group in this plan. Unfortunately, among experts of various areas (pedagogues, psychologists, physicians) still there is no common, theoretically substantiated concept of a complex habilitation of such children and their subsequent successful social adaptation. In opinion of A.V. Semenovich, today it is necessary "*… to integrate ideologems of various disciplines* (neurosciences, medicine, psychology and pedagogics, psycholinguistics, ecology, genetics), *united by the system and evolutionary paradigm"* [8, p. 19]. It is difficult to disagree with this thesis, as the above-mentioned author says that "…ontogenesis is understood as a neuropsychosomatic system included in the biosociocultural environment and developing according to objective universal laws" [8. p. 19].

We should note that in Ukraine by request of the relevant Ministry the state program on correctional physical education and improvement of the preschool children having cerebral parlay and other disorders of the LS is just now created. The author of the present article (together with N.D. Mogoy) is a developer of this program; the further edition of a number of workbooks and recommendations on

various aspects of the locomotor habilitation of children of the specified contingent by means of physical education is intended. The urgency of this article is caused by the stated above.

The research purpose is finding of common evolutional interdisciplinary approaches in overcoming of children's complex dysontogenesis by example of correctional physical education of preschool children with the LS disorders.

There are the following research aims:

1) revealing of the universal principles of ontogenesis of the child of the first years of life (his/her somatic and psychical spheres) by the analysis of literature on the subject. As a basis we take A.V. Semenovich's theory of substitutional ontogenesis as it generalizes the majority of previous researches in the field of neuropsychological correction (habilitation).
2) consideration of their competency concerning children of preschool age having various disorders of the locomotive system functions.
3) transformation of the found principles into a technique of correctional physical education of the specified contingent of children for the purpose of increase of its efficiency.

The developmental approach looks for its place in a system of locomotor habilitation of children with the LS disorders for a long time. Concerning children with cerebral palsies, this tendency took place at the seventies-eighties of last century (K.A. Semenova, L.O. Badalyan, R.D. Babenkova, L.T. Zhurba, R.K. Dementieva, A.E. Shterengerts, S.A. Bortfeld, E.P. Mezhenina, E.I. Rogacheva, E.M. Mastyukova, N.N. Efimenko, M.B. Eidinova, etc.). Thus it is necessary to note that, first of all, it concerned rather severe forms of infantile cerebral paralysis; it is clear that a bed child, for example, of 6 months – 1,5 years needs to be trained in movements in a lying initial position only because he/she cannot yet neither creep, nor sit and stand. Increasingly it concerned the motor sphere, recovery of necessary patterns of the locomotor development of the child of the early ontogenesis period: lying, turning from back to front and vice versa, crawling, sitting down, sitting, rising, standing in a two- bearing orthograde position, walking, etc. Actually it was a question of habilitation of locomotor functions: their development, strengthening, stimulation.

In this situation we have raised the following question, "If a child with infantile cerebral paralysis, in spite of delay and with a various degree of success, nevertheless have mastered all necessary stages of biological maturing of the motor sphere, i.e., eventually, independently have walked, have begun to manipulate with objects, keeping balance in a vertical situation, what should be the main movements to start further physical culture studies with him/her? Should it be in a upright initial position, in walking or all the same in a lying initial position, in an "embryo pose", repeating the evolutionary logic of early ontogenesis? What a surprise we had when visiting a special boarding school for children with disorders of the locomotor system at the beginning of a physical culture lesson we heard a teacher's command, "Stand in a rank!", and after that, "Left turn! Quick march!" The paradox was that many children of the 1st form could not stand

independently and, all the more, walk! The teacher was guided by the program which was based on a traditional approach to a preparatory part of a physical culture lesson. This approach provides constructions and re-formation in a lesson preparatory part with the subsequent walking around a hall (ground) in various variants. But it is impossible to transfer a work technique with rather healthy children on a physical culture lesson with children with infantile cerebral paralysis. Though, if one is to judge by the highest standards, the technique of carrying out of studies with so-called "healthy" children also demands radical re-formation towards its "evolutionization".

In the light of the stated above we should designate one more important aspect – according to own researches, today in preschool educational organizations about 65–95% of children have various disorders of health and development deviation, which, besides, in the most part are not diagnosed at a standard medical and pedagogical examination. Now these children make the prevailing array of preschool children scattered in a rather wide range between norm and pathology.

A.V. Semenovich has this nervous situation statement: "Once again we should emphasize that the context of individual distinctions and, in particular, a "reaction norm" drift in modern children's population is stressed. ***"Deviating development"*** (it has been distinguished by me. – N.N.) is considered as a part of an all-population ontogenetic tendency. First of all, it is a question of "standard deviations", of a new view on a "norm pathology" dyad as the figures and facts given above indicate that children, to whom this research is devoted, form an overwhelming majority, even according to bare statistical data" [8, p. 28].

What should be physical education of this category of children? Undoubtedly it should have the habilitational, correctional orientation based on ***phylogenetic regularities, reflected in the child's ontogenesis.*** That is why already at the end of the eighties – the beginning of the nineties of last century in the programs of physical education of preschool children both in special preschool establishments for children with infantile cerebral paralysis, and mass infant schools (that is very important!) we have introduced **a phylogenetic principle of correction and habilitation of motor disorder by means of physical education.** First of all, it means that, irrespective of a degree of the motor sphere safety (a degree of severity of motor disorders, including norm), physical culture studies should be carried out in accordance with phylogenetic staging of formation of the animal world and the human, as its evolution summit. More specifically it is expressed in the fact that in his/her natural physical development and locomotor preparedness any child (both healthy, and with severe form of infantile cerebral paralysis) has to pass an obligatory sequence of formation of main movements, characteristic for the early ontogenesis period. Such approach has received a specific methodical name ***"to play back an ontogenetic reel" (to be plunged in infancy again and again)***, to play main scales repeatedly like musicians; separate accords of such scales will be able to make the whole beauty of musical harmony in the main work. In our case it is a question of a child's full-fledged, harmonious physical development which stimulates development of all mental functions in the same degree.

So **the first "golden formula" of a child's locomotor development** was born (there are eight of them) [4, 5, 6]; it is expressed in the following (fig. 1): ***carrying out of any form of physical education and improvement of children, it is necessary to start to practise in the lying or horizontalized positions (as the most "ancient", natural, basic) – with gradual load increment to the upright position, walking, running, leaping and jumping (as the most modern, "humanized", load, rather difficult in regulation)***. In other words, every time at physical education studies under the guidance of the pedagogue children have to pass an original evolutionary track ("***evolution in miniature***") of formation of the animal world and the person: at first a conventional fish period, then a period of amphibians, vermigrades; to pass to a stage of mammals, birds; further to become similar to the erect human (homo erectus) and to the rational human (homo sapiens). Such methodical vector can be supported already proceeding from the elemental worldly logic – repeating the way of Mother Nature, we will be always closer to truth, than in any other case. But the whole paradox of today's education system is that there is only one physical education program (author's program) where this approach is methodically realized. It is a matter of N.N. Efimenko's program "The theater of physical education and improvement of preschool children". As follows from the illustration, we have prolonged the evolutionary track of formation of locomotor functions of children with disorders of the LS concerning the existing canons of exercise therapy when the locomotor habilitation ends at a function of independent walking [7]. Such main movements, as climbing, running and jumping are added. Certainly, the extent of their development will directly depend on a child's nosology, degree of its expressiveness and features of locomotor disorders inherent in this disease. All eight terrestrial main locomotor modes (MLM) specified in fig. 1 can be well mastered by the majority of children being in a "border zone" between norm and pathology (having slight, imperceptible forms of locomotor disorders). The water mode is a kind of introduction, anticipating natural physical education of children on land; thus it has a huge importance concerning ***a child's evolutional physical development***. The theme of children's early training in swimming, hydrokinesistherapy (hydrocorrection) is so extensive and interesting that assumes writing of a separate large article or even a workbook.

From N.A. Bernstein's researches [2] it is known that evolving locomotor functions of animals stimulate maturing of the nervous system relevant structures, at first of a spinal, and then of a cerebral level, thereby preparing the foundation for mastering of more perfect, humanized (if it concerns a child) "locomotor contingents". We are impressed by **a phylogenetic approach** of a leading figure in locomotor science concerning the problem of origin of a person's motor function: "… Appearance of a new brain superstructure in phylogenesis marks a biological response to *a new quality or class of locomotor tasks.* As it follows below, at the same time without fail it means appearance of a new *synthetic sensor field*, and thereby also the appearance of possibility of realization *of a new class or contingent of movements* differently constructed and differently operated, than that were available to a sight until the present. We desig-

nate the whole listed complex of morphological and functional sides, characteristic of movements for such a new class, as a next *level of construction of movements* and locomotor coordinations [2, p. 14]… Against this fact it is very interesting and significant that coordination *contingents of human movements* form just the same sort of simultaneous recapitulation of the whole history of animal movements… Each of these consecutive constructions is connected with the next new morphological substratum, and, as it follows below, each of them does not negate the underlying, more ancient coordination stratifications, but joins them in a very peculiar and diverse synthesis" [2, p.16].

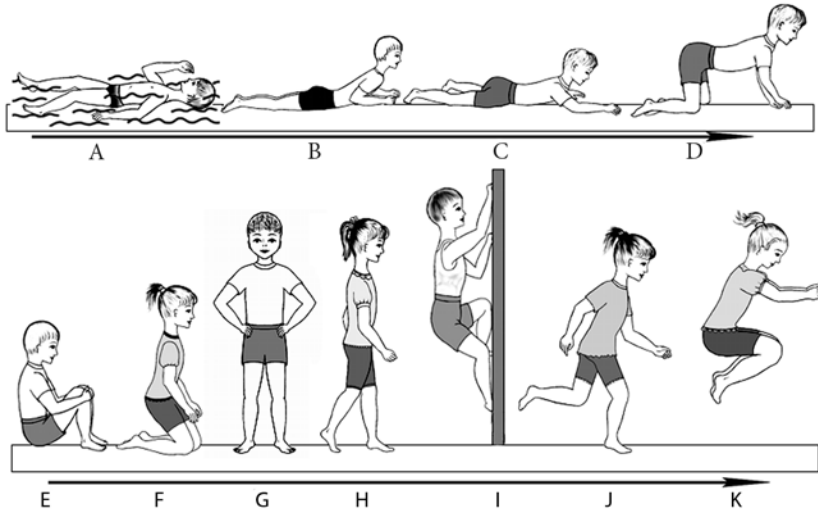

Fig. 1. The first "golden formula" of a child's locomotor development

The quoted thesis gives us chance to formulate **the principle of hierarchy** of a child's locomotor development, more mature, further developing the above-named phylogenetic principle. Now we accepted not only the necessity of a certain sequence of a child's locomotor development (both in norm, and with various variants of deviating development). It becomes clear that all higher steps should not negate the earlier mastered; on the contrary, the pedagogue should apprehend the most important methodological truth: the child's more mature, perfect movements won't ever be able to take place fully without evolutionary lower contingents of movements. The analogy with music comes to mind again. Before execution of an integral piece of music pupils-musicians usually warm up, work out scale: at first elemental, then more and more complicated when to an initial harmony they add improvisation elements, with gradual involvement of more and more new, diverse and complex variations in sound-

ing. It seems to us that the "***phylogenetic and ontogenetic methodical variation***" should become fundamental at a correctional physical education lesson of children with disorders of the locomotor system.

The principle of hierarchy of a child's locomotor development means that it is impossible to create a full-fledged brain structure (of the cortex, especially) without initial, archaic ("animal") main locomotor modes to which we attribute a "lying", "crawling" and "sitting" modes (the first three of eight) [4, 5, 6]. G. Doman, American expert, has the same methodological position; he considered that concerning children of early age it is crawling in all its versions that promotes development of the first three levels (of seven) of the brain substratum: medulla spinalis, pons, mesencephalon [3, pp. 43–45]. "The faster the comprehended movements replace disorderly and aimless motions of hands and legs, the faster and more successfully there will be developed the muscles necessary for such movements. But the most important is that it will depend on the speed of development of sensory and motor brain divisions which regulate such movements. In turn it is a result of the frequency of a child's ***possibility to move*** (it is distinguished by me. – N.N.). The most important and surprising thing is that the earlier the child started moving, having had all possibilities for this purpose, the faster his brain will grow and develop, allowing to go over to the following, higher stage" [3, pp. 56-57].

G. Daman enters such an extremely exact and capacious concept as a "***locomotor intelligence***" which means a uniform biological (neurogenetic) basis for a child's physical and mental development, irrespective whether he/she is absolutely healthy or has various deviations in his/her development. By the data of A.V. Semenovich, "… a present situation is characterized by that regardless of presence or absence of a child's diagnosis, as simple as a subpopulation stigma, the majority of such children (more than 70%) have a prepathologic condition of *the most early ripening* brain systems subcortical and stem. These are the systems which are morphologically and functionally formed prenatally, generally predetermine a course of the prenatal period and lay the foundation for all subsequent ontogenesis. The importance of these brain formations is connected with that thanks to them the most global structural and procedural aspects of the person's activity are actualized" [8, p. 29].

The reasonings stated above even more confidently allow to introduce the following methodical postulates into correctional physical education:

- on importance of early diagnosing of physical development of children not only by means of traditional sports resultant tests, but also with neurologic tests;
- on importance of early beginning of correctional actions concerning the child with disorders of the LS functions;
- on extraordinary relevance of rather "ancient" main locomotor modes (lying, crawling and sitting) for physical development of all children, without an exception (in the "norm – pathology" range); realization of these modes forms a basis of stem and subcortical brain constructions;

Two last positions found their implementation in the author's system of planning of children's physical education and improvement, in particular, ***in the age principle of planning***. It can be presented as follows: the younger children are (from birth till 3 years), the more the exercises in lying and horizontalized, "animal" positions are important for them in correctional physical education; on the contrary, the elder the preschool child is (6-7 years), the more it should be actual to exercise in movements from more verticalized, functional main locomotor modes (climbing, running and jumping). We find the same an approach (only from a position of a neuropsychologist) in the following thesis of A.V. Semenovich's theory of substitutional ontogenesis, "Conformably in this complex approach there are distinguished the following levels, acting as correctional targets.

1. Involuntary self-regulation, energy supply and static and kinetic balance of neuropsychosomatic processes. At this level there is a primary formation of self-regulation of the child by means of rhythmological, ritualized ways of influence. Here there is a detection and destruction of pathological, pseudo-compensatory mechanisms, optimization of a natural and truly compensatory potential of involuntary self-regulation of the child. Body-focused, naturopathic, ethological, art therapeutic, etc. techniques are leading at this level. In the neuropsychological context there is *the main target emotional, sensorimotor (cognitive) and psychosomatic factors and processes mediated by subcortical and deep brain divisions*" [8, p. 258].

For more than two decades such an approach in locomotor habilitation (correction) is implemented by N.N. Efimenko's author's technology "The theater of physical education and improvement of children in norm and pathology". First of all, it is embodied in such forms of preschool children's physical education, as ***evolutional gymnastics of awakening*** (after a night and day sleep), ***amusing athletes, horizontal plastic ballet (plastic-show), correctional etudes*** and, ***certainly, sports fairy tales studies.***

"***Evolutional motor function***" is a peculiar starting mechanism in them, a generator consistently involving more and more mature levels of brain formations and, respectively, of higher mental activities. T**he principle of multidimensional content of a lesson** propagated by us promotes it (fig. 2); it means the pedagogue's realization of three main plans during a lesson: ***physical (somatic), intellectual and information, spiritual*** in a uniform subject and game action. Proportions of realization of the listed plans can change, vary, fluctuate depending on the child's age, his/her nosologies, dysontogenesis degree, specifics of motor disorders, etc. From figure 2 it is obvious that the physical plan is primary, then the intellectual and information plan connects to it, and further, according to a plot, there is a spiritual plan. However, such a consecutive, strictly outlined, inclusion of conventional plans, is tentative, approximate; actually all plans start to interact from the first minute of a study in the uniform conglomerate stimulating development. From the picture one can see the fourth ("anonymous") in the form of an indistinct contour; thus we wanted to show a joint component of impact of all three plans on the child with going into higher orbits of ontogenesis stimulation.

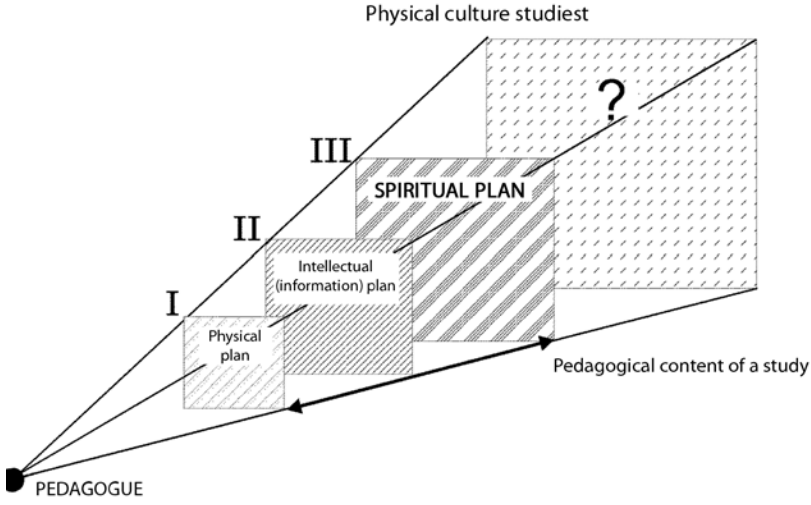

Fig. 2. The principle of multidimensional content of a physical education study

Further A.V. Semenovich displays a certain similarity of reasonings; as the next "correctional target" she offers the following stage:

"**2. Operational ensuring of interaction with self and outer world**. Here the main *target* is overcoming of asynchrony and dysontogenesis (disorders/distortions) of various *operational psychological* (first of all, cognitive skills and automatisms) *factors*; besides the target of this stage consists in correction and habilitation, creation of prerequisites for full formation of *complete mental functions* (speech, memory, somatognosis, spatial ideas, etc.) and *interfunctional interactions* (writing, somatoreflection, thinking, etc.). Unlike the first level on the second one the greater influence is gained by the methods of cognitive correction developed in neuropsychology and defectology. They are organized so that it would be possible harmoniously to increase the child's f*unctional resources of subcortical and cortical, inside - and interhemisphere interactions*" [8, pp. 258-259].

And further, the third stage is "**3. Voluntary self-regulation, thinking and the sense formative function of mental processes.** At this level *there are corrected and formed synthetic, integrative inter- and overfunctional interactions*; there are fixed and stagnated the accumulated at former levels ways and algorithms *of use of speech generalizing and regulating function, intellectual operations, voluntary attention. Skills of voluntary self-regulation* in emotional and cognitive aspects are automatized. All methods (neuropsychological, logopedic, psychotherapeutic, etc.) applied earlier, assimilate and modify in a new system subordinated and determined by group (game, social) rules, rituals, canons, expansion of repertoire of "roles", etc. Neuropsychologically correctional techniques of this level are directed towards *formation of an optimum functional status of frontal brain divisions*" [8, p. 259].

Concerning interaction of the listed above methods of dysontogenesis overcoming, A.V. Semenovich has the following reasonings consonant with ours: "Once again let's emphasize that requirements to introduction of the offered correctional (habilitational, preventive) system means a ***onetime*** inclusion of techniques of all levels. However a specific gravity and time, the beginning and completion of their application will vary depending on the initial status and dynamics of psychological and pedagogical support of the child. The deeper deficiency (underdevelopment) is, the more time it would be necessary to devote to training of the 1st level, with gradual transition to the following. At the same time it is difficult to imagine a situation at which studies can be organized without involvement of group and game (rules, roles, etc.) factors of the 3rd level. Ideally even in rather simple cases there should be methods of influence on all levels. Besides, it is obvious that automatisms, for example, of the 1st level can successfully assimilated in programs of the 2nd and 3rd levels as a component of any exercise" [8, p. 259].

For years and even today the offered author's technology of physical education of N.N. Efimenko does not yet find a system support in official administrative (from education) and teaching circles; though it is very well perceived by children and expert teachers. Its main achievement consists in impressive results of not only motive (somatic) development of children with health limitations, but also other directions of their development. That is why recent acquaintance with main works of the author of the theory of substitutional ontogenesis, A.V. Semenovich [8, 9], became a striking and promising event; without seeing, in December, 2012 she has positively spoken of the evolutional method of children's physical education, described in a relevant section of the "Dialogue" exemplary educational program for preschool children; it saw the light of day in February, 2013. It gave us confidence in the chosen direction of scientific and practical researches. According to A.V. Semenovich's apt remark "… as it follows from basic postulates of the evolutionary theory, ***the universal laws of development are identical for supernorm, norm, subnorm, prepathology and pathology as these cohorts are not discrete.*** They form a continuum and cannot be considered independently from each other in any way" [8, p. 16]. Thus our realization of the developmental approach in physical education of preschool children (not only in relation to children with infantile cerebral paralysis, but also concerning children with rather normal level of development) has found its weighty scientific and methodological substantiation in basic learning aids of neuropsychology specialists. Discussing the problem of speech ontogenesis A.V. Semenovich notices that "… *transition to an intertheoretical paradigm* will allow to define more clearly the organization and content of fruitful interdisciplinary alliances, to designate limits of professional competence as well as it will raise the general level of professional reflection" [8, p. 22]. It is equally fair for research of problems of physical development of a child with disorders of functions of the locomotive system (whatever degree of expressiveness of these disorders).

Thus, being based on the above stated positions of the theory of substitutional ontogenesis, the phylogenetic principle in creation of the system of correctional

physical education of children seems rather reasonable; this principle was developed in a principle of hierarchy of locomotor development (habilitation, correction, prevention), and also concretized in the developmental method of physical exercises.

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