

## STUDY ON THE PHYSICAL DEVELOPMENT CHARACTERISTICS IN SMALL AGED SCHOOL CHILDREN THROUGH THE AGENCY OF EVALUATION TOOLS

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**Abstract:** *The present article refers to the development characteristics in small aged children, especially those related to their locomotive apparatus. The purpose of this article is knowing the somatic variability limits in the case of certain subjects with physical deficiency, II degree scoliosis, through the agency of evaluation tools, somatoscopy and anthropometry on a sample of 30 girls with ages of 8-11 years old. The objective set in mind was studying the morphological and functional development of the scoliotic disease in small aged school children, during a year, physical development that is not precisely done according to the normal indicator parameters.*

*The article approaches the evaluation tools topic so as to appreciate the level of physical development in small aged school children with II degree scoliosis, by applying the following indicators: waist, weight, and thorax, thoracic perimeter in repose, Pinie and Erisman indicators. One of the goals of the physical education teacher is to help each and every child in reaching and finishing his/her own development potential so as t become an adult. Reaching this goal presumes the periodic examination of each child, monitoring the physical development progression according to certain parameters and quantifying the abnormalities. In this context, we have effectuated a pedagogical experiment in which small aged school children have participated (30 girls) with the diagnosis of “II degree scoliosis”, where we have studied their physical development and the indicators of their functional condition during a year. The subjects have undergone a program of physical exercises, with 3 sessions a week.*

**Key words:** *physical development, small aged school children, evaluation tools.*

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The process of development and human growth is done in stages, steps and periods that characterize the entire life course. By growth and development we understand a dynamic complex of biological processes that goes through the human organism in its evolution to maturity. Growth is a quantitative cellular reproduction process that regards the enhancement in weight, volume and body dimensions, while the development is a qualitative process of cellular differentiation that can be translated by functional alterations and qualitative improvements that mark a perfection and adaptation of the organism's systems and apparatuses, as well as a complex evolution and an integrated coordinate in a whole (M. Ifrim, 1986).

Growth is defined as the expression of the quantitative phenomena related to the body's dimensions and segments. The development represents the qualitative processes of evolution and basically relates to the functional differentiation of tissues, to the body's functional perfecting of systems and apparatuses including the psychological one that presents itself as a discontinuity with different qualitative sequences that appear as a result of an internal and epigenetic program. Both these two processes are not done linearly, but in seizures, with high oscillations to the level of the different segments and with a speed that diminishes while reaching adulthood (C. Baci, 1977). The laws of normal growth and development stated by A. Ionescu (1986) are: the law of the unequal and asymmetrical tissue and organ growth; the law of the different growth and development rhythm; the law of proportions; the law of alternation; the law of growth and development differentiated on sex. The growth processes stop, generally, around the age of 17-19, while

the boys continue to grow until the age of 21-25. The organism, in any age period, appears as a whole, while its physiological systems, such as the nervous, the locomotive, the haematic, etc. are tightly connected.

The unequal and sex differentiated growth and development is not accidental, but bent to certain coordinative and balanced superior laws, done on evolution stages that tend to transform the child into an adolescent and the adolescent into an adult (N. Alexe, 1981). In the beginning stage of 6-7 years old, the general rhythm of growth is faster than the one felt until that age, while at the age of 8-11 years old there is a marked slowing down, especially in the somatic sphere (waist growth). For girls of 7-9 years old and boys of 7-11 years old, the rhythm of growth and ossification decreases than the previous stage. In the latter there are no new centers of ossification. Forming the child's osseous system is a continuous process. For girls of 9-11 years old and boys of 11-12 years old, it is a stage of active proliferation that leads to the incubation of the apophyses, the sesamoid bones and to the completion of the medullar cavity, stage that continues during puberty, as well (A. Ionescu, 1968). Although one notices an exacerbation of the ossification process, at these ages the bones present in their structure a considerable quantity of cartilaginous tissue, fact that determines a weak resistance to different physical demands. The articular system strengthens at the age of 8-9 years old, but not enough, presenting aspects of instability.

The skeleton of the small aged child is characterized by a pronounced elasticity that can lead to its deformation in the case of breaching a certain correct attitude and the hygienic norms. The incorrect bench position at school and at home and over

demanding the child's organism can prevent the skeleton's normal development and can lead to irreducible deformations (A. Ionescu, V. Mazilu). As a consequence, to small aged children, one frequently registers deviations of the spine, expressed particularly through cyphosis, lordosis, cypholordosis and different degree scoliosis. At the end of the first primary cycle, the scoliotic disease occupies the first place among the spine's deformations, being mainly encountered in girls (4-5 times more frequent than in boys). These aberrations have negative effects on other systems as well, such as the respiratory, the cardio vascular and the nervous system. The structural alterations of the spine and the thorax draw alterations of the respiratory system as well. The lung form the convex part of the deformation increases in volume compared to the one from the concave part. The excursion of the thorax decreases especially in the concave part, fact that creates conditions for the disproportional ventilation of the lungs.

A cause of the derangement to what the lungs are concerned, with the anatomical alterations of the spine and the thorax, is considered to be the deformation of the bronchial tree (C. Baciu, 1977). This derangement is connected to the alteration of the respiratory muscularity as well. The position of the diaphragm changes as a result of inter thoracic and inter abdominal pressure modification. In case of inter abdominal pressure prevails the diaphragm is situated upper than usual. Thus, in people with scoliosis the different level of the diaphragm depends on the location, degree and character of the scoliotic deformation that can also have an influence on the inter thoracic and inter abdominal pressure, fact that has a

considerable importance to the pulmonary ventilation disorder (C. Zaharia, 1991).

The cyphoscoliotic deformation leads to morphological and functional disorders of the haematic system. The location and the heart's shape depend on the character, the degree and the location of the scoliotic curve and the diaphragm's condition. Heart disorders happen when related to the modification of the gas exchange function, in the case of scoliosis. As a result, in the organism one certifies an oxygen insufficiency, fact that compensates through the cardiac flow, the increase of the pulmonary-arterial pressure, the over solicitation of the right ventricle. The aforementioned alterations appear and are gradually developing. They can be outlined depending on how serious the scoliosis is, its age and the efficiency of the effectuated recovery (C. Baciu, 1977). All these alterations generate disorders both in the small aged child's physical development and his/hers psychosomatic training (U. Schiopu, 1995).

Beginning with the things mentioned above, the period of the organism's growth and development must be carefully monitored, for the following stages in an individual's life depend on it. That is why one entails the necessity of perpetual monitoring of the developing rhythm, that can easily be appreciated with the help of the evaluation tools, especially of the somatometrical elements (waist, weight, thorax volume, etc.) and the somatoscopical ones (the shape of the spine, the thorax, the sole, the body's attitude, etc.) (C. Atanasiu, 1988). Thus, the general somatoscopical evaluation concurs to tracking down the body's physical deficiencies. The general somatoscopy follows the discovery of the body's physical or attitude deficiencies and appreciates the stature (the subjects can be

of normal stature, hyper stature or sub stature); the nutrition state (the subjects can be normal weight, overweight and underweight); the global attitude (one appreciates the general presentation of the body, as well as the child's psychological condition) (C. C. Baci, A. Demeter, 1970). The normal values can be expanded, while the deficiencies can exist through lacks, excesses or be asymmetrical. Appreciating the correct attitude can be done proportional to the normal position of the spine; any deformation of the latter determines the apparition of deficiencies or short attitudes of the body. There are differences between the attitudes and the proper physical deficiencies. The physical ones can be mild, medium and accentuated, while the deficient attitudes represent those aberrations from normal that have not yet produced alterations in the inherent structure of the tissues and segments. The short attitude is in the most part related to the mild deficiency that corrects and hyper corrects through functional trials (C. C. Baci, A. Demeter, 1970).

The somatoscopic exam allows the establishment of the child's attitude or posture; the global nutrition state, the muscular development (its shape, volume, repartition, symmetry or disharmony), the presence and repartition shape of the adipose tissue and the physical deficiencies. Through the correct posture one understands the regular, unforced posture of the body while standing up. A correct posture is characterized through a right position of the head and the neck being on the same vertical, that goes posterior beyond the mastodon apophysis, posterior beyond the cervical limbs, intersects the VII cervical limb, goes anterior beyond the dorsal limbs, posterior beyond the lumbar region, crosses over the

lumbosacra junction, goes in front of the knee articulation touching the land on the side of the anterior tars. The posture is collaboration between the entire myo osteoarticular system and the nervous system, influencing to a certain extent even the psychological condition. It is a dynamic stereotype that is formed during the physical development and through the individual education. The maintenance functions of the posture varies, the shift from normal to pathological being quite difficult to depict for it is imperceptibly. One bears in mind that during the child's growth period there are better chances of correction, thus the somatoscopic examination of small aged school children must be done compulsory in the beginning of each school year. The ideal position of the evaluation is the following: relaxed shoulders, superior limbs near the body, palms in the intermediary position of pronosupination, fingers slightly flexed, chin in the horizontal position, agnate inferior limbs, knees in extension, soles anterior oriented, agnate heels, tip toes further apart no more than  $45^\circ$  (I. Haulica, 2002).

The anthropometrical indicators such as waist, weight and the excursion of the thorax in the different ontogenetic stages are manifested with different intensity. In the case of a scoliotic disease in children from the primary cycle, these indicators do not correspond precisely to the normal indicator parameters.

In this context, we have effectuated a pedagogical experiment in which small aged school children (30 girls) with the diagnosis of "II degree scoliosis" have participated, one studying their physical development and the indicators of their functional condition during a year in the following tests: height; weight; the perimeter of the thorax in repose; the

excursion of the thorax; the Pinie indicator; the Erisman indicator. During a whole year, the group of 30 girls participated to a recovery program that comprised physical exercises for scoliosis recovery, done in 3 sessions a week.

We present the indicators evaluated in the experiment: *stature*, *waist* and *height*, being the anthropometrical values proportional to the other indicators. One effectuates the measurements while standing, with the heels, buttocks and shoulder blades glued to the wall or the taliometer, chin inside the chest, so as the superior margin of the external auditory conduct and the eye's external angle are on the horizontal. Since the stature is comprised of several segments, there can be variations of up to 3 cm in the course of a same day. An individual is considered tall or not proportional to the population average from which he comes from.

*Weight* is a perfectible indicator and can mostly influence the exogenous factors, such as alimentation and certain educational factors. These ones can have a great impact on the evolution of weight in surplus (overweight) in except (underweight).

*The movements of the thorax* ensure the air coming in and out from the lung both in regular repose conditions or minimal physical effort and during forced inhale and exhale conditions as a consequence of the expansion and pulmonary-thoracic retraction effectuated by the contraction and relaxation of the respiratory muscles (Harrison, 2001).

*The thoracic perimeter* is measured with the metric band placing the palms on the back head or the arms in the lateral. Up to 9-16 years old in boys and girls the metric band is placed behind under the inferior angle of the shoulder blades and in front under the nervous aureole, and in girls to the level of the ninth rib articulation with the supra mamarous stern.

*The normative Pinie indicator* characterizes the state of the body's configuration having as basis the following physical development indicators: height, weight and the perimeter of the thorax during exhaling. The Pinie indicator is calculated after the following formula:  $Ip = \text{Height} - (\text{Weight} + \text{PCT during exhaling})$ .

The Pinie indicator has been appreciated according to the following criteria:

<b>The indicator interval</b>	<b>Appreciating the configuration</b>
Less than 10	Strong
From 10 to 20	Good
From 21 to 25	Medium
From 26 to 35	Mild
More than 36	Very mild

*The Erisman indicator* characterizes the shape and condition of the thorax to what the researched children are concerned and represents an informative indicator of the locomotive apparatus (spine) in case of

scoliosis. This indicator is calculated having as basis the perimeter of the thorax in repose and the height of the researched children.

The calculus formula for the Erisman indicator is as follows:

$$I_e = PCT \text{ in repose} - \text{Height}/2$$

The Erisman indicator is determined according to the following criteria:

The indicator interval	Appreciating the condition of the thorax
Less than 0	The thorax is narrow
More than 0: <ul style="list-style-type: none"> <li>▪ from 1-5</li> <li>▪ more than 5</li> </ul>	The width of the thorax is normal: <ul style="list-style-type: none"> <li>▪ The medium development of the thorax;</li> <li>▪ The good and correct development of the thorax</li> </ul>

In table 1, we present the evaluated indicators in their initial and final testing

Table 1

*The comparative analysis of the tested indicators within the experiment (girls: nr=30)*

Nr. crt.	Tests	Initial testing	Final testing	t	P
		$\bar{X} \pm m$	$\bar{X} \pm m$		
1	Height (cm)	143,00 ± 1,72	144,00 ± 1,60	0,43	>0,05
2	Weight (kg)	40,00 ± 0,80	39,50 ± 0,85	1,28	>0,05
3	Excursion of the thorax (cm)	4,50 ± 0,18	5,55 ± 0,15	2,09	>0,001
4	Perimeter of the thorax in repose (cm)	69,00 ± 1,62	79,25 ± 1,56	2,66	>0,001
5	Pinie Indicator (physical level)	27,00 mild	23,00 medium	-	-
6	Erisman Indicator (conventional units)	-5,25	+3,00	-	-

One must mention that, during the research period, the dynamics of the physical development indicators for the girl group was positive. Thus, one has improved the indicators of the thorax excursion ( $P < 0,001$ ) as well as the thoracic parameter indicators ( $P < 0,001$ ).

At the end of the experiment, the weight indicators decreased considerably in children ( $P < 0,005$ ) which constitutes a positive result.

The Pinie indicator reflects the gradual shift from the satisfactory level (27) to a more qualitative level (medium: 23)

proportional to the child's body resistance and development.

The dynamics of the Erisman indicator proves that there has been a shift from the narrow shape of the thorax to a relative normal one (+3, 00).

These positive changes of the indicators probably happened due to the physiological development of the child's organism and to the influence of the applied methods (physical exercises). In the same time, the Pinie indicator shows that, in the initial testing, the subjects find themselves in a weaker level to what their physical configuration is concerned. The negative values of the Erisman indicator, in the initial testing, show that the subjects present a slight narrowness of the thorax. Nevertheless, in the final testing, according to the data taken from table 1, one notices a considerable remission (with approximately 50%).

Table 1 reflects the data of the final indicators to what the subjects' physical development is concerned, the obtained results showing a conspicuous difference of the physical development, with exceptions in height and weight.

Therefore, the deductions mentioned before prove that the oriented corrective exercises, used during the experiment did not have a negative influence on the physical and functional development of the researched subjects. These methods exerted a positive influence and have had a positive final result in improving the functional indicators.

## Conclusions

In the full period of growth a series of aberrations from normal can appear in the child's shape and functions, generated by a series of diverse causes.

A great part of the physical deficiencies encountered in children of 12-14 years old

are located to the spine level, especially in the anterior-posterior plan.

A precocious tracking down of these deficiencies is imperative and this can be done by the medical examination of the entire pupil collective, in the beginning of each school year, using for this purpose, the somatoscopic exam, to which physical education teachers can also participate.

Regarding the data of the experiment, one has noticed an improvement of the physical development and functional indicators in all subjects proposed to be evaluated in the present study. In the evaluation in question, the physical education teacher has an important role for he/she collaborates with the school's medical staff that organizes the methodic forms through which one can intervene in the physical development and the prevention and correction of the spine's physical deficiencies. In order to obtain the best results, one recommends using as many evaluations as possible, as well as action and surveillance methods to what the child's physical development is concerned.

It is necessary to infuse in small aged school children the concern for physical development, as well as the rebutment of the physical deficiencies, during the growth period, effectuating corrective exercises at home and creating the support of physical education teachers.

By strengthening health and improving physical capacity indicators one acts favorably and with beneficial effects for the future, on the physical deficiencies, thus contributing to the increase of the anthropometrical indicator values.

During the physical education lessons a careful medical observation of the pupils carrying a physical deficiency with systematic monitoring on the ponderal stature curve is necessary.

An increased number of hours must be assigned in order to keep practicing the special programs so as to improve and accelerate the physical development.

The physical education program must be individualized, organizing adequate activities depending on the type of physical deficiency, with the goal of harmonizing the corporal attitudes through the balanced development of the general muscularity.

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