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ROLE OF EARLY-CHILDHOOD REFLEXES IN THE PSYCHOMOTOR DEVELOPMENT OF A CHILD, AND IN LEARNING

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SUMMARY

Background: The aim of this paper is to present the occurrence of primitive reflexes in children with learning difficulties, and, in particular, to establish whether these are the vestigial forms of primitive reflexes occurring in the case of children at school age suffering from learning difficulties.

Material/ Methods: The research group included 27 school children, including 11 male attendees and 16 female children (the average age: between 7.0 and 18.2 years) from the Complex of Educational and Care Facilities in Cracow suffering from learning difficulties and with different intelligence quotient levels. In the investigation, applied was the diagnosing program developed by S. Goddard and intended to be used with children above the age of 7 years; this being composed of large muscle coordination tests and tests of balance, ones investigating the reflexes, and also of the Tansley Test and the Bender-Gestalt Test.

Results: It was found that the vestigial primitive reflexes occur in the case of school-age children suffering from academic difficulties. Those reflexes do not decrease simultaneously with the passage of time, but rather become more intensified. In children with low IQ, the vestigial form of preserved primitive reflexes occurs more frequently, and are more intensified. The number of primitive reflexes is not on the decrease simultaneously with the passage of time in the two studied groups. In the case of children whose intelligence quotient is at a lower level, the vestigial form of primitive reflexes occurs more frequently and is more intensified.

Conclusions: In school-age children with learning difficulties, primitive reflexes occur in their vestigial form. Those reflexes do not decrease simultaneously with the passage of time, and it rather seems that they have become more intensified.

Key words: residual reflexes, postural reflexes, difficulties with learning, psychomotor development

INTRODUCTION

For the time being, irrespective of the rapidly increasing knowledge on the subject of the development and diagnosing of the central nervous system, the quantity of knowledge on new therapeutic methods is still insufficient. Even today, the following methods: NDT-Bobat's method and V. Vojta's method, and also the theoretical foundations provided by them, and their observations, are the background for the formulation of a diagnosis, and the most important methods of exerting influence upon the nervous system of a small child threatened with cerebral palsy. In recent years, it has been observed that the Sensory Integration Method developed by A.J. Ayres, the intended application of which is to develop sensory integration, has become more popular. The method in question is intended to be applied in the case of older children rather than in that of younger ones, and the youngest on whom it may be applied are those at nursery school age. There have also appeared the method developed by S. Goddard, Ph.D., and P. Blythe, Ph.D., (2004 and 2006) applied to children suffering from neurodevelopmental abnormalities.

The objective of my paper will be to present in general the conception developed by S. Goddard, Ph.D., and P. Blythe, Ph.D., one relevant to the influence exerted by primary (primitive) reflexes, and by the postural ones, upon the psychomotor development and learning of a child, and also to present the pilot studies relevant to the occurrence of the vestigial form of primitive reflexes in the case of children suffering from learning difficulties.

To date, attention in the medical literature has principally been concentrated on the occurrence of primitive reflexes in the case of children suffering from cerebral palsy. In the medical understanding of that term, or, to be more precise, in the neurological one, preserved reflexes are formed as a consequence of serious organic damage to the brain in the course of the period of fetal life, or, alternatively, in the course of delivery, creating a certain set of symptoms referred to as spastic diplegia (Chymlik, J., Michałowicz, R. 2001, p.114). A. J. Ayres, in her theory of sensory integration, paid attention as well to the selected primitive reflexes, which, in accordance with her opinion, may disturb development, but do not produce symptoms as strong as in spastic diplegia. For that very reason, they may be less intensified.

A point of view similar to that of J. Ayres is presented by P. Blythe, Ph.D., and his wife, S. Goddard-Blythe, Ph.D.. In the conception developed by those authors, primitive reflexes may occur at times different than the physiological period of the occurrence, but being less intensified, as a residual reflex, causing disturbance in psychomotor development in the form of so-called neuro-developmental delays. Those disturbances have a foundation which is functional rather than organic, and, for that very reason, we may encounter them in the case of children that seemingly are developing well. From the point of view of medicine, primary reflexes are those which develop in the course of the period of fetal life and gradually disappear after the birth of a child, no later than until the sixth month of life.

If they last longer, then they will be causing serious disturbances in the further psychomotor development, and they will become preserved reflexes. Preserved reflexes are formed as a consequence of serious organic damage to the brain. As it can be seen, there may occur a different degree of intensification of preserved reflexes. A small degree in their intensification, and this means residual reflexes, will be referred to by the author of this paper as the vestigial form. The vestigial form of residual reflexes exerts a negative influence not only upon the motor development of a child, but also upon the development of mental functions, and, in the further course, upon the formation of learning difficulties.

Postural reflexes (*ibidem*, pp. 49-50) appear after the birth of a child, and the objective of them is to bring about the obtainment of a vertical posture and the correct body balance. Those reflexes do not disappear, but rather occur throughout one's entire life. Postural reflexes may not develop with the appropriate force, and they may not become entirely mature. Then, in the case of a child, there appear difficulties with motor development, and also, in less conducive conditions, in maintaining the balance of the entire body, and also, at the appropriate age, difficulties with learning will become observable.

Upon the basis of an analysis of the subject literature, it is possible to say that early-childhood reflexes, or the early-infantile ones, are genetically encoded, and the ones with which a child is born, with which a child undergoes motor development, and, in the further course, by means of the appearing postural reflexes, through which a child adopts a vertical posture. In accordance with the opinions of Blythe and Goddard-Blythe, **primary reflexes and postural reflexes develop also such mental functions as: lateralization, visual perception, aural perception and the coordination of them, exerting influence upon emotional development.**

The pioneer of investigations into reflexes understood as the permanent constituents of motor development, rather than as an immediate reaction to the acting stimulus, was Rudolf Magnus (Czochańska, J. 1995, p.41). A reflex, as J. Czochańska wrote (1985, p.155), ought to be understood in a broader manner, and, therefore, not as an unchangeable stereotypical reaction to the acting stimulus, but rather as the constituents of the motor development of a child. Those reflexes shape a certain motor pattern, and thanks to it, in the first and the second year of life, they develop in a similar manner. To the reflex reactions with which a child is born and which help to ensure the correct positioning of the body, Rudolf Magnus applied the term: **the reflexes of posture**, and to the other ones, those serving to maintain the vertical position, the term: **the reflexes of extending**. The first ones of them are maintained throughout the first six months, and the other ones are formed in the second six months of life. Thanks to them, a child becomes quadrupedal, and, in the further course, bipedal. In the second six months of life, **the reflexes of balance,** which commence their development in the period between the sixth and the eighth month of life, and which ought to be completely developed between the eighth and the twentieth month of the life of a child, are formed. J. Czochańska (*ibidem*, p.154) adheres to the opinion that

both participate in **the** formation **of the reflexes of posture and extending the vestibular system and the cervical receptors. The author includes the following ones into the reflexes of posture** (Czochańska, J. 1995, p.44):

- the crossed extensor reflex,
- the truncal incurvation reflex (the Galant reflex),
- the supporting reflex,
- the asymmetrical tonic neck reflex,
- the symmetrical tonic neck reflex,
- the tonic labyrinthine reflex.

In turn, in the set of the reflexes of extending she differentiates between the following ones (*ibidem*, p.54):

- the neck tonic reflex, which occurs until the sixth month of the child's life ,
- the screw extending reflex, which appears between the seventh and the eighth month of life, and which lasts until approximately the second or the third year of life,
- the tonic labyrinthine-optical head extending reflex,
- the Landau reflex,
- a readiness to jump,
- the parachute reaction.

Apart from the reflexes from the group of the postural and extending ones, a number of other automatisms of movement with tension were described. Nevertheless, in accordance with the opinion of J. Czochańska (*ibidem*, pp.53-60) and those of other authors, only some of them are of a clinical significance. From this group, the following were encompassed: the Moro reflex, the Palmar grasp reflex, the plantar response, the sucking reflex and the seeking reflex.

The reflexes of extending help to overcome the force of gravity, are the basis for gradual verticalization, and also initiate the development of bipedality. Gradually, while the nervous system is attaining the state of maturity, the reflexes of extending become weaker, and they have nearly disappeared by the fifth year of life. They are replaced by the reactions of balance, which appear after the period between the sixth and the eighth month of life, and are the expression of mutual collaboration between the cortex, the basal ganglia and the cerebellum. The role of the mechanisms of balance is to ensure the appropriate positioning of the body in relation to the situation of the center of mass. Czochańska (1995, pp.60-67) has differentiated between the following reactions of balance:

1. The reactions of balance in the supination position,
2. The reactions of balance in the pronation position,
3. The reactions of balance in the quadrupedal position,
4. The reactions of balance in the seating position,
5. The reactions of balance in the kneeling position,
6. The reactions of balance in the standing position.

The role of early-childhood reflexes used to be treated as certain motor patterns, which appear at the appropriate time, and the task of which is to practice a motor pattern. The role of the reflexes was, therefore, understood only as ex-

ercising a certain motor pattern, thanks to which a child may adopt a vertical posture.

Blytheand and Goddard-Blythe (2004, 2006) extended the meaning of the infantile reflexes and demonstrated the influence exerted by them upon various mental functions, and also upon the process of learning. This conception is comparatively new and, for that very reason, it ought to be approached with a certain caution. The investigations conducted by those authors, and by other researchers, demonstrated that a given reflex opens and activates the neural pathways, conducting the impulse to the different structures in the brain. And, for that very reason, they also adopted in their conception the presumption that if the primary reflexes (and that means those with which a child is born, and which have gradually disappeared by the sixth month of the life of a child), will last longer than the physiological period of their occurrence, they may disturb psycho-physical development. Such a reflex is then referred to as a **primitive reflex**. In the conception developed by those authors, a residual primitive reflex brings about a functional disorder, rather than an organic one. This differentiation between those two meanings is of significance because, in medical nomenclature, primitive reflexes are formed as the consequence of organic damage to the brain (Michałowicz, 2000).

The primary reflexes, according to Blytheand and Goddard-Blythe (2004, 2006) **are:**

- the Moro reflex,
- the Palmar grasp reflex,
- the asymmetrical tonic neck reflex (ATNR),
- the sucking reflex and the seeking reflex,
- the truncal incurvation reflex (the Galant reflex),
- the tonic labyrinthine reflex (TLR),
- the symmetrical tonic neck reflex (STNR),
- the Babiński reflex,
- the plantar response.

The Moro reflex is formed in the period between the ninth and the twelfth week of fetal life, and it develops throughout the entire period of pregnancy. It disappears between the second and the fourth month of a child's life. It appears as the response to an unexpected stimulus such as noise, unexpected movement or change in the aspect of light in the field of vision, and also to the stimulation of the labyrinth by means of the changed position of the head, pain, change in the aspect of temperature or the dramatic movements of another individual. The reaction of a neonate consists in the unexpected abducting of the hands backwards, and in deflecting the head, in flexing the legs, and also in uttering a sonorous scream by a child; then, in the subsequent course of events, the hands gradually come back to the closed position. Abducting facilitates an unexpected inspiration, and adducting expiration. The entire organism is dramatically stimulated. The Moro reflex is an involuntary reaction to a threat. It acts like the earliest form of the fight-or-flight response, appearing in the further periods of life. It is

the function of that reflex to alert, to wake up and to call for help. The vestigial form of the Moro reflex brings about excessive reactions to being surprised, the hypersensitivity of one of the sensory channels. A child suffers from an elevated level of anxiety, manifests a propensity for excessive reactions, and seems to be emotionally immature, bashful, or, perhaps, hyperactive in the aspect of psychomotorics. The vestigial form of the Moro reflex exerts influence upon emotional functioning, brings about an absence in the selection of stimuli, and also increases the production of adrenaline and cortisol, decreasing the organism's immunity. For that very reason, it results in a propensity for infections and allergies. More frequently, a child is hypersensitive to loud sounds, or only some of them because the vestigial form of this reflex brings about disturbance in the development of the stapedius muscle in the middle ear. This muscle, in the course of being exposed to a noise, draws the auditory ossicles away from the tympanic membrane. It also exerts an influence on the ability to fixate eyesight upon a selected figure amongst other figures in the field of vision. It develops as the first, and, for that very reason, it may disturb the development of those which ought to be developed afterwards.

The Palmar grasp reflex, and that means the palm reflex, is formed in the eleventh week of pregnancy, and it disappears (becomes extinct) in the third month of life. Its features being the grasping movement of the palms. A delicate touch or pressure upon the palm of a neonate brings about a clenching of the fingers. In the period between the fourth and the sixth month of life, this reaction starts to be transformed into the reaction of grasping by the thumb and the index finger.

The vestigial form of the Palmar reflex brings about: awkwardness, the inhibition of the development of the independent movements of the thumb and the fingers, disturbance in grasping, which, as a result, brings about untidy handwriting, and through the loop of Babkin (the neurological connection between the palm reflex and the sucking reflex) it disturbs articulation. Those children, while they are writing and drawing, move their tongues and their lips. It is also possible that hypersensitivity is observed on the palm.

The asymmetrical tonic neck reflex **(ATNR)** appears in the eighteenth week of fetal life, becoming gradually extinct by the sixth month of a child's life . It consists in the fact that when a child turns away its head to the side, then, simultaneously, it brings about an extension of the the hand and the leg on the side to which the child has turned the head, and a flexing of the extremities on the opposite side. In the course of the period of fetal life, this reflex develops the movements of kicking and the moving of a child in the mother's womb, develops muscular tonus and stimulates the vestibular system. This reflex ought to be completely developed in the period of delivery because it may participate in it, and that, namely, because a child, by means of moving and turning away, collaborates with the Braxton-Hicks contractions. S. Goddard and other researchers claim that not only does it play a major role in the course of a delivery, but it is made more intensified by the delivery in question. In the period of infancy, this reflex increases the tonicity of the extending muscles, exercising in turn each

half of the body, and also movements to the side, creating the foundations for the movement of reaching. It is also ascribed an important role in the development of motoric-visual coordination, which will make it possible in the future for a child to touch objects in the course of observing them with their eyes.

The vestigial residue of the ATNR makes it more difficult to conduct alternate movements in the course of creeping and crawling, which exerts a negative influence upon the coordination of movements and the integration of the vestibular system with the other senses, and also upon the formation of excessively weak connections between the right and the left hemispheres of the brain, which take place in the corpus callosum. The development of lateralization is weak, and what is made more difficult as well, is following with the eyes, which brings about difficulties with reading, and about disturbed convergence and accommodation. Handwriting is untidy, and grasping is not correct, the automatization of handwriting is at a low level, and, therefore, there appear difficulties with expressing one's thoughts in a written form.

The reflex of sucking and seeking – this appears between the twenty-fourth and twenty-eight week of fetal life, and it becomes extinct between the third and the fourth month of life. The vestigial form of the reflex of sucking and the one of seeking brings about problems with articulation, protruding the tongue forward, which may bring about increased difficulties in chewing foodstuff, and about salivating, and, in the further course, cause hypersensitivity in the region of the mouth, and also through the loop of Babkin, exerting an influence upon manual dexterity.

The truncal incurvation reflex (the Galant reflex) – is formed in the twentieth week of fetal life, and it is active no longer than until the ninth month of the child's life. This derives from the fact that if the lateral part of the child's torso is irritated or touched, then it is followed by a flexing of the concavity which is in the direction of the acting stimulus. This reflex ought to be intensified on both of the sides to the same degree. It provides support in the course of delivery.

The vestigial form of the Galant reflex results in hypersensitivity in the region of the back from the shoulder blade to the hips and, for that very reason, children that are suffering from it are reluctant to wear belted-up items of clothing, and they find it uncomfortable to seat on chairs with a backrest, they keep fidgeting on a chair, have weak short-time memory and difficulties with controlling the urinary bladder. In the case of those children, enuresis may be more frequently encountered.

The tonic labyrinthine reflex (TLR) is divided into two parts:

1. The tonic labirynthine reflex in the extended position (anterior),
2. The tonic labirynthine reflex in flexing (posterior).

The posterior TLR – this appears gradually in fetal life by means of adopting the flexing position, and its extinction occurs around the fourth month of life. In turn, the other one appears when a child enters the birth canal, and is completely present after delivery, whereas it becomes gradually extinct between the seventh week and the third year of life. The automatism of the first of those reflexes consists in the fact that, when a child bends its head forward, this brings about as well a flexing of the arms and the legs. The automatism of the other reflex makes

a child, while their head is being bent backwards below the line of the backbone, extend its arms and legs. The action of this reflex is complicated. It cannot be doubted that it exerts influence upon the appropriate distribution of muscular tonicity in the body. In turn, Ayres (1973) indicates disturbances in the sense of gravitational stability, causing, *ipso facto*, the absence of the ability to assess space (top-bottom, right-left, front-back), depth, distance and rapidity. The extended influence exerted by this reflex delays the development of setting the position of the head. The weak control of the head muscles brings about disturbances in the functioning of the eyes and to proprioception. It will also make it more difficult to creep and to crawl. The non-integrated posterior tonic labirynthine reflex will make it difficult to shape the correct posture of the body. A child will manifest a propensity for slouching, and for leaning the head forward, resulting in a flexing of the knees, while movements in the course of running and/or walking on foot will be less harmonious and less flexible. The weak balance of the entire body brings about a fear of heights. What will also be disturbed is the ability to form sequences, and an imperfect (flawed) sense of time will be observed.

The anterior tonic labirynthine reflex, apart from the symptoms referred to earlier in the text of this paper, may bring about a propensity for walking on its toes, inflexible and jerking movements brought about by the domination of the extensor muscles.

The vestigial form of this reflex disturbs the muscular tonicity of the flexor muscles and of the extensor muscles. A child may slouch or become excessively inflexible, performing jerking movements, and also walking on its toes. What occurs is a disturbed sense of balance and motion sickness, and the reason for that is that this reflex is connected with the labyrinth. A child may suffer from weakened visual perception (figure-background), and problems with orientation in space, with the sense of time, forming sequences, and also weak organizational skills. In the case of children, we encounter the fear of heights as well.

The symmetrical tonic neck reflex (STNR). This is a temporary reflex, and it appears in the period between sixth and the ninth month of life, and becomes extinct between the ninth and eleventh month of the child's life. It facilitates a counteracting of the force of gravity by means of lifting upwards onto the hands and the knees from the recumbent position on the belly. It facilitates the extinction of the TLR. It divides the body into halves along the central line, facilitating the independent movements of the upper and lower extremities. It facilitates observation at greater distances, and it also makes it possible to track the object approaching a child.

The vestigial form of this reflex exerts influence upon the formation of incorrect body posture. A child is slouching in the course of lessons, and in the course of writing, the head is excessively leaning forward, and the upper extremities are bent to bring about so-called 'writing with the nose.' At the end of a lesson, a child is tired, the symptom of which is that the elbows have to be applied to support the body on the bench, and to maintain the position of the head. More frequently, the movements are awkward, and difficulties are experienced in the course of

PE lessons, which is accompanied by the weak coordination of hand and eye movements. A child is incapable of playing ball games, with the reason for this being that the ball is no longer in the field of vision when it is moving. The reflex may also bring about movement hyperactivity and disturbance in concentration, and that for the reason difficulties with remaining seated in one position qat a school desk. For that very reason, a child starts to turn and fidget, which prevents them from concentrating upon the lesson.

The Babiński reflex – this appears approximately one week after the delivery, and slowly disappears by the second year of life, which is connected with a maturing of the cortical-medullary tract. The delicate irritation of the external edge of the feet brings about the truncal flexing of the big toe, and a widening of the toes. This reflex exerts an inhibiting influence upon the plantar response, and it helps a child in crawling by means of planting the toes on the ground and pushing away with the use of the feet.

The plantar response is a grasping reflex (and the primary one), and it occurs until the seventh – ninth month of a child's life. It appears after pressing delicately the soles of the feet, and afterwards it is followed by a movement of flexing and grasping with the toes. The role of this reflex is not entirely clear. The extended presence of this reflex may exert influence upon the formation of the propensity for flexing the toes in the standing position, which, consequently, will cause the absence of the sense of safety and the absence of confidence in the gravitational field. It may also disturb manual development, through the nervous loop connecting the palm reflex, and the plantar response.

When a child has been born, the development of the muscles commences, even though slowly, together with that of their strength, and, gradually, postural reflexes will appear. Into this group, authors have included the reflexes of extending and the reactions of balance. Those reflexes do not disappear; they rather occur throughout one's entire life. There are multiple and diversified roles of postural reflexes.

In accordance with the opinion of Sally Goddard (2004), the reactions of extending encompass the following ones:

- the reflex of visual head positioning,
- the labyrinthine reflex of head positioning,
- the Landau reflex,
- the amphibian reflex,
- the reflex of gradual torso turning.

The reflex of visual head positioning develops after obtaining the appropriate strength of the nape muscles by a child so that the child could control the movements of the head. When a child controls the movements of the head, and that means after the fifth month of life, then it develops the reflex of visual head positioning. This reflex makes it possible to fixate eyesight upon a point in the course of performing a movement, and it is needed to maintain the fixed position of the eyesight. If it is not developed appropriately, following with the eyesight and fixing it upon a point maybe made more difficult. This reflex is dependent upon visual information.

The labyrinthine reflex of head positioning develops simultaneously with the reflex of visual head positioning. These two ought to be synchronized with one another. This develops upon the basis of the information flowing from the vestibular system. In the Polish literature on neurology (Czochańska, J. 1995, p.54), those two reflexes referred to earlier in this paper are referred to as the reflex extending the position of the head (the labyrinthine-optical one), and they ensure the correct positioning of the head in space. In the vestigial form, this reflex lasts for one's entire life.

The Landau reflex is formed simultaneously, at which the reflex of positioning the head, gradually becomes extinct by the forty second month after birth. It is this reflex's task to support the tonic activity of the labyrinthine reflex in the extended position. It strengthens the extensor muscles, and, in particular, the muscles extending the head. It is not a typical postural reflex because it gradually disappears after the third year of life.

The amphibian reflex develops between the fourth and the sixth month of life, originally, in the position on the belly, and, in its subsequent course, on the one on the back. It will make it possible for children to creep, and, in the further course, to crawl. This reflex will make it possible for the independent movement of the lower and the upper extremities to take place, and also for the movement of one of the lower extremities away from the other three. The reflex in question, if weakly developed, will make it difficult to engage in physical exercises and in harmonious movements. Until such a time when the amphibian reflex is developed, the movement of legs is dependent upon the positioning of the head, and upon the automatism of movements in the form of the asymmetrical tonic neck reflex (ATNR). The appearance of the amphibian reflex is the symptom of the extinction of the ATNR. It will make it possible, therefore, for the further development of the movements of extremities, independent of one another, and also of the head, to take place. This reflex develops gradually, and it exists throughout one's entire life.

The reflex of gradual torso turning activates rotational movements, which will make it possible to perform torso turning in the recumbent position. It appears at the age of six months, and it will make it possible to rotate from the back onto the belly, and, at the age of eight to ten months, to rotate from the belly onto the back, and, in the further course, to sit down and use supported kneel. This reflex exists throughout one's entire life in order to ensure fluent movement in the course of performing physical exercises, running, jumping, skiing and inline skating.

The reactions of balance commence their development, when the reactions of extending have been formed, and, therefore, at approximately the ninth month of life. They are brought about by the stimulations of the vestibular system. They help to maintain balance, in particular, in the course of moving. In children in the case of whom those reactions are weakly developed, we more frequently observe falling and the experiencing of difficulties with unexpected changes of direction. They are divided into two reflexes. The parachute reaction, and that means the turning reflex, and the supporting reflex ('lateral'). The 'lateral' supporting reflex

occurs in the course of the loss of balance in a seating position, and it will make it possible to support the torso on the side. This protects a child from falling.

Postural reflexes may not be developed completely and may not have reached complete maturity, irrespective of the fact that the primary reflexes have been developed, and postural reflexes have appeared to take their place. The absence of maturity in postural reflexes brings about different kinds of difficulties which form in childhood, or no sooner than during adolescence, or even when one attends an institution of tertiary education. The reason for this is that in the latter period of life one is required to think independently, to be able to formulate conclusions, and to manifest substantial flexibility in relation to different problems. At a younger age, those individuals may have coped well in school and in their everyday lives, and the reason for that was that they did not have to make decisions independently, to formulate conclusions and to learn how to conduct complicated actions; nor did they have to master complex patterns. In connection with the required manner of action, those individuals in the course of adolescence have difficulties within the scope of:

- combining different information and formulating conclusions,
- adjusting to a new situation,
- the application of known conceptions for solving problems,
- combining different pieces of information with one another,
- processing multiple stimuli simultaneously,
- coping with a great number of pieces of information simultaneously, and concentrating upon one of them,
- dividing information into sequences.

In addition to that, in the group of older people, and this means in the case of youths, there may occur such symptoms as:

- a limited lexicon,
- an absence of flexibility in thinking and assimilating principles,
- difficulties with assimilating new rules, and in adjusting them to contemporary conditions,
- a low level of manual dexterity,
- a low level of energy resembling that observed in the case of depressions, but not responding to pharmacological treatment,
- a low level in the flexibility of the (torso) postural muscles,
- difficulties in performing complicated patterns of movements, for instance in the course of dancing, or in martial arts (Lawrence and Beuret, quoting after: Goddard, 2004, pp.60-61).

Discussing the development of the reflexes, it is impossible not to incorporate the conception of Bertha and Karl Bobat, one of the principal therapeutic methods, applied in the treatment of spastic diplegia. In that conception, it is presumed that the gradual counteracting of the force of gravity, simultaneously with the correct course of psychomotor development, is determined by the appropriate development of reflexive activity. The division and the chronological appearance of the reflexes is, nevertheless, different than that (Matyja and Domagalska, 2009).

Into the group of the fundamental reflexes in this conception, it is possible to include the following:

- the cortical reflexes by which set the following were encompassed:
- the reflexes of supporting,
- the crossed extensor reflexes,
- the grasping tonic reflexes of the hands and the feet,
- the reflex of pushing the extremities,
- the reflexes of the shortened torso (Galant).
- the bulbar reflexes:
- the tonic labyrinthine reflex,
- the asymmetrical tonic neck reflex,
- the symmetrical tonic neck reflex,
- the setting neck reflexes of the screw type.

As it was expressed by Matyja and Domagalska (*ibidem*, pp.64-65) '… "disappearing" reflexes, in the matter of fact, do not disappear, but rather become dominated by the setting reactions and the reflexes of balance, which do not "appear," either, sooner at the particular stage of development, but rather only when the influence exerted by them on the course of postural and motoric patterns is possible to be observed. In principle, in the case of every individual that is correctly shaped in functional terms, it is possible to find the elements of tonic activity…. That confirms one more time the accuracy of the thesis of "the coexistence of all the forms of reflexive activity at every stage of reflectory development."'

The objective of this paper is to present investigations into the pilot studies, and relevant to the occurrence of the vestigial forms of primitive or primary reflexes in the case of children suffering from difficulties with learning at school age, diagnosed with the application of the program developed by P. Blyth, Ph.D., and S. Goddard-Blythe, Ph.D. (Goddard S., 2004).

The pilot studies have, as well, another objective – to verify the dexterity of the research tool which is constituted by the diagnosing program developed by S. Goddard-Blythe, Ph.D., and also our own knowledge and abilities in the aspect of the application of this research tool.

The research is directed to the answer of the following questions:

- does the vestigial form of primitive reflexes occur in the case of children at school age suffering from difficulties with learning?
- is, simultaneously with the passage of time, the number of primitive reflexes in their vestigial form on decrease in the two studied groups?
- do, in the case of children whose intelligence quotient is below the average level, vestigial primitive reflexes occur more with increased intensity than in the case of children whose intelligence quotient is at the average level?

MATERIAL AND METHOD

The research group included 27 school attendees: 11 male attendees and 16 female attendees (the average age: 7.0 – 18.2 years) suffering from difficulties

with learning and having different levels of intelligence. In the case of one of the children, it amounted to 53 points on the Wechsler Intelligence Scale, and in the case of another 79 points. In turn, the remaining outcomes were within the following range: between 80 and 113 points. The investigations were conducted on the premises the Complex of Educational and Care Facilities No. 2 (children's home) in Cracow, and also on the premises of the Psychological-Pedagogical Clinic No. 3 (also located in Cracow) in the period from February until May 2006. The studied children came from dysfunctional families, with disharmonious development being observed in them. Those children were classified into the first group. Into the second group were classified those attending therapeutic classes at the Psychological-Pedagogical Clinic No. 3 in Cracow, which was also designated for children suffering from learning difficulties. The age of the participants was between 9.9 and 13.8 years with 9 male attendants and 2 female.

Applied research tools

Applied in the investigation was The diagnosing program developed by Goddard and intended for children above the age of 7 years was used in this study. This program was composed of test coordination of the large muscles and tests of balance, tests investigating the reflexes, and also of the Tansley Test and the Bender-Gestalt Test,. The test is assessed on a five-grade scale, on which an outcome of '0' points means that the task was performed in a correct manner, of 1 point that 75 % of the task was performed in a correct manner , of 2 points – that the task was performed only correctly in 50%, of 3 points – that the task was performed only to a 25% degree of correctness, and of 4 points – that the task was not performed at all. The detailed description of the research tool can be found in the study (Goddard 2002, 2006).

Research trials and tests used:

1 – walking on foot along a straight line forward
2 – walking on foot along a straight line backwards
3 – walking on foot on the edges of one's feet forward
4 – walking on foot on the edges of one's feet backwards
5l – the Ayres test, the left side
6p – the Ayres test, the right side
7l – the Schilder test, the left side
8p – the Schilder test, the right side
9 – STOS – flexing
10 – STOS – extending
11 – TLR – flexing
12 – TLR – extending
13 – following with one's eyes
14 – integration
15 – integration
16 – integration
17 – differentiation between sounds

18 – the Tansley Test – visual differentiation
19 – the Tansley Test – visual-movement integration
20 – the Bender Test –visual differentiation
21 – the Bender Test –visual differentiation.

Description of the received outcomes

The first question is relevant to the problem of the occurrence, in their vestigial form, of primitive reflexes in the case of school-age children suffering from learning difficulties. Occurrence of primitive reflex is presented in Fig. 1.

This diagram indicates that, in the case of children suffering from difficulties with learning there occurs the vestigial form of primitive reflexes. The outcomes obtained both in the first group, and in the second one alike, at level 1 and the higher one alike, support the claim that there remains the vestigial form of the reflexes under discussion. In the first group, the children performed least positively in the following tests: 3, 4, 13, 14, 15, 16, 17, 19 and 21, and for the second group in the following tests: 2, 3, 4, 14, 15, 16, 17, 18, 19, 20 and 21. The incorrect performance of those tests suggests the occurrence of the vestigial form of primitive reflexes in the case of the children studied. Into the group of those reflexes, it is possible to encompass: the tonic labyrinthine reflex, the asymmetrical tonic neck reflex and the symmetrical tonic neck reflex. In the second group, there occur as many as 11 tests performed incorrectly, and that means two more than in the

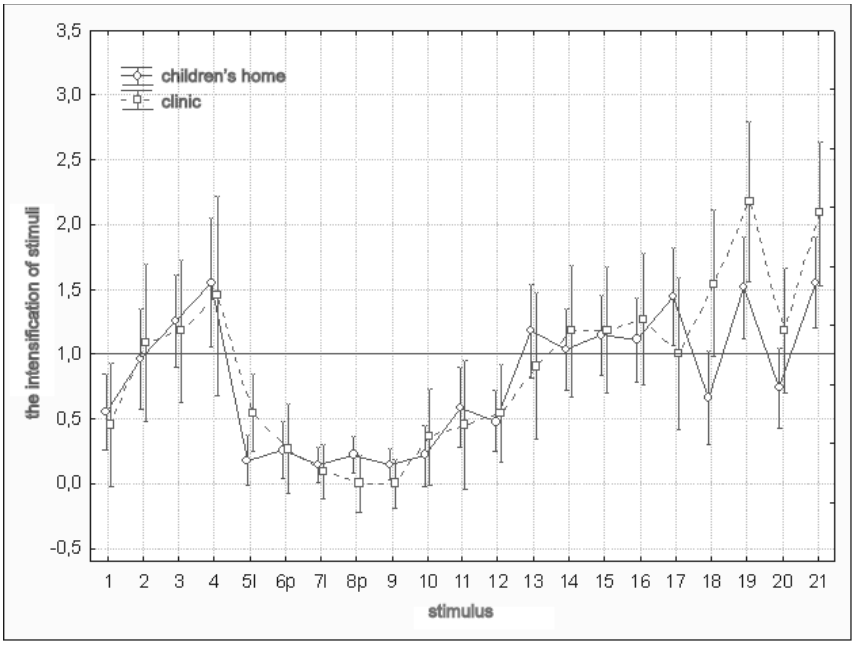

Fig. 1. Occurrence of primitive reflex traces in Group 1 (from a children's home) and Group 2 (from a clinic)

first group. It is also possible to observe the greater intensification of them.

The second question is as follows: is, simultaneously with the passage of time, the number of primitive reflexes in their vestigial form on the decrease in the two groups studied?

Obtained outcomes were placed in Fig. 2.

As can be concluded from the diagram, the second group and the first one did not obtain an outcome of statistical significance (p=0.21, p=0.05). It is possible, nevertheless, to observe that in the investigations, it is possible to observe a certain propensity, namely, simultaneously with the passage of time there is observed an increase rather than decrease in the number and intensification of the vestigial of form primitive reflexes. This propensity appears in the second group.

The third of the formulated questions is as follows: do, in the case of children whose intelligence quotient is below the average level, vestigial primitive reflexes occur more with increased intensity than is the case with children whose intelligence quotient is at the average level?

Obtained outcomes are presented in Fig. 3

It shows that in the case of children whose intelligence quotient is at the level of 90 and more points on the Wechsler Scale any intensification in the vestigial form of reflex occurrence is smaller, and the reason for this is that it most frequently reaches the value of 20 points. If the intelligence quotient is lower, it is possible to observe their intensification of occurrence of the vestigial primitive

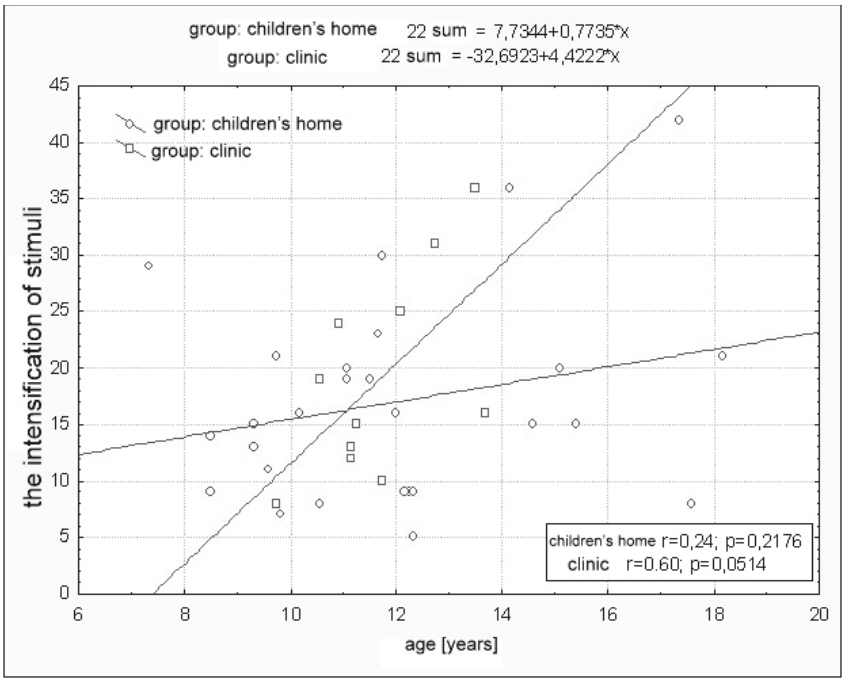

Fig. 2. The number of primitive reflexes in their vestigial form

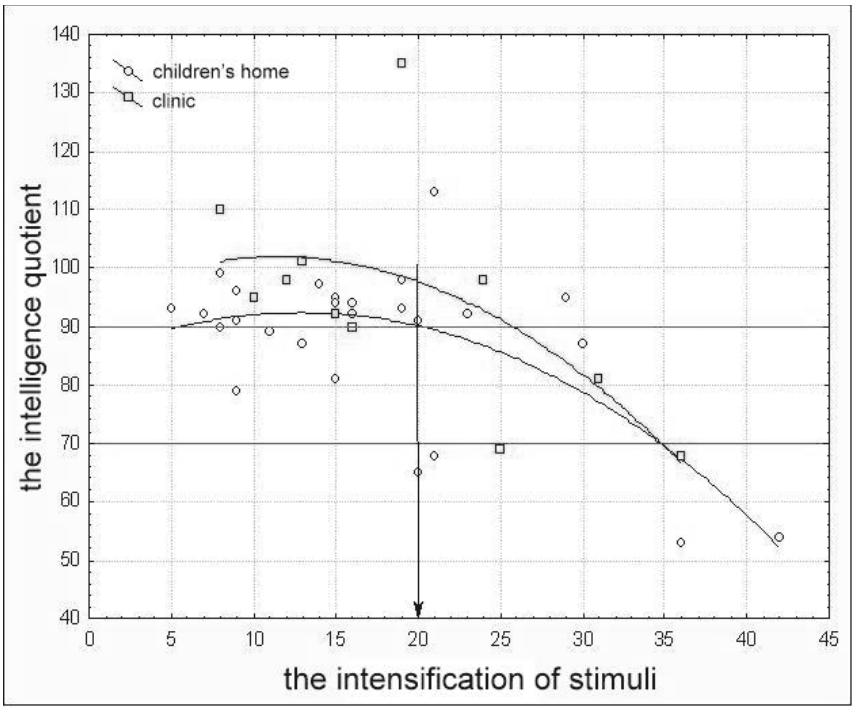

Fig. 3. The intelligence quotient in children

reflexes (Pąchalska, Kaczmarek and Kropotov 2014). And, therefore, with the outcomes referred to earlier in this paper, in the case of children whose intelligence level is lower, the vestigial form of primitive reflexes occurs more with increased intensity in comparison with children whose intelligence level is normal.

CONCLUSIONS

In school-age children with learning difficulties, primitive reflexes occur in their vestigial form. Those reflexes do not decrease simultaneously with the passage of time, and it rather seems that they have become more intensified. In the case of children whose intelligence quotient is at a lower level, the vestigial form of primitive reflexes occurs more frequently and is more intensified. They encourage one, nevertheless, to conduct further investigations.

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