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Study in Connection with the Development of One's Body Schema through the Specific Means of Swimming

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Abstract

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The body schema represents one of the person's fundamental psychic structures. It has an important role in the drawing of one's own image. It is based on the reflection of the parts of one's own body (when it is static or dynamic). It is made up step by step over time with the help of the multiple sensorial mechanics. At the same time, it is based on the association of several visual, tactile, hearing and other information and each person's experience. One of the most useful instruments for evaluation of one's own body scheme is Goodenough-Harris test. We applied initial testing in July 2014 to a Down's syndrome child, aged 13. We asked him to draw a man, a woman and himself respecting all the requests of the test. The second evaluation was in January 2015 (intermediary testing), when the subject had the same drawing to make. Between the two evaluations, our subject attended the swimming lessons. They had as objectives accommodation with the water, learning of the specific aquatic breathing and floating, learning of the arm and kick movements from the freestyle and integral technique too. At the same time, all these skills started being consolidated. These objectives were achieved using the specific means of swimming, which requested simultaneous and successive movements of the different parts of the body. These had straight effects towards the construction of the body schema.

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1. Introduction

The concept of body schema was originally suggested by Schilder (1923), as being the tri-dimensional image everybody has about self, with a significant importance in the individual relation with his/her ego and with the surrounding environment. Verza (1997: 626) defines the body schema as being "the representation every individual has on his/her own body and which serves as spatial benchmark for his/her most simple movements and for his/her image about him/herself. It is a permanent, visual, postural, spatial and infra-conscious model, as well as a spatial benchmark". "The



body schema is the image of the tri-dimensional body image made up of different elements, involving a special relation between the constitutive parts of the body, which gain significance only in relation to the assembly” (Horghidan, 2000: 58), being the reflection of the own body capabilities, corporal attitudes and postures. Through this basic psychic structure, the individual succeeds to maintain a permanent feeling of being him/her, during the entire life.

The development of the body schema represents the basis for constituting the psychic inner.

The body schema is a dynamic phenomenon, which forms and restructures in ontogenesis, transposing into control of the own body, voluntary conscious control, fine discrimination and selective use of each body segment. Processing of the information on own body, as well as the psychic-behavioural instrumentalization, are achieved by stages in ontogenesis as the kinaesthetic-tactile structures are formed against the exterior objects.

Literature provides many theoretical models of staged progressive development of the body schema, as the models developed by Vayer (1972), Lauzon (1990), etc. Thus, Vayer (1972) highlights several important evolution stages of the body schema development: 0-2 years old (maternal period) – passing from the reflex activity to the first global coordination actions (i.e., stepping); 2-5 years old – increased capacity of self-control over one’s own body as a whole; 5-7 years old (transition period) – passing from the global synthetic stage to the stage of differentiation and analysis, characterized by the full expression of laterality, development of the capacity to control the posture, to coordinate breathing with movement, to coordinate the entire body and especially the upper limbs; 7-11/12 years old (final development of the body schema) – acquiring the functional independence of different corporal segments and elements, but also developing the capacity to coordinate corporal segments and elements with the whole body, such progress resulting in an increased autonomy.

Lauzon (1990) considers 3 stages of body schema evolution: 0-3 years old – lived body stage; 3-7 years old – perceived body stage; 7-12 years old – represented body stage.

The development of the body schema has a neurological basis. The complex process of developing the body schema is based on the synthesis of the segmental reflections of the own body and is achieved progressively over time by multisensory mechanisms relying on repeated associations of the information received on sensorial way with the subjective experience of each individual. “All the segments of our body are represented in our brain. The shape of their projections in the cortex or thalamus roughly imitates the body shape, being also given the name of “homunculus” (Constantin-Dulcan, 2008: 44). The image of each segment of the body in the brain cortex, in terms of kinaesthetic sensitivity, should be proportional with the functional value of the relevant body segment.

Integration of the synergic maturity and cognitive-sensorial experience into the characteristics of own body sets up more and more complex structures of cognitive-conative nature, the body schema becoming for the individual one of his/her defining coordinates. The insufficient cognitive development (in sensory-motor terms and also in terms of thought quality), the intellectual and psychomotor immaturity, the quality of the information processes induce, in the case of subjects with mental disabilities, disorders in the evolution of the body schema. Those disorders dramatically reduce the capacity of adaptation of the individual to the natural, social-cultural and technical environment, being expressed at the motor, cognitive, verbal, affective, self-serving levels, as well as at the level of

personality and social relations of the child, because he/she develops somatically and mentally by the interaction between his/her body and the outer environment (the world of the others and the reality of things).

This study is part of a more extended research having as objective the development of an action system using the specific swimming means for the bio-psycho-motor stimulation of the subjects with Down syndrome.

To prepare this study, we have started from the following *assumptions*:

- The motor act underlies the entire somatic-psycho development of the individual; the central axis of the complex process of body schema development (as well as of thought development, as proved by Piaget) is the introversion and coordination of motor actions;
- The more motor skills are gained by the child, the faster the action set of the child is enriched with new skills within both the motor area and the other development areas: cognitive, verbal, affective, self-serving, social ones;
- The specific swimming means are very efficient for the development of the body schema in subjects with Down syndrome, because they involve the entire body, favouring the organization of the motor feedback, the harmonious development of laterality, etc.

1.1. Hypothesis

The intervention at the psycho-motor level by an action system based on specific swimming means has strong impact on the psycho-motor level, favouring the development of the body schema in subjects with Down syndrome.

2. Materials and methods

2.1. Subject

The subject B.T. is a child with Down syndrome, born in August 2001. He is a 6th grade pupil at a school for children with special needs in Bucharest.

2.2. Material and Methods

To conduct this study, we used the Goodenough-Harris test applicable to children of 3-15 years old.

The test investigates the intellectual maturity and ability to form abstract concepts (perception, abstraction, classification and generalization), as well as the characteristics of the psycho-motor function, as the body schema, laterality and achieving the graphical gesture. Therefore, approached as a structural projective test, this test is one of the most recommended instruments to know the corporal image characteristics, mainly in the case of children with intellectual disabilities. The “corporal image” concept represents the core axis of this test.

Usually, the child projects his/her inner image when drawing a person. The child is also asked to draw a person of the opposite gender, because sometimes, based on the differences between the two drawings, the attitude or construct of the tested child goes towards a person of the opposite gender.

This test comprises: *the test to draw a man* – “*Draw a man*” – Instruction: “I want to draw a man. Let it be the best drawing you can do. Do not rush and work very carefully. You must draw the entire body of a man, not only the head and shoulders”; *the test to draw a woman* – “*Draw a woman*” – (similar instruction); *the test to draw his/her own person (the inner)* – “Draw yourself”.

The initial testing was carried out in July 2014. Starting with August 2014, the tested subject participated in the programme for the stimulation of the self-image, which developed under the form of swimming classes. The intermediate testing was carried out in January 2015.

We mention that the stimulation programme will further apply, the subject following to be submitted to the final testing in July 2015.

Application of the testing was carried out under a “single-subject experiment” (Epuran, 1995: 199), by which we wanted to assess the effectiveness of the acting system for the development of the body schema, in the case of a subject with Down syndrome.

2.3. Body Schema Stimulation Programme

During the 6 months elapsed between the initial and intermediate testing, the subject participated in 18 swimming classes. It must be noted that our subject’s participation in swimming classes has depended on a number of variable factors as availability of the parent to bring him to the pool, the working schedule by taking into consideration that, in the first classes, the coach works individually with the persons having Down syndrome (Bálan, 2015: 51), the school schedule, the season diseases, the sports or social activities organized by the Foundation where our subject is a member, other activities in which he participated, unforeseen situations, etc.

During the first 6 classes, the coach worked individually with our subject. Then, he was integrated within a swimming group made up of children and youngsters with the same major health problem (Down syndrome).

The motor objectives aimed during the swimming classes covered: getting comfortable with water, learning special breathing, learning starfish float on chest, learning leg movement for crawl style, learning arm movement for crawl style, improving leg movement for crawl style, improving arm movement for crawl style, learning the crawl style and improving the crawl style.

All these objectives were reached using special swimming means involving simultaneous or alternative movement of different body segments, with direct effects on the body schema. These objectives were scheduled for 18 swimming classes.

To achieve the motor objectives proposed, the methods used were selected based on our experience in teaching children and youngsters with mental retardation to swim.

The means executed on the edge of the pool, as well as some exercises executed on land, preceding the entry into water, were: shower, splash/ self-splash, Dog paddle sitting on the pool edge and Leg kick in crawl with arms extended and supported against the wall.

The exercises performed in movement are expressed as the number of swum pools during the aforementioned period (1 pool = 31m). The pool was swum using special supporting means (kickboard, noodle, swimming fins, swimming float belt). During the lessons of the stimulation programme, we gradually renounced to their use, according to the progress attained by the subject in the learning

process. During the last stimulation programme lesson, our subject succeeded to swim crawl with the legs using only the kickboard and full crawl style, without the support of any specific or unspecific floating means.

There were also other means exercised by us with the subject, which did not aim directly the aforementioned motor objectives, but such exercises were mentioned and quantified as the number of swum pools, because they also stimulated the development of the body schema (backstroke leg kick with noodle, backstroke leg kick with swimming fins + noodle, backstroke leg kick with swimming fins + kickboard).

Under the stimulation programme for the body schema development, most pools were swum with the legs. This is because the first movement learnt in the methodical sequence of any swimming style is the movement of legs. The means enabling to learn the movement of arms are added subsequently. Finally, the full swimming style is swum.

3. Results

To present the subject’s results at the Goodenough-Harris testing, there are two scoring methods: Point Scale: each item is scored with 1 (correct) or 0 (incorrect). The score is then converted into standard and percentile scores; Quality Scale: with 12 points, where 1 is for the poorest energy and 12, for the strongest energy.

We also calculated the “Height of Person”, considered for the person drawing as a standard measure related to the characteristics of the body schema, corporal image (Kotkov & Goodman, 1953), and to the “key-aspects of the personality” (Abraham, 2006: 209). The person’s height (h) is calculated from the head top, including hat, chignon or up-coiffure, to the tiptoes, always placed on a straight line (Abraham, 2006: 211) (Tables 1, 2, 3 and 4).

Table 1. Goodenough-Harris Test Results at the Initial Testing

	Raw Score	Standard Score	Percentile Rank
Point Scale			
Man	12	61	1
Woman	9	52	1
Average		55	
Self	11	60	1
Quality Scale			
Man	2	64	1
Woman	1	55	1
Average		59	

At the initial testing, the results obtained by the subject in all of the tests are within the percentile 1 range, for both the Point Scale and the Quality Scale.

Table 2. Height of Person – Initial Testing

Goodenough-Harris Tests	Height of the person chosen by the subject B.T. (cm)	Height of the person for normal male subjects of 13 years old (Abraham, 2006: 217)	Difference (d)
“Draw a man”	15.2	13.7	1.5
“Draw a woman”	5.9	14.3	-8.4
“Draw yourself”	5.8		
Mean	8.9	14	

With regard to the indicator “Height of Person”, the results obtained by the subject B.T. at the initial testing proved to be compliant with those mentioned in the literature, namely: “drawings of subjects with mental retardation are significantly smaller than those of the normal children” (Abraham, 2006: 222). We also notice that, in the assessed subject (B.T.), the height of the male person is larger than the average in the reference group ($d_{\text{male person i.t.}} = 1.5$ cm). With regard to self-drawing at the initial testing (the tested subject being a male subject, the reference height of the person in “Draw a man” test is 13.7cm), the height of himself as drawn by B.T., namely $h_{\text{self-drawing i.t.}} = 5.8$ cm, is much lower than the average in the reference group: $d_{\text{self-drawing i.t.}} = -7.9$ cm.

Table 3. Goodenough-Harris Test Results at the Intermediate Testing

	Raw Score	Standard Score	Percentile Rank
Point Scale			
Man	19	67	1
Woman	22	69	2
Average		68	
Self	31	84	14
Quality Scale			
Boy	2	64	1
Girl	3	71	3
Average		67	

After carrying out the intermediate testing, we find, from the Standard Score, that the subject has made progress in all three tests. The highest progress is achieved in the case of self-drawing: from Standard Score 60 (percentile 1) at the initial testing to Standard Score 84 (percentile 14) at the intermediate testing.

Table 4. Height of Person – Intermediate Testing

Goodenough-Harris Tests	Height (cm) of the person drawn by B.T. - 13 years old	Height of the person for normal male subjects of 13 years (Abraham, 2006: 217)	Difference (d)
“Draw a man”	19.5	13.7	5.8
“Draw a woman”	18.1	14.3	3.8
“Draw yourself”	13.8		
Mean	17.16	14	3.16

We find that the height of the person drawn by B.T. at the intermediate testing is bigger than the average in the reference group for all three tests: $d_{\text{male person intermediate testing}} = 5.8$ cm; $d_{\text{female person intermediate testing}} = 3.8$ cm; $d_{\text{self-drawing intermediate testing}} = 3.16$ cm.

testing = 3.8 cm and Δ self-drawing intermediate testing = 0.1 cm. With regard to self-drawing test at the intermediate testing, the height of the person drawn by B.T. is h self-drawing intermediate testing = 13.8 cm, while Δ self-drawing final testing = 0.1 cm. On the Quality Scale, the drawing of himself evolves from level M-1 to level M-3.

4. Discussions and conclusions

Our body is the support for our conscience and self-identity, as well as the instrument by which we physically act and express our own psychic contents. For this reason, the body schema represents one of the basic psychic structures for the individual's mental and somatic development. Communication with the environment and the ego, preparation, organization and self-control of some appropriate and effective behaviours, enabling a flexible and efficient adaptation to the environment, have as essential prerequisite the building of a consistent and veracious information model on the own body (which corresponds to the setting up of the body schema). The development of the body schema represents the basis for constituting the psychic inner. The progress achieved by the subject in his drawings highlight the formative valences of the acting system, reason for which we consider that the assumption of our research is validated. At the intermediate testing, the subject showed progress in all of the tests in terms of both quantity and quality. The strongest progress was achieved in drawing his own person: from Standard Score 60 (percentile 1) in the initial testing to Standard Score 84 (percentile 14) in the intermediate testing.

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