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## The Left-Handed Child and Learning Difficulties

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**Abstract.** School education plays an essential role in the formation and development of the child's personality, and due to this fact it is necessary that the educational process be adapted to the requirements of all children, whether they are normal or with special educational requirements, right-handed or left-handed. Due to the predominance of the right cerebral hemisphere these children process information differently. However, the entire school curriculum is designed for children who are left-hemisphere dominant. Thus the right hemisphere is little used, while the left hemisphere is overworked. In the case of left-handed children, this fact generates learning difficulties, due to the fact that most educational activities fail to highlight their abilities, which are different from those of other students. We must draw attention to the fact that a left-handed child is not a child with an intellectual disability, but an inflexible educational system can turn a biological peculiarity such as left-handedness into a handicap. This paper deals with the problems that the left-handed child may have in the educational setting, especially due to the specific learning difficulties that may arise. Approaching the problem through the analysis of learning styles will help us to develop a series of methods and activities that will value them.

**Keywords.** cerebral hemispheres, laterality, mirror writing, mirror movements, dyslexia, dysgraphia

### Introduction

Popescu-Neveanu (1978) defines laterality as a functional predominance of one of the symmetrical segments of the locomotor apparatus and sense organs over others. He states that the phenomenon of laterality is necessary for intrafunctional coordination and implies the predominance of mechanisms from the corresponding cerebral hemisphere. In left-handed children, the activity of the right hemisphere predominates, unlike right-handed children, where the basic function belongs to the left hemisphere.

#### Biological aspects

Modern neurology has highlighted the existence of an asymmetry in the functionality of the two cerebral hemispheres, but not all differences could be highlighted and proven by scientific means. What is certain about this is that speech is predominantly controlled by the left cerebral hemisphere, and intuition, creativity, emotions, feelings are mainly under the control of the right hemisphere. Under certain conditions, however, one of the cerebral hemispheres can take over part of the functions of the other.

Due to the complexity of human actions it is obvious that both cerebral hemispheres are permanently engaged in human activity. The control of motor activity of the body obeys the crossed rule, thus, the right hemisphere controls the left side of the body, and vice versa, the left hemisphere controls the right side of the body. For example, tactile stimuli coming from the left side of the body are transmitted to the right hemisphere. In the case of left-handed children, they tend to have bilateral language control, a common fact in early childhood. Specialists say that when he is forced to use his right hand, this transfer of coordination collides with the inability of the subordinate hemisphere to take over the driving skills of the dominant hemisphere, which can lead to speech motor conduction disorders.

Each of the two hemispheres carries out distinct processing of information, and they have a series of characteristics that differentiate them, as can be seen from the table below, adapted from Betty (2012):

Left hemisphere	Right hemisphere
Verbal mode of processing, using words to name, describe and define	Non-verbal processing mode, using non-verbal cognition to process perceptions
Analytical processing of information, step by step and part by part.	Synthetic processing of information, using parts to form a whole
Symbolism, using symbols to represent objects, actions, etc.	Concrete processing, relating to things as they are in reality, in the present.
Abstract processing, using a partial piece of information or feature to represent the whole	Analogical reasoning, sensing similarities, metaphorical connections
Temporal, constantly looking at timing, performing actions sequentially, in a certain order.	Timeless, without having a perception of time
Rational, reaching conclusions based on arguments, facts, reasoning.	Non-rational, does not need facts and reasoning.
Numerical, processing and equating information best with the help of numbers, constantly making quantifications	Spatial, sensing the relationships between the parts and how they participate in the formation of the whole
Logic	intuition
Linear, convergent thinking	Holistic, global, divergent thinking

*Table 1- Processing characteristics of the cerebral hemispheres*

### **Establishing laterality**

In order to establish the strategy for approaching the educational activity specific to the left-handed child, it is necessary to establish the laterality on hand-eye-foot coordinates beforehand. But the most important for school activities is the establishment of manual dominance. One of the methods that can be used for this determination is the Harris laterality test. In this, to establish hand dominance, the child is asked to imitate certain actions, such as throwing a ball, turning a clock, turning a key, wiping the nose, cutting with scissors or a knife and finally writing. Without indicating or demonstrating how these actions should be performed, the hand used in each situation is noted. There is also a battery of Galifret Granjon laterality tests in which manual dominance is established through a series of movements. For example, the child is asked to cross his arms, with the dominant hand instinctively placed on top.

### **Education of laterality**

It is recommended that the training of manual laterality begins around the age of 4-6 years. Teachers must understand that left-handedness is not a sign of inferiority, but an absolutely normal biological diversity. That is why, during the preschool and school period, the child should not be forced to use another hand than the one with which he acts naturally. The education of manual laterality can be achieved through practical activities such as manual work, drawing or modeling. Especially during the preschool period, these activities have the role of preparing the child's hand for writing by developing the small muscles of the fingers.

In most cases, the plasticity of the cerebral hemispheres tends to disappear after the age of 6, and therefore the education of laterality in the first years is of particular importance. Many children up to 6 years of age develop ambidexterity, the ability to use both hands with equal dexterity. Zazzo (1979) considers that ambidexterity is a pedagogical solution to be avoided, because from a psychomotor point of view it is a wrong phenomenon, requiring a certain functional specialization of a cerebral hemisphere. In other words, it is better for a child to be left-handed than ambidextrous. Moreover, the lack of development of laterality after this age is one of the signs indicating the possibility of learning difficulties. A rigid attitude of teachers regarding left-handed people does nothing but lead to the emergence of the phenomenon of opposing laterality, with important consequences in the child's life, such as stuttering and other language disorders, dysgraphia, enuresis, synkinesis, psychomotor instability, negativism, or anxiety.

### **The left-handed child in school**

Some left-handed children have difficulties in school. They require individual attention, non-traditional schemes and specific teaching methods and adaptation of the lesson structure. The particularities of left-handed development have a significant impact on the educational process in school. The differences lie in the specific functioning of the brain in these children. From a psychological point of view, some authors note some peculiarities that left-handed children present. They are more stubborn, more emotional, spontaneous, gullible, capricious. They are more sensitive in receiving music, they draw and model better from the age of three. They are very communicative and make friends easily.

### **Cognitive and intellectual peculiarities**

The right hemisphere exceeds the left hemisphere in the considerable number of transverse convolutions (two-three to one). The left hemisphere, on the other hand, has more gray matter. This asymmetry is also found in the functional plan. The left cerebral hemisphere processes verbal information and as a sequential modality, the right cerebral hemisphere processes (processes) non-verbal information and is creative and as a holistic modality. Synthesis is done in the left hemisphere, it is the area of speech, while concrete information is processed in the right hemisphere. During information processing, the left hemisphere analyzes objects inductively, while the right hemisphere follows the deductive principle. The left hemisphere processes data as it arrives, and the right hemisphere processes it as a whole.

In order to identify the cognitive and intellectual peculiarities of left-handed children, it is necessary to analyze the functioning peculiarities of their dominant hemisphere, the right hemisphere. It specializes in interpreting non-verbal messages, voice tone and intonations. It is appreciated that rhythm, music, but also images, colors are analyzed in the right cerebral hemisphere. Its mode of operation is based on associations, with imagination and intuition as

dominant functions. The right hemisphere is characterized by spatial thinking and the ability to see abstractly.

Left-handed students prefer analogies, schemes, having synthetic thinking and special visual and spatial memory. They are able to easily synthesize the relationships between objects, make associations of ideas, reconstruct a series of information without apparent connections between them. The context of receiving this information is also more important for left-handed students.

### **Specific school problems**

A first problem that left-handed students encounter is the placement of windows in classrooms. They are located to the left of the pupils so that the light falls directly on the paper. In the case of left-handed students, this orientation determines the formation of a shadow of the left hand on the surface of the notebook. To see better what he writes, the left-handed child tends to arch his wrist, this position often leads to an inclination of the spine and the appearance of deformities such as scoliosis. At the same time, this position causes the small muscles of the hand to tire more quickly. When writing, a right-handed student drags the pen onto the paper, while a left-handed student pushes it, the effort being greater. This fact makes some left-handed children have worse writing in the beginning, and in addition the left-handed student may develop an attitude of rejection towards this activity which proves tiring for him. In the case of practical activities, left-handed students may encounter difficulties due to equipment designed for right-handed people: scissors, microscope, mouse, musical instruments.

### **Difficulties in reading and writing**

Often, in the case of all children, in the initial phase of learning to write, so-called "mirror" writing is recorded, as well as some "mirror" movements. There are various theories that try to explain the causes that determine the phenomenon of "mirror" movements. Some authors consider as the cause of these manifestations some disturbances in spatial perception, in right-left orientation or defects in visual-motor coordination. What is obvious, however, is the fact that this phenomenon is more frequent in the case of left-handed people. At the same time, dyslexia, delays in language development, difficulties in perceiving the meaning of words, loss of lines, confusion of letters when writing and reading, mirror writing of graphemes are more common in left-handed people. Disturbance of communication through the oral language, but especially the written one, is one of the frequent problems that lead to school and intellectual failure, as the learning and understanding processes cannot be conceived outside of the read and written word.

Writing "in the mirror" is a type of dysgraphia that manifests itself spontaneously in most preschool children, being a natural stage in the assimilation of writing. However, the frequency of this phenomenon decreases after the age of 10. Mirror writing and other types of "mirror" movements are determined by the functional insufficiency of the corpus callosum, which at the age of 10 reaches the level of maturity. The corpus callosum is responsible for connecting the two cerebral hemispheres and transmitting sensory and motor information from one hemisphere to the other. In the case of left-handed students, this mirror writing manifests itself in a much higher proportion, causing serious difficulties in language assimilation. This fact is due to the mechanism specific to writing-reading activities, which are exclusively left-hemisphere tasks, and for the learning of which it is necessary to create a left-hemisphere-right-hand, right-eye, right-ear dominance scheme.

Taking into account the peculiarities of information processing by left-handed children, it is possible to identify the methods of education and training through which the difficulties that may arise can be correctly managed.

### **Preventing writing letters on the mirror**

In the initial training activities aimed at assimilating writing by students, special attention must be paid to training the left-handed child in spatial orientation, left-right, up-down, explaining the notions of length and width. Due to the fact that "mirror" writing is more common in left-handed children, a series of exercises can be performed with them to prevent or correct this writing.

One such exercise is the one where you start by analyzing each letter separately, explaining to the left-handed student where to start writing it, what are the component parts. Before it is written the letter can be built from sticks or even modeled. Comparison with similar figures or objects is also useful. You can also use boards in which the starting point in writing the letter is marked in red, and the meaning of the writing is indicated with arrows. To ensure the correct assimilation of the writing of the letters each of these must be highlighted from a string of letters that are visually similar and pairs of letters that are written in the mirror, such as d-b, p-d, p-b.

The left-handed student requires not only individual attention but also constant stimulation. He must not feel that he is different in order to avoid perceiving the use of his left hand as a disadvantage or handicap but as a natural thing. The left-handed pupil should be seated in the bench so that the light falls on him from the right side, and he should be taught the correct position of the hand while writing. The elbow of the left hand should be outside the table so that it can move smoothly over the entire surface of the sheet. The right one should be placed on the bench, holding the sheet from the bottom. The little finger of the left hand is its fulcrum, the left hand having the palm facing the sheet. Also, the hand should not be tilted inwards very much, and the pen should not be straight, but slightly tilted towards the shoulder.

### **Learning styles**

Language development is largely dependent on the level of auditory perception. Hearing speech is achieved with the right ear, being a function of the left hemisphere, while rhythms are perceived with the left ear, as a function of the right hemisphere. The two hemispheres are specialized for certain types of activities, the dominance of each determining different learning styles. Students with a predominantly auditory learning style are left-hemisphere dominant, while students with a predominantly visual learning style use the right hemisphere. This is also the case for left-handed students, who have a global cognitive style. They are creative and intuitive, easily guessing words only by their beginning. They are able to read only with the help of their eyes, without changing their head position. They can also perform mental sorting and filtering with ease.

The right cerebral hemisphere processes information in a sensory way, the perception of the external environment not being mediated by language. The inclination towards a kinesthetic learning style is given by the fact that the right hemisphere perceives visual, auditory, gustatory, olfactory, tactile, movement sensations, music or sounds from nature. The left-handed student is able to process information simultaneously, globally, but has difficulty memorizing information presented sequentially, step by step, without first seeing the big picture.

### **Case Study**

A. is a left-handed child, in a family where both parents are right-handed. He went through kindergarten without any particular problems due to the use of his left hand. His grandmother, a former teacher, constantly tried to move the pencil from his left hand to his right, but without success. The child, obedient, passed the pencil to the other hand but after a few seconds, involuntarily, moved it back to the left hand.

However, after discussions with the teacher, A.'s mother understood that it would be a mistake to force him to use his right hand instead of his left, because he would be more left-handed using the hand that he is not familiar with. Also, the teacher explained to him that in order to help him learn to write, a different technique than the one for right-handed children must be used. In this the child is held by the hand, with the parent or teacher behind, guiding his hand while writing. This is not possible for an adult who is right-handed. Instead, the child can be shown the correct writing in the mirror. For this, the adult must position himself on the other side of the bench or desk and write so that the left-handed child looks in the mirror, it being much easier for him to imitate the adult's movements. In this way, A. was also shown the correct position of the body in the bench. Later, A. also learned how to hold the pen correctly. He tended to squeeze it between his fingers, writing sloppily and tiring very quickly, sometimes becoming frustrated by this fact. In the case of a left-handed child, the sheet should be tilted so that the right corner of the sheet is closer to the body than the left. In order to avoid A. getting dirty on his sleeves, because he is left-handed, his left hand constantly goes over the written line, the teacher drew a demarcation line on his pen, about three centimeters from the nib, and the student had to grab the pen and hold it above this dividing line. Initially the letters written in this way by Alexander were larger, but as she gained experience they became uniform and got a suitable size. Especially for left-handed people there are also pens with a constant flow of ink, so that it dries almost instantly.

### **Conclusions**

In order to achieve a coherent and effective educational process for all children, including left-handed ones, it is necessary to eliminate the prejudices that make being left-handed a wrong thing that needs to be corrected. Left-handed students should be treated like others and encouraged to use their dominant hand, using different methods and exercises designed to properly educate laterality. The learning difficulties that occur in left-handed children can be effectively managed, and if they achieve below average school results this fact is due to the teachers ignoring their left-handedness. Dyslexia and dysgraphia that occur in left-handed students can be easily corrected if they are given the necessary attention.

At the same time, their native abilities must be highlighted, their creativity used to the maximum and the creation of a positive attitude towards the aspects that make them different from other children. In Romanian education, there are no special training programs for teachers in which they are taught how to assist left-handed students in the process of assimilating writing or how to manage the problems they may encounter. However, these problems must be addressed and solved, all the more so since there are solutions and methods that can make educational efforts easier for left-handed students and can ensure them equal chances to achieve school performance.

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