

# Educational peculiarities and difficulties of children with left-sided laterality: The technological solution of the problem

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## Abstract

Nowadays there is a significant increase of the incidence of left-handedness and sinistrality among schoolchildren. They demonstrate a large number of left-sided motor and sensory preferences which are considered as external markers of functional hemispheric asymmetry of the brain. The purposes of this study are to investigate gender peculiarities and specificity of age-related dynamics of laterality pattern's formation in junior schoolchildren and to find out educational peculiarities and difficulties of left-handed children. The findings show that left-handers differ greatly in their mental development by having some peculiarities of intelligence, world's perception and prevailing thinking strategies, ways of memorization, specificity of emotional-affective expression. The main problems of left-handed children in school performance are academic failure, lack of perseverance, anxiety neurosis, and extreme emotional lability. Integrated development of the left hemisphere and the right hemisphere thinking of left-handed schoolchildren is a favorable condition for harmonious personal and intellectual development and effective mastering of various modules of the school curriculum. The technological solution of the problem of teaching the children with left-sided laterality is to include in educational programs some special exercises to develop imagination, emotional sensitivity, integrity of perception, global view to the problems, creativeness, and original approaches to tasks' solving. So a complex program for the intensive development of the right hemisphere of children who demonstrate left-sided laterality to overcome the possible failure at primary school is proposed in this paper.

*Keywords:* Functional asymmetry of the brain, laterality profile, left-handedness, sinistrality, neuropsychology of childhood;

## 1. INTRODUCTION

Functional asymmetry of any biological object, including animals and humans, can be regarded as the basis of its existence. The principle of symmetry-asymmetry is one of the fundamental properties of nature. Everything is symmetrical in nature; asymmetry can be considered as the way of adaptation to changing environmental conditions. The functional asymmetry of the brain is a concrete manifestation of the unity of "symmetry-asymmetry" in nature.

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Functional asymmetry of the brain is one of the most important peculiarities of personality and operates as one of the factors that determine the psycho-physiological adjustment mechanisms of a person, features of development of cognitive, regulatory and volitional spheres (Доброхотова & Брагина, 1981; Семенович, 2002; Семенович, 2008; Awolola, 2011). The problem of functional asymmetry of the brain (FAB) is currently being investigated within differential neuropsychology (Хомская, Ефимова & Будыка, 1997; Чуприков & Волков, 2004) and neuropsychology of childhood (Семенович, 2008; Цветкова, 2006). Nature and dynamics of forming the functional organization of the brain are related to the causal level that defines the specificity of a personality's psychological development along with neurobiological features of development and social situation of development (Семаго, 2006; Цветкова, 2006).

The human brain has two distinct cerebral hemispheres. The sides resemble each other and each hemisphere's structure is generally mirrored by the other side. Yet despite the strong anatomical similarities, the functions of each cortical hemisphere are managed differently. The human brain works as paired organ when controlling any mental function. It defines the functional hemisphere specialization. Both hemispheres are involved in the process of implementation of any mental function, but either right or left hemisphere can be the leading one. This indicates the existence of specific bilateral principle of implementing such important brain functions as perception, attention, memory, thinking, speech (Москвин, 2002). So every person in human population has the dominant cerebral hemisphere regulating the interaction with the environment. But brain hemispheres function as a unit as they are connected by cerebral commissures. More than 90% of motor and sensory functions are controlled by the opposite hemisphere of the brain. The left hemisphere controls the right hand, foot, ear and eye. The right hemisphere controls the left hand, foot, ear and eye.

The fundamental problem when discussing left-handedness is to determine the cause. No one knows exactly why almost 90% of human population is right-dominant and only 10-12% of people demonstrate left-sided laterality but a number of theories have been proposed. So there is no single cause of left-handedness but there are genetic and pre- and postnatal conditions that can result left-handedness.

Approximately 25% of all left-handers are natural or genetic lefties. Inheritance plays a leading role here. If both parents are right-handed, the probability of having a left-handed baby is about 2%. If one of the parents is left-handed, the probability increases to 17%. If both parents are lefties, so they would have a child with left-sided laterality in almost 46% of cases (Семенович, 2002).

In the right shift theory handedness is explained by the presence or absence of a specific gene (Annett, 1985). They consider that there is the right shift's gene. But in 2007 researchers discovered a gene LRRTM1. This is the first gene that potentially increases the likelihood of a person having left-handedness. Unfortunately, even presence of this gene does not automatically guarantee a left-handed baby.

The Geschwind theory states that the presence of high levels of testosterone before birth can lead to a left-handed child (Geschwind & Galaburda, 1987). There is the strong evidence that prenatal testosterone contributes to brain organization. High level of prenatal testosterone results in a higher incidence of left-handedness. Testosterone suppresses the growth of the left cerebral hemisphere and so more neurons migrate to the right hemisphere. The highly developed right hemisphere is better suited now to function as the center of language and handedness. The fetus is more likely to become left-handed since the right hemisphere controls the left half of the body. Perhaps this explains why there are more left-handed males than females.

The pathological or compensatory left-handedness can be due to the brain damage during the birth process or the brain dysfunction that can occur in prenatal or natal period. Difficult or stressful birth, accelerated or delayed delivery, birth trauma happen far more commonly among babies who grow up to

be left-handed or ambidextrous. Also it may be the result of prematurity, dystocia, a new-born baby's asphyxia, severe disease and traumas in infancy (Annett, 2002; Хомская, Ефимова & Будыка, 1997).

The most common causes of forced or learned left-handedness are considered as a long-term injury of the right hand, congenital abnormality or the loss of the right upper limb. If the dominant right hand is damaged at the age when a child only starts learning various manipulations by hands, he or she tries to protect the limb and learn to use actively the left one. Sometimes left-handedness can be the result of social learning. Children can imitate their relatives' hand preferences or choose consciously left-sided laterality to look like them.

Functional asymmetry of the brain can change from the birth until the age of 18. In the early stages of ontogeny most children demonstrate right-hemisphere type of world's perception as the right hemisphere is maturing faster than the left one. In early postnatal period any individual has already prerequisites for functional asymmetry of the brain, but no type of functional asymmetry has formed yet. The basis of functional hemisphere specialization is inborn but development, improvement and complication of the interhemispheric asymmetry's and interhemispheric interaction's mechanisms take place during child's growing up.

According to statistics, there are less lefties among adults than among children. The percentage of left-handers decreases greatly as they grow older. Even among children there is no constant number of left-handers. There is a tendency: the younger the children - the higher the percentage of left-handers among them. From the birth till the age of 3 the number of right-handers increases from 50% to 80% and by the age of 10 this number is up to 88% - 90%. Small children show the left-sided laterality more often but it does not mean true ambidexterity or sinistrality and it does not reflect the peculiarity interhemispheric interactions' formation (Семенович, 2002; Семаго, 2006; Цветкова, 2006). Significant changes in interspheric interaction are observed in the first stage of schooling when the lateralization of brain functions occurs.

Functional asymmetry of the brain has also a bio-social dependence. The right shift theory of handedness postulates that left cerebral hemisphere dominance can be regarded as the biological function of growing up, on the one hand, and as the result of cultural traditions, social influences and learning techniques, on the other hand (Annett, 2002; Barsley, 1970; Доброхотова & Брагина, 1981).

Nowadays there is a significant increase of the incidence of ambidexterity and sinistrality among children, who demonstrate a large number of left-sided motor and sensory preferences which are considered as external markers of functional hemispheric asymmetry of the brain. The analysis of mental differences of schoolchildren from the standpoint of a complex neuro-bio-social nature of personality development and ontogenetic peculiarities of the laterality pattern can be regarded as the real condition of rendering effective assistance to left-handed schoolchildren, predicting their success or failure in school performance. The category of left-handed schoolchildren is heterogeneous and little-studied. When compared with right-handers left-handed children differ greatly in mental development by having some peculiarities of intelligence, world's perception and prevailing thinking strategies, ways of memorization, specificity of emotional-affective expression.

Sinistrality – is a complex stable psychophysiological characteristic, specific type of functional organization of the brain. Sinistrality, as well as dextrality, can be absolute and partial. There is only 42% of the European population that is absolute dextral. They demonstrate all right-sided motor and sensory preferences. Absolute lefties demonstrate all left-sided preferences. They are only 8-10% of the population. The majority of people (48% - 50%) is partial sinistral or dextral.

Left-handedness reflects the preference of active using of the left hand. Moreover there can be left-footedness, left-ear and left-eye preferences. All this left-lateral preferences reflect the cerebral basis of the sensory and motor functions more directly. As for left-handedness it is much easier for other people to notice a person who uses the left hand while writing, eating, sewing and drawing than to learn his or her eye or foot preferences.

There are four main types of handedness (Чуприков & Волков, 2004). Right-handedness is most common. Right-handed people are more dexterous with their right hand when performing a task. A variety of studies suggest that 70-90% of the world population is right-handed.

Left-handedness is less common than right-handedness. Left-handed people are more dexterous with their left hand when performing a task. A variety of studies suggest that 8–12% of the world population is left-handed.

Mixed-handedness, also known as cross-dominance, provides doing different tasks better with different hands. For example, mixed-handed persons might write better with their left hand but throw a ball more efficiently with their right hand.

Ambidexterity is very rare, although it can be found. A true ambidextrous person is able to do any task equally well with both hands. Although a small number of people can write competently with both hands and use both sides of their body well. Even these people usually show preference for one side of their body over the other.

Left-handedness and sinistrality as a variant of normal personality development are determined by the dominance of the right hemisphere of the brain. The right cerebral hemisphere is characterized by synthetic character of mental processes, dominance of intuition, simultaneous processing of large amount of information in the form of images. This hemisphere of the brain determines the spatial-imaginative, intuitive, three-dimensional way of thinking that creates a lively and integral image of the world, reflecting its diversity and complexity (Barsley, 1970; Семенович, 2008).

In modern society there was a positive shift towards the recognition of left-handed children's special educational needs and opportunities. Moreover nowadays they refuse to retrain left-handers. However every day left-handed schoolchildren, living in a world dominated by right-handed people, face many challenges and frustration – the so called “dextral-stress”. During the period of adaptation to the school system left-handers are in a situation of a double stress. As a result of constant failures experienced by the children, they are not confident in their abilities, anxious, depressed and dissatisfied.

Moreover children are developed at different rates, and some children show no strong preference for one hand over the other one to write with by the age of 5. In left-handers it is common for this preference to be delayed up to the age of 7. According to the modern educational programs children start to learn writing skills at 5, if not younger, and all children are urged to choose a hand for writing at this age. A child without a strong hand preference can therefore be at an even greater disadvantage than a strongly left-hand biased child. That is because sometimes children may begin writing with one hand then want to switch to the other as their hand-eye co-ordination and fine motor skills develop. As a result the main problems of left-handed children at the primary school age are academic failure, lack of perseverance, anxiety neurosis and extreme emotional lability (Семаро, 2006; Хомская, Ефимова & Будыка, 1997; Чуприков & Волков, 2004).

The problem statement shows that understanding and investigating of left-handers' difficulties while studying at school is topical and relevant nowadays. One must pay special attention to the lateral profile (LP) in the complex psychological diagnosis, which is considered to be one of the factors that determine possible difficulties of left-handers while mastering various modules of the school curriculum. Integrated

development of the left hemisphere and the right hemisphere thinking of schoolchildren is a favorable condition for harmonious personal and intellectual development and effective schooling of left-handed children. Thus the age-related dynamics and the peculiarities of laterality profile among primary schoolchildren were investigated in the research.

Moreover according to the new Russian Federal Educational Standard (FES) of primary education effective educational technologies should be developed and implemented into schooling practice. New educational programs are to include traditional components aimed at left hemisphere's development and some educational competences, such as paying attention to individual abilities of a child, organizing children's self-development and self-actualization, forming learning skills and interpersonal skills. Therefore the main aim of the study was to develop a complex program for the intensive development of the right hemisphere to overcome the possible failure of primary school children who demonstrate left-sided laterality.

## 2. METHOD OF INVESTIGATION

Currently there are several classifications of functional asymmetry of the brain in neuropsychology. In Russia the most popular complex classification is based on the analysis of interhemispheric interaction according to three sensory receptor systems ("hand-ear-eye") (Ефимова & Будыка, 1997). Theoretically there can be identified 27 variant of lateral profiles according to three types of functional asymmetry: manual, visual, audile. But for practical purposes these lateral profiles can be integrated into 5 main groups (where R means right-sided preferences of any paired organ, A – active usage of both hands, ears or eyes, L – left-sided preferences of any paired organ):

- dextrals who demonstrate right-sided dominance in all sensory receptor systems (right hand – right ear – right eye (RRR));
- right-handers who have right-hand dominance combined with different variants of ear and eye dominance (RRL, RAR, RAA, RAL, RLA, RRL, RLR, RLL);
- ambidexters who use both hands as active and can have different variants of ear and eye dominance (AAA, ARR, ARA, AAR, ARL, ALR, AAL, ALA, ALL);
- left-handers who have right-hand dominance combined with different variants of ear and eye dominance (LRR, LRL, LLR, LRA, LAR, LLA, LAL, LAA);
- sinistrals who demonstrate left-sided dominance in all sensory receptor systems (left hand – left ear – left eye (LLL)).
- Moreover the group of left-handers and the group of right-handers are not homogeneous. Various degrees can be pointed out among them:
  - marked left-handers who fulfill all actions with left hand;
  - non-marked left-handers who prefer left hand in everyday's activity but fulfill some actions with right hand;
  - ambidexters who can fulfill any actions with both hands without preference;
  - non-marked right-handers who prefer right hand in everyday's activity but fulfill some actions with left hand;
  - marked right-handers who fulfill all actions with right hand.

These classifications were the basis for the complex of techniques used in the study to investigate the laterality pattern among primary school children. The diagnostics of laterality profile identifies the type of interhemispheric asymmetry of the brain and determines the degree of left-handedness. The choice of tests was determined by the age peculiarities of schoolchildren. Some genetic and social aspects of interhemispheric asymmetry of the brain were taken into account. The procedure can be carried out frontal; it is technically uncomplicated and doesn't take much time. All tests in the complex of techniques can be done individually and in any sequence.

The complex of techniques includes practical test to find out motor (the leading hand, foot), sensory (the leading eye, ear) and cognitive (dominant hemisphere) asymmetries. But the fundamental part of this complex diagnostics is tests to determine handedness. Handedness is the most studied manifestation of interhemispheric asymmetry. As a multifactorial concept it requires to use practical tests which reflect the activity of various muscle groups as well as simultaneous activity of both limbs. As for manual tests such as which hand children use to take a spoon, to draw something and to clean their teeth, they characterize socially acceptable and socially approved skills. Basically these skills are the result of social and cultural experience learning and do not reflect genetic specificity of spatial and functional organization of the brain. That is why some additional practical tests such as ringing a bell, distributing cards, wounding thread on a spool, pouring water from one vessel to another, which are under no conscious control, are included in the complex of techniques suggested in the research.

The main criteria of investigating dominant and non-dominant paired organs are:

- leading hand is more dexterous, more capable to perform fine coordinated and complex motor acts;
- duration of motor program formation of the leading hand (foot) are shorter;
- leading hand (foot) is stronger and is able to carry out more precise and perfect actions;
- leading eye is the first to fix on the point and controls the other eye's set; visual accommodation is quicker and eye muscles are more developed in the leading eye.

The system of practical tests to measure the laterality profile includes observation of the children doing various tasks:

- "maps of lateral signs" (Annett, 2002) that take into account both the data of Annett questionnaire and such tests as interlocking fingers, crossing hands on chest, crossing shins and feet, type of applauding, "knee on knee" test, leading ear when "talking on the phone", leading eye in the "card with a hole" test.
- the system of tests (by M. Osiense) (Cemaro, 2006) which include practical tasks, such as pricking beads onto a string, threading a needle, pouring water from one vessel to another, striking a match, etc. The activities proposed in practical tasks are neither everyday nor familiar to children. They require precision, good coordination of movements, agility, which provides a reliable picture of hand dominance.
- tests to determine the degree of left-handedness (marked left-handedness, non-marked left-handedness, ambidexterity) (by O.B. Inshakova) (Семенович, 2002). The tests include two groups of tasks: "main" tasks, i.e. the activities that are almost always under adult's supervision (for example, a hand to hold a spoon, a pen, a pair of scissors); and "additional" tasks, i.e. the activities which are seldom paid specifically attention to (a hand to lift a toy from the floor, to shake the crumbs from the table, to wave goodbye).

A total of 157 schoolchildren of both sexes at the age of 7 - 10 from the first - fourth forms were involved in this research. A qualitative analysis of the most common school problems was carried out by using interview and standardized observation. The statistical processing of results was performed with multifunctional Fisher's test.

### 3. RESULTS AND DISCUSSION

The findings show that there is a statistically reliable ( $f^* = 2,041$ ,  $p < 0,05$ ) reduction of the number of schoolchildren with left-sided dominance up to the age of 10. 27 children at the age of 7-8 (total number is 75 respondents) demonstrated left-sided preference doing various tasks which are 37% of the total number of children. 48 respondents (63% of subjects) demonstrated right-sided preference when performing practical tests. It was revealed that 13 children aged 9-10 (total number is 82 respondents) belong to the category of schoolchildren who demonstrate left-sided laterality so the percentage of lefties at this age group is only 17% of the subjects. 69 children belong to the category of schoolchildren with right-sided laterality which is 83% of the total number of children.

A significant number of lefties and left-handers aged 7-8 indicates the imperfection of cross-functional interactions of the brain's hemispheres at this age stage in accordance with normative formation of progressive lateralization. Whereas a steady decline of the number of left-handed children up to 9-10 years reflects the peculiarities of the formation of spatial and functional organization of the brain systems that show the formation of laterality pattern.

The gender analysis of the laterality profile among schoolchildren showed that at the age of 7-8 67% of boys, that are 18 respondents, and 33 % of girls, that are 9 respondents, belong to the category of lefties (total number is 27 children). At the age of 9-10 left-handed boys also prevail in this category (9 respondents, 72% of total number). So this category includes only 4 girls which are 28% of subjects. Thus, the boys who demonstrate left-sided motor and sensory preferences are predominantly more numerous than the girls in both age groups. This confirms the average statistical data that there are more left-handed males than females.

When finding out the degree of left-handedness of schoolchildren it was revealed that at the age of 7-8:

- 8 children (6 boys and 2 girls) have marked left-handedness which is 44% of subjects.
- 4 children (3 boys and 1 girl) show non-marked left-handedness which is 23% of left-handers.
- 6 children (3 boys and 3 girls) belong to the category of ambidexterity which is 33% of children.
- Among 9-10 aged left-handers it was revealed that:
  - 4 children are in the category of children with marked left-handedness, 4 children - in the category of ambidexterity which is 60% of lefthanders. It is significant that the group of marked left-handers include only male subjects but the group of ambidexters comprises of 2 boys and 2 girls.
- the category of non-marked left-handedness is represented by 40% of subjects (3 boys and 2 girls). This is the most numerous group.

On the whole, the specificity of the dynamics of left-handedness's manifestation in different age groups was identified. The specificity is revealed in the reduction of the number of ambidexters and children with marked left-handedness and in the increase of the number of schoolchildren with non-marked left-handedness to the age of 10. This is due to the normative formation of progressive

lateralization as a reflection of the gradual fixation of the hierarchy of intra- and interhemispheric interactions of the brain.

The qualitative analysis of lefties' educational peculiarities showed that the left-handers may have some problems with understanding and analyzing different situations, may have insufficient vocabulary, may be worse at mastering the skills of reading and writing, but they often have better mathematical abilities than right-handers. When mastering some learning activities at junior school age, the left-handers usually have a number of difficulties concerning insufficient formation of visual-spatial representations, disorders or underdevelopment of fine motor skills and of finger movements' coordination.

The dominance of the right hemisphere determines the sensibility to creativity as well as concrete-imaginative character of cognitive processes. To remember new and unknown information "right-hemispheric" children rely on their visual and tactile sensations and they need the support of a figure, a natural object or any other adjuvant. Left-handers are sensitive to tiny changes in color or shape of any object; they individualize the world and the society.

Left-handed children are typically more vulnerable, emotional, lively and anxious; they get accustomed to a changing situation less successfully. Sometimes they can be too much open to other people, naïve, unreasoned in expression of their feelings and suggestible. Right hemisphere dominant children are inclined to meditateness and reminiscence, they feel and perceive all events in their life subtly and deeply. Often they behave under the influence of momentary mood; they are easily upset; anyone can easily make them cry or angry.

Many of them are slow in drawing, writing and other manual activities, but, conversely, hyperactive in free activity. So slowness in carrying out fine coordinated movements can be combined with general motor disinhibition. The left-handers are also characterized by inconsistency of their psycho-emotional sphere: communication need – shyness, dominance need – conformity, recognition and esteem needs – low self-control of behavior.

They can learn social norms and rules quickly and firmly. It defines their responsibility, commitment and sociability but it is often combined with the lack of self-confidence. It's difficult for left-handed children to work in large groups with strictly regulated conditions and subordination. They prefer individual work where they can demonstrate their own initiative and intuition, creativeness and rich imagination or fantasy.

The main problems and difficulties of left-handed children at primary school are:

- academic failure in learning to read and write, in visual-motor coordination, in visual memory, in space, time and plane orientation;
- lack of perseverance, unreasonable anxiety, problems with attention focusing and substance memorization;
- extreme emotional lability, fluctuations of mood;
- lack of self-confidence, the persistent feeling of loneliness, touchiness;
- fear of silence or, on the contrary, painful reaction to any noise;
- irritability, impatience, hastiness, low self-control.

The recognition of the special educational needs of left-handed children and the refusal to retrain left-handers do not solve the problem of successful adaptation of such children to the school system which mainly focuses on the development of the left hemisphere and logical thinking in mental activity



of junior schoolchildren. If they teach left-handed children with the help of technologies for right-handers without elements of adaptation, it may lead to the disorder of interhemispheric interaction and the inhibition of right hemispheric functions. It causes detraction, inhibition of intellectual activity, development of instability of intellectual activity, which ultimately results in significant difficulties in school performance.

In modern educational technologies they train and develop only left hemisphere of the brain and logical thinking overvaluing their role in the capacity of intellectual activity of children and ignoring thereby half of the brain power. But at the first stage of school education the main type of thought is representational which involves the right hemisphere in the process of learning. To intensify the effectiveness of educational technologies it is necessary to put into practice such special features of the right hemisphere of the brain as imagery, generality, integrity, emotionality of perception and involuntariness as often as possible.

Thus, there is the importance to integrate the lateral profile in the complex psychological assessment of schoolchildren and in the complex psychological diagnosis to predict their possible success or failure in school activities. Nowadays there is a lack of adjustment and remedial school activities to stimulate the intensive development of the children' right hemisphere.

The suggested complex program of intensive development of the right hemisphere includes 2 main units:

- 1) psychological intervention of "school failure", overcoming possible difficulties in school performance;
- 2) development of children's creativity and positive emotionality.

The first unit has exercises to develop fine motor skills and exercises to develop visual-motor coordination and visual memory. The development of fine motor skills and of finger movements' coordination is one of the important aspects of the development of left-handed children and a condition of their success in learning writing. The basic methods and techniques include: kneading modeling clay with fingers; rolling pebbles, beads, small balls with each finger of the left and right hands; finger exercises and finger theatre; tying knots on a rope or a cord; screwing up; drawing in the air and on the sand; playing with sand and water; drawing with different tools (pencil, pen, chalk, paints, cotton swab, coal etc.); braiding of paper, wire, small beads; making figures of small sticks and matches. Tasks to copy shapes and graphic elements, to draw the missing elements in them, to perform graphic dictations are suggested for the development of visual-motor coordination and visual memory of left-handed schoolchildren.

The second unit includes exercises to develop imagery and creativity; exercises to overcome anxiety, touchiness and shyness, to develop leadership qualities. To develop imagination, emotional sensitivity, integrity of perception, global view to the problems, creativeness, and original approaches to tasks' solving a variety of art-technologies, which use active forms of work aimed at the integrated harmonious development of cognitive, personality, affective and communicative spheres, is considered in the program suggested. They provide children with emotional comfort, openness to any experience of interpersonal interaction, ease of expressing feelings, freedom to choose and accept themselves and others, awareness of their motives, destruction of conventional role stereotypes.

The main art-technologies include: dough modeling; drawing therapy and art-design; making foil dolls; fairy-tale therapy; dance therapy; body-oriented therapy; role-playing therapy; trainings; psychodrama. Dough modeling involves making figurines of humans, animals and various objects (vases,

boxes), pictures out of salty dough. All these can later be painted with gouache. It is also possible to combine dough with other materials: peas, beans, twigs, small sticks, beads etc.

Art-design uses color-psychology, inkblot psychology. Some special artistic techniques can be applied for remedial and developing aims. For example, children are invited to finish a picture having only two or three lines or figures, making it meaningful. Stencil drawing involves filling in contours of animals, humans, machinery models with letters, numbers, geometric figures or their elements, and making a human being, for example, with the help of fruits, or a car - of flowers. The technique of making a foil doll allows children to develop creative expression and to represent self-image. It enables a visual projection: understanding of feelings, experience of different emotions through symbolic representation.

Fairytales therapy, role-playing games and psychodrama in the suggested program are used as integrated classes for psychological intervention and development of leadership potential, overcoming anxiety and reducing aggression by means of fairytales plots based on the works of Russian folklore, folk and literary fairytales. Children who are leaders are invited to play the roles of rejected heroes (outsiders) to correct their leadership potential. Children, who are not leaders, are offered the roles of hero-leaders, both negative and positive to develop leadership qualities. The use of dance and body-oriented therapies includes free dance, mirror dance, "merry animals" dance, "body" drawing and massage with game's elements.

Educational technologies and equipment should be adapted where relevant to give left-handed children an equal learning experience. So the important training aids for the left-handed school children are:

- modified tools for writing;
- three-dimensional aids for the development of spatial thinking;
- visual aids such as pictures, schemes, special educational signs and sketches;
- methods and techniques of teaching based on kinetic memory;
- exercises and plays aimed at prevention and elimination of difficulties in interpersonal relationship and communication with other children.

In conclusion, the technological solution of the problem of teaching children with left-sided laterality is to include in educational programs some special activities and exercises to develop both right and left hemispheres of the brain. This research shows that the teaching at primary schools can be improved using some technologies for developing the right hemisphere of the brain. Education of lefties and schoolchildren who demonstrate left-sided preferences should contain elements of adaptation and include specially organized remedial and developing classes. In modern educational technologies anyone needs to take into account and appreciate the far reaching relevance of children's handedness in all aspects of their schooling.

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