Psychological aspects of developing education of children with left-sided laterality

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Abstract

Gender peculiarities and specificity of age-related dynamics of laterality pattern’s formation in junior schoolchildren to identify the ontogenetic peculiarities of lateralization are considered. Basic “school” difficulties of the children who demonstrate left-sided motor and sensory symptoms are analyzed. The importance to integrate the lateral profile in the complex psychological diagnosis of the child is discussed. A structure of a complex program for the intensive development of the right hemisphere and to overcome the possible “failure” of left-handers and lefties in school performance is proposed.

Keywords: functional asymmetry of the brain, laterality profile, left-handedness, sinistrality, neuropsychology of childhood

1. Introduction

The relevance of research is determined by 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 problem of functional asymmetry of the brain (FAB) is currently being investigated within differential neuropsychology (7; 8) and neuropsychology of childhood (1; 6). 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 (1; 4). The 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 (2; 5; 6).

Functional asymmetry of the brain has a bio-social dependence and can change from 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. Small children show the left-sided laterality more often, but it doesn’t mean true ambidexterity or sinisrallity and it doesn’t reflect the peculiarity interhemispheric interactions’ formation (1; 4; 5).

Significant changes in interspheric interaction are observed in the first stage of schooling when the lateralization of brain functions occurs. 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 (2; 5).

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 heterogenous 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.

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 synthetical 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 (5; 6).

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. The main problems of left-handed children in primary school performance are academic failure, lack of perseverance, anxiety neurosis, and extreme emotional lability (4; 7; 8).

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’ 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. The most popular in Russia is a complex classification based on an analysis of interhemispheric interaction according to three sensory receptor systems (“hand-ear-eye”) (7). This classification was the basis for the complex of techniques used in the study to investigate the laterality pattern of primary school children.

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

- “maps of lateral signs” (8), that take into account both the data of Annette 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) (4), 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) (5). 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 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

A total of 157 schoolchildren of both sexes at the age of 7 - 10 from the first - fourth forms were involved in this research.

The findings show that there is a statistically reliable ($t^* = 2.041$, $p < 0.05$) reduction of the number of schoolchildren with left-sided dominance up to the age of 10.

Among 27 children at the age of 7-8 demonstrated left-sided preference doing various tasks, which is 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 spatio-functional organization of 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 is 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 left-handers. It is significant that the group of marked left-handers include only male subjects, 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’ success and difficulties at school 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; they need the support of a figure, a natural object or any other adjuvant. Left-handed children are typically more vulnerable, emotional, lively, anxious, they get accustomed to a changing situation less successfully. 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 lefthanders 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.

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.

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 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. The use of dance and body-oriented therapies includes free dance, mirror dance, “merry animals” dance, “body” drawing, and massage with game’s elements.

Fairytale 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 fairytale plots based on the works of Russian folklore, folk and literary fairytales. So, 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.

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. Education of lefties and schoolchildren, who demonstrate left-sided preferences, should contain elements of adaptation and include specially organized remedial and developing classes.

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