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## THE RELATIONSHIP BETWEEN INDIVIDUAL CHARACTERISTICS OF INTERHEMISPHERIC ASYMMETRY AND COGNITIVE STYLE "IMPULSIVITY/REFLECTIVITY"

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ВЗАЄМОЗВ'ЯЗОК ІНДИВІДУАЛЬНИХ ОСОБЛИВОСТЕЙ  
МІЖПІВКУЛЬНОЇ АСИМЕТРІЇ ІЗ КОГНІТИВНИМ СТИЛЕМ  
"ІМПУЛЬСИВНІСТЬ/РЕФЛЕКСИВНІСТЬ"

DOI: <https://doi.org/10.35774/pis2024.01.171>

УДК: 159.92

**Introduction.** As it is known, the idea of the dominance of the left hemisphere belongs to H. Jackson, who formulated the theory of the dominance of the left hemisphere regarding the functioning of the language. R. Sperry, following H. Jackson, discovered that each hemisphere of the brain acts as dominant in relation to the process of realization of certain mental functions.

In his system of human knowledge, speaking of the individual, B.G. Ananiev [1] singled out its primary and secondary properties. One of the properties attributed to the group of primaries was the functional asymmetry of the brain, which, according to the author, can be considered as the most important factor determining the originality of the psychological characteristics of each person.

Traditionally, it is believed that there are three types of functional asymmetry: right, left, and ambidexterity (no distinction between the right and left hemispheres). In this respect, according to the data known to us, in the world among the population the majority of right-handed people (dominance of the left hemisphere), the rest of humanity are divided into two uneven parts: approximately 5 to 20% are left-handed (dominance of the right hemisphere) and somewhere 2-3% are ambidexters.

Along with the specialization of the hemispheres, the brain works as a whole. It is assumed that the differences between the functions of the hemispheres are reduced to different ways of organizing the contextual relationship between the elements of the processed and perceived information (*see Table 1*).

In accordance with the localization in relation to the senses, all manifestations of functional asymmetry are usually divided into three groups: motor (motor), sensory and psychological.

Motor asymmetry is manifested in a combination of signs of uneven functioning of the muscles of the arms, legs, half of the body and face, the formation of general motor behavior in general. Motor asymmetry is not stable enough and may change in the process of adaptation.

Sensory asymmetry is manifested in the functioning of the hearing organs. This group of asymmetries persists and is fixed throughout life, so it is a fairly stable characteristic of the central nervous system. Note that the sensory systems of vision, hearing, taste, smell, touch perceive information with the participation of the right and left hemispheres, and its analysis and subsequent preservation is carried out by the hemisphere that is more adapted to a certain type of information.

Table 1

Dependence of information processing on the dominance of the cerebral hemispheres

Options	Hemisphere	
	Left	Right
1. Information	Discrete	Continuous
2. Perception	Unimodal Analytical	Intermodal Simultaneous
3. Method of processing information	Consecutive	Parallel Simultaneous
4. Types of thinking	Verbal Formal-logical Analytical	Visual-figurative Effective Intuitive
5. Communication	Verbal communication	Pre-verbal communication
6. Emotions	Positive	Negatives

Psychological asymmetry in the process of mental activity is manifested in the specificity of the functioning of the cerebral hemispheres and is reflected in the characteristics of emotional manifestations, perception, thinking, speech and other functions.

**PURPOSE.** The purpose of this work was to consider the features of FAH in their relationship with the cognitive style “impulsivity-reflectivity” as an individually preferred and stable way of cognitive activity of children of primary school age.

### THEORETICAL FOUNDATIONS

In the studies known to us it is shown that the “left-hemisphere” subjects of the formal-logical components of thinking are mediated by any sign material in such a way that a strictly ordered and unambiguously understood context is created, which is necessary for successful communication between people. It can be not only words, but also other symbols, signs and even images.

In other words, from all the real and potential connections between objects and phenomena, several specific ones are selected that do not create contradictions and fit into this context. Thus, the word included in the context acquires only one meaning, although in reality there may be much more.

In turn, the function of the “right-hemisphere” components of thinking is to simultaneously grasp a large number of contradictory connections from the point of view of formal

logic and form a holistic and multi-valued context due to this. The advantage of such a strategy of thinking is manifested in cases where the information is complex, internally contradictory and cannot be reduced to an unambiguous context [2]. It can be assumed that the role of the right-hemisphere strategy of cognition, manifested in the ability to capture many connections and options in a multi-valued context, makes it the most important participant in the creative process.

From the point of view of the ontogenesis of brain structures, the maturation of the right hemisphere proceeds at a faster pace than the left, therefore, in the early period of development, its contribution to the psychological functioning of the individual exceeds the contribution of the left hemisphere. It is also argued that up to 9-10 years the child is a right-hemisphere being. We believe that such an assessment is not without some grounds, since it is to some extent consistent with certain features mental development of children in preschool, and partly in primary school age. Indeed, young children are characterized by involuntariness, low awareness of behavior, emotionality, their cognitive activity has a direct, holistic and figurative character.

At present, it has been established that significant changes in interhemispheric interaction are observed by the age of 6-7, that is, by the beginning of schooling. The impetus for the activation of the left hemisphere is the appearance of self-awareness in a two-year-old child.

At the same time, the maximum expression is observed in the formation of children's egocentrism. The child has negativism, a slight slowdown in the perception and processing of information coming from outside.

With the increase in the activity of the left hemisphere, complex concepts appear, the development of abstract thinking, the ability to count and write. According to some reports, {4} certain gender characteristics are observed here. So, in boys, by the age of six, the left hemisphere may be more active than in girls. Therefore, some of them begin to read as early as 4-5 years. At the same time, sometimes emotional, impressionable and artistically gifted boys have brain differentiation in the same way as girls, as a result of which they retain the right-hemisphere specialization of the brain longer. Often, they do not always write well, skip letters, do not finish words. Mastering the multiplication table is a great difficulty for them. All this gradually evens out to the third or fifth grade.

Girls under the age of 13 retain a certain plasticity of the brain, the equivalence of its halves. Therefore, only by the age of 13 it is determined how successfully girls learn a foreign language or mathematics (if left-hemisphere functions predominate).

It is known that the specificity of the child's thinking lies in the fact that he has not developed the ability to think logically until a certain time, and imaginative thinking, with all the potential wealth, is not sufficiently ordered. It is this property of the child's mind to perceive everything concretely, literally, the inability to rise above the situation and understand its general, abstract or figurative meaning is one of the main features of children's thinking. This feature is especially evident in the study of such abstract school disciplines as mathematics or grammar.

In addition to the functional asymmetries of the cerebral hemispheres, the features that affect the learning process also include cognitive styles, with the help of which information is encoded, which makes it possible to identify the leading cognitive modality. Currently, in the psychological literature, you can find a description of about 20 different cognitive styles, most of which are bipolar formations.

Numerous studies by J. Kagan [4] allowed him to suggest the existence of individual differences in the "cognitive pace" (speed of decision-making), namely, he found that children who make decisions slowly tend to an analytical way of categorizing, are more attentive to individual details of what is happening and better control

their intellectual behavior, i.e., act reflexively. On the contrary, children who tend to demonstrate a thematic way of categorization find manifestations of impulsivity in their behavior (they are less attentive and hyperactive in their actions), make decisions slowly.

According to J. According to Kagan [4], the factor of cognitive pace, acting as a dynamic characteristic of intellectual activity, is found only at certain phases of the process of solving problems, among which the following can be distinguished:

- decoding the problem situation, understanding the problem;
- selection of possible hypotheses that can be relied on to find a solution;
- performing the necessary operations to substantiate the initial hypothesis;
- assessment of the correctness of the solution chosen in the 3rd phase;
- communicating the response to the teacher or experimenter.

The tendency to act impulsively or reflexively manifests itself in the 2nd and 5th phases, i.e., it is associated with the mental choice of hypotheses and the communication of the answer.

Determinants of individual differences in the speed of decision-making J. Kagan associated with the peculiarities of the motivational-affective sphere of the personality, so the tendency to be reflective (long decision-making time) or impulsive (fast decision-making time) is a peculiar function of the balance between two subjective values: orientation towards quick success, or anxiety for a possible mistake. If the child's anxiety about the possibility of making a mistake is greater than his desire to succeed quickly, then he will find a reflective style and, conversely, if anxiety about his own mistakes is less than the desire for quick success, then he will have an impulsive style.

Later, after conducting a series of studies, M.A. Kholodny found that subjects prone to a slow pace of finding a solution (representatives of the reflexive cognitive style) – in contrast to subjects who are inclined to make decisions quickly (representatives of the impulsive cognitive style) – are characterized by greater intellectual productivity, including in the conditions of solving test problems.

In this regard, it seems relevant to empirically consider the features of the functional asymmetry of the cerebral hemispheres (FAH) and their role in the individual characteristics of the decision-making speed in children of primary school age.

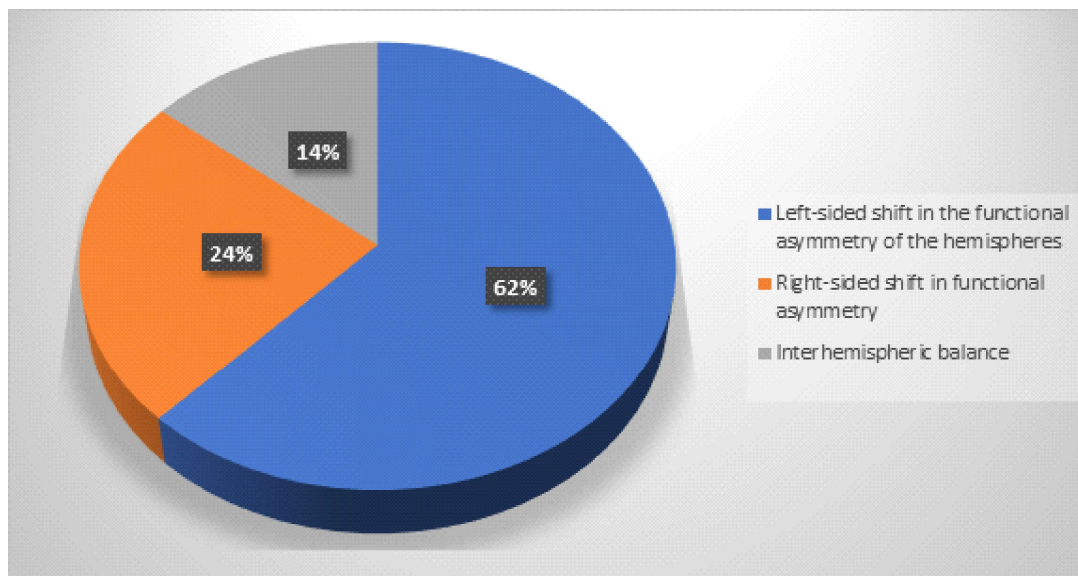


Fig. 1

Results of the study of the severity of functional asymmetry using an activatiometer (in %).

**RESEARCH METHODOLOGY.** The study was conducted on the bases of secondary schools in Donetsk and Odessa regions, directly in the experiment were attended by children of primary school age aged 8-11 years, studying in the 3rd, 4th and 5th grades in the amount of 462 people.

Functional asymmetry of the cerebral hemispheres was determined using Activatiometer-6 (Y.A. Tsagarelli); To study the speed and accuracy of decision-making verifying the cognitive style “impulsivity / reflectivity”, the test “Choice of a paired figure” (MFF-12 by J. Kagan) was used.

At the beginning of the study, the subjects were diagnosed using Activatiometer-6. It was revealed that 62% of children have a left-sided shift in the functional asymmetry of the hemispheres, as a result of which their mental activity is characterized by discreteness and analyticity, provides a logically consistent analysis of objects, phenomena and their states according to a certain number of corresponding descripts.

24% of children have a right-sided shift in functional asymmetry, so their thinking in relation to the properties of objects, phenomena and space is defined as holistic-figurative, spatial, eventual, simultaneous.

14% of children have interhemispheric balance, whose mental activity can be characterized in the form of a certain conglomerate of psychological characteristics characteristic of “right-handers” and “left-handers”. (The distribution of the results obtained in % is shown in *Figure 1*).

The average indicators obtained as a result of the examination of children using the method “Selection of a paired figure – MFF-12” were distributed as follows: in the group of children with left-sided displacement of FAP, the average was 0.6099, in the group of children with right-sided displacement of FAP, the average was 0.5613, in the group of children with hemispheric balance (ambidextrous) the average was 0.5422. (These figures are presented in *Table 2*)

The survey using the test “Selection of a paired figure” – MFF-12 “and the correlation analysis of the data with the indicators obtained during the study using the Activatiometer-6 of Y.A. Tsagarelli (with the use of the Spearman correlation coefficient) made it possible to determine that children of primary school age with right-sided displacement of the FAP, as well as children with interhemispheric balance, have a high level of impulsivity, which indicates their characteristic rapid acceptance decisions without its sufficient justification, the thoughtlessness of choosing from a variety of alternatives. In particular, during the study, the subjects gave very quick answers, often focusing on the impact of momentary emotions.

Children with left-sided displacement of FAP, on the contrary, had reflexive and mixed styles of cognitive activity. The pace of response in the situation of choice was carried out slowly, the hypotheses tested were repeatedly refined, decisions were made on the basis of a thorough preliminary analysis of the signs of alternative

Table 2

Average indicators according to the method “Choosing a pair figure”

	Left-hemisphere displacement of FAP (62% of subjects)	Right-hemisphere displacement of FAP (24% of subjects)	Interhemispheric balance (14% of subjects)
Average indicator "Selection of a paired figure - MFF-12"	0,6099	0,5613	0,5422

objects. In general, for representatives. This type is characterized by accuracy and consistency in solving problems, they thought about their decisions for a long time, “did not hurry” with the answer, while performing tasks with the least number of errors.

**SCIENTIFIC DISCUSSION AND CONCLUSIONS.** Thus, the study made it possible to confirm and clarify the features of the differences in the processing of information by the left and right hemispheres, which underlie modern ideas about the work of the human brain, as well as to identify a certain relationship between the functional asymmetries of the brain and the level of impulsivity-reflectivity.

In particular, it was found that when solving problems where, under conditions of uncertainty, it was necessary to make the right choice from a certain number of alternatives, the subjects, classified as impulsive, made their choice quickly, without careful study of alternative options. In turn, the reflective subjects, on the contrary, made their decisions on the basis of a thorough study of all. “pros” and “cons”, while using more productive ways of solving problems.

The results obtained, reflecting some features of FAP, their connection with the cognitive style “impulsivity-reflectivity”, as an individually preferred and stable way of cognitive activity of a child of primary school age, can be used to create a more effective learning and educating environment, as well as to choose the most adequate ways of teaching them.

In the future, consideration of the problem of the influence of FAH on the peculiarities of the functioning of cognitive styles is seen in a broader involvement in the study of other cognitive styles (field dependence-field independence; smoothing-sharpening; concreteness-abstractness; focusing-scanning).

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## АНОТАЦІЯ

**МАКСИМЕНКО Юрій Борисович, БУРЖУМОВА Муна.**

**Взаємозв'язок індивідуальних особливостей міжпівкульної асиметрії із когнітивним стилем «імпульсивність/рефлексивність».**

У статті на теоретичному та емпіричному рівнях розглядаються особливості взаємозв'язку функціональних асиметрій півкуль головного мозку молодших школярів з когнітивним стилем «імпульсивність – рефлексивність». Охарактеризовано основні підходи щодо вивчення цього питання у вітчизняних та закордонних дослідженнях, вказано на актуальність його розгляду. У пошукуванні використалися прилад Активометр-6 (Ю.А. Цигарелі) та методика «Вибір парної фігури» (Дж. Каган). Проведене дослідження дозволило встановити та уточнити існування відмінностей у переробці інформації лівою та правою півклями головного мозку, а також підтвердити наявність гіпотези про певний зв'язок між функціональною асиметрією півкуль з такими проявами когнітивного стилю, як «імпульсивність/рефлексивність». Зокрема, доведено, що існування індивідуальних відмінностей (5% рівень значущі) у швидкості прийняття рішень веде до того, що діти, для яких характерна лівостороння гемісферна організація, мають «рефлексивні» ознаки, приймають рішення повільно, схильні до аналітичного способу категоризації, більш уважні відносно окремих деталей, краще контролюють свою поведінку, використовують більш продуктивні засоби вирішення завдань. Навпаки, діти, які мають правосторонню асиметричність, демонструють тематичний стиль категоризації, для них характерні прояви імпульсивності, вони менш уважні, гіперактивні у своїх діях, рішення приймають досить повільно.

**Ключові слова:** функціональні асиметрії півкуль, амбидекстрія, когнітивний стиль, імпульсивність, рефлексивність.

## ANNOTATION

**Yurii MAKSYMENKO, Muna BURJUMOVA.**

**The relationship between individual characteristics of interhemispheric asymmetry and cognitive style “impulsivity / reflectivity”.**

The article at the theoretical and empirical levels discusses the peculiarities of the relationship between functional asymmetries of the cerebral hemispheres of younger schoolchildren with the cognitive style «impulsivity-reflexivity». The main approaches to studying this issue in domestic and foreign studies are characterized, a conclusion is made about the relevance of its consideration. The study used the device Activacyometer-6 (Yu.A. Tsygareli) and the technique “Choosing a paired figure” (J.Kagan). The study made it possible to establish and clarify the existence of differences in the processing of information by the left and right hemispheres of the brain, as well as to confirm the existence of a certain connection between the functional asymmetry of the hemispheres with such manifestations of cognitive style as “impulsivity – reflexivity”. In particular, it is given that the existence of individual differences (5% level is significant) in the speed of decision-making leads to the fact that children, who are characterized by left-sided hemispheric organization, have “reflexive” signs, make decisions slowly, are prone to analytical means of categorization, are more attentive to individual details, better control their behavior, use more productive means of solving problems and perform tasks with the least number of errors. On the contrary, children who have right-sided asymmetry demonstrate a thematic means of categorization, they are characterized by manifestations of impulsivity, they are less attentive, hyperactive in their actions, give very quick answers, most often focusing on the influence of momentary emotions. The investigation led to the conclusion that in certain conditions of uncertainty, when it is necessary to make the right choice from a number of alternatives, impulsive subjects made their choice quickly, without careful study of alternative options. In turn, reflective subjects, on the contrary, made their decisions on the basis of careful study of all. Pros and cons, while using more productive ways to solve problems.

**Keywords:** functional asymmetries of hemispheres, ambidextrous, cognitive style, impulsivity, reflexivity.

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Надійшла до редакції 20.02.2024.  
Підписана до друку 15.03.2024.

Бібліографічний опис для цитування:

**Maksymenko Y., Burjumova M. The relationship between individual characteristics of interhemispheric asymmetry and cognitive style “impulsivity / reflectivity”. *Психологія і суспільство*. 2024. №1. С. 171-176. DOI: <https://doi.org/10.35774/pis2024.01>. 171**