

**Research Article**

## **Neuropsychological foundations of conscious self-regulation of students**

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### **ABSTRACT.**

This article presents an analysis of the interrelation between the lateral organisation profiles' indicators and self-regulation features. The existence of significant distinctions in the processes of self-regulation among respondents with different variants of lateral profiles of the interhemispheric asymmetry is proved, as well as the common features of these processes that are peculiar to the individuals having identical options of the lateral profiles are specified too. The combination of general psychological and differential psychological approaches made it possible to establish multilevel connections between the functional asymmetry peculiarities and behavioural and personality self-regulation characteristics being put into practice within the action system aimed at arranging temporal and living space of a person. It is revealed that there is a logic connection between the characteristics of the self-regulation processes and the profiles of lateral organisation, conditioned by the interaction of the interhemispheric asymmetry's native traits within the motor activity organisation having the experience gained during a person's lifetime. The lateral organisation profiles with a more complex interrelation between sensory and motor systems are connected with the formation of personality and activity characteristics of voluntary activity's self-regulation, acquired within the processes of education, upbringing and other forms of socialization. The research results can be used in vocational guidance, and for academic activity optimization. They can also be applied while implementing principles of differential education, as well as at the classes of mastering the self-regulation system.

**Key words:** neuropsychological approach, psychology of individual differences, self-regulation, human voluntary activity, lateral profiles.

### **INTRODUCTION**

The analysis of works devoted to various aspects of the research of individual differences in self-regulation processes shows that more and more new aspects of individual distinctions in self-regulation are being brought to life. However, alongside with this, the differences of approaches to the investigation of the contents, functions and structure of the self-regulation processes are revealed too (Korneeva, 2013). Since mental self-regulation is regarded as a process controlled by consciousness, at the basis of the present study there lies a reasonable assumption that self-regulation features can be

connected with the interhemispheric organisation of the brain activity that can be judged about by the indicators of the motor and individual lateral profiles tests (Annett, 1985, Chomsky, 1983, Lopez, 1987, Witkin, 1982). A fruitful and perspective conception in the development of this direction was A.R. Luria's conception (on the structural and functional units of the brain) and V.A. Moskvina's approach, being developed on its basis, in which within the study of the hemispheric interaction in the norm, lateral features and options of their combinations (individual lateral profiles) are

matched with the features of a number of mental processes' realisation, including the possibility of an arbitrary activity management (Luriya, 1932, Luria, 1973, Moskvin, 2002). Nowadays, the issue of individual differences in the processes of self-regulation still remains scantily studied. Researchers' interest towards phenomenology of self-regulation is clearly increasing; the scope of investigations touching upon different aspects of this phenomenology is broadening too. At the same time many problems of self-regulation still have to be investigated, as well as individual differences and peculiarities of self-regulation connected with psychophysiological organisation of human activity have to be studied in particular. Thus, the aim of the research under consideration is to study the constituents of students' self-regulation process and the conditions that either enable or impede its progress.

## MATERIALS AND METHODS

Since in the most general form of hemispheric differences in connection with the analysis of the prevailing mental activity characteristics fit into a number of dichotomies: abstract (verbally-logic) and specific (visual-shaped) ways of information processing, voluntary and involuntary regulation of mental activity, emotionality-rationality, awareness-unawareness of mental functions and conditions.

### Experimental research base

For the study of individual differences in the self-regulation processes 195 respondents were surveyed. The sample included the students of Belgorod State National Research University (95 boys and 100 girls – the students of the

Faculty of Physical Education and Sports and the Faculty of Pre-Primary, Primary and Special Education) at the age of 17-19. The study was conducted in 2013-2014 and 2014-2015 academic years.

## Research Methods

When doing this research we used two blocks of methods.

1. Techniques focused on the diagnostics of functional asymmetry indicators: A.R. Luria's technique, and motor tests included in the "Map of Lateral Signs" and the technique for determining individual laterality profiles (according to V.A. Moskvin).
2. Techniques for diagnosing individual personal characteristics, one way or another related to the indicators of self-regulation: A.K. Osnitsky's technique for diagnosing abilities and characteristics of self-regulation of activity; the technique for measuring the level of a person's self-actualization (SAT); the technique for determining life-purpose orientations (LPO); the "Time Orientation" technique.

## RESULTS

The prevalence of lateral signs was studied in accordance with the "Map of Lateral Signs" technique; variations of lateral profiles were considered in the framework of the "hand-ear-eye" system.

3. Authors' results. The results presented in the table indicate that among the students – boys and girls – some subgroups of students with various lateral profiles were identified. Moreover, the number of subgroups among boys and girls varies considerably.

**Table 1.** Distribution of Respondents According to Their Lateral Organisation Profiles

Respondents' Samples	Lateral Profiles (%)				
	RRR	RLR	RRL	RLL	Left-handers and Ambidexters
A. Boys (n=195)	62.4	23.3	10.0	3.3	1.0
B Girls (n = 120)	52.0	14.0	24.4	7.0	3.0
Validity of Distinctions: ( $\varphi$ *Fisher's test)	p <0.05	p <0.05	p <0.05	p <0.05	p <0.05

In the profile "hand-ear-eye", 'hand' was considered a motor component of a behavioural

act, whereas 'ear' and 'eye' – perceiving and orienting components. It was necessary to take that into consideration, as the physiological and psychological traits are determined by a profile of functional asymmetry in motor and sensory systems, rather than by specific modalities of cerebral dominance (including the right - or left-handedness). The type of hemispheric lateralization is the neurophysiological basis of both psychophysiological and psychomotor personality, and human motor organisation reflects a holistic description of it as an individual, as a person, and as a subject having all unique individuality.

The results indicate that among the students – boys and girls – some subgroups of students with a various lateral profiles were identified. Moreover, the sampling pattern of subgroups among the boys and girls differs greatly. The analysis of the prevalence of lateral features and types of their combinations in boys' and girls' samples – students (with a gender-based approach) allowed in a number of cases to identify significant differences. This coincides with the results of other studies that have identified some features of lateral signs distribution in different professional samples (Moskvin, 2002, P. 127).

The findings of the study made it possible to make an assumption about the lateralization of the neurophysiological bases of individual differences that can find their realisation in the intellectual (both general and social intelligence) and emotional activities, as well as the most valuable for this work, especially in regulatory processes. Thus, on the basis of this assumption, all the data have been systematized taking into account the indicators of functional asymmetry by A.R. Luria and V.A. Moskvin. While analysing functional brain asymmetries, the motor sample was measured; that allowed dividing the sample into right- and left-handers. A.K. Osnitsky's questionnaire "Self-regulation" was used as a basic technique in order to identify individual characteristics of students when self-evaluating the presence or absence of regulatory skills or any self-regulation characteristics associated with problem solving, fulfillment of training and academic-practical tasks and the organisation of everyday behaviour (Osnitsky, 2010, P. 94). The respondents with different indices of motor tests showed a number of significant differences in self-evaluation of self-regulation skills.

**Table 2.** Indicators of Students' Self-evaluation of Skills and Characteristics of Self-regulation

Self-regulation Skills	Self-evaluation of Self-regulation Skills (%)					
	Availability of Self-regulation Skills		Lack of Self-regulation Skills		Self-evaluation Errors	
	Right-handers	Left-handers	Right-handers	Left-handers	Right-handers	Left-handers
Structure-component Conditions (SCC)	62	57	14*	25	24	18
Functional Peculiarities (FP)	68	60	9*	29	23	11
Dynamic Peculiarities (DP)	51*	42	10*	43	39*	15
Style-Personality Peculiarities (SPP)	51*	62	11*	25	38*	13

\* Figures that are significantly different at  $\phi^*$  Fisher's test, with  $p < 0.05$

According to the indicator of formation of structure-component skills of self-regulation (SCS), some significant differences between the subjects with different indices of motor sample were revealed. Thus, the subjects with the right indicator of motor sample less often pointed at the absence of these abilities – 14 and 25 (left

indicator). That is, the respondents with the right indicator of the sample "folded arms" are better at setting and retaining goals, analysing and modelling conditions, choosing means and methods of actions, as well as at evaluating results and their correction (if needed).

Some significant differences in the results of self-evaluation of self-regulation's functional features were also identified. On this scale the same dynamics can be traced, i.e. the subjects with the right indicator of motor sample show high indicators of functional abilities – 60 and 68 (left index sample of “folded arms”), and significantly lower absence – 9 and 29, respectively. Thus, the students demonstrate higher levels of security regulation in general, orderliness, detailing, practical intentions feasibility and optimality of actions regulation.

But along with these data the students with the right indicator of the sample “folded arms” show higher indicators on the ‘Self-evaluation Errors’ scale. Perhaps this is due to the respondents’ higher self-esteem, due to more self-confidence and confidence in their abilities.

In the indicators of self-regulation characteristics that determine the dynamics of the actions taken, some statistically significant differences were identified too. The respondents with the right indicator of the sample “folded arms” often point at the existence of caution, confidence, flexibility, practicality and firmness in the regulation of activities rather than the respondents with the left indicator of motor sample of 51 and 42 per cent characterizing the presence of 10 (right index of motor test) and 43 (left indicator) – the lack of these skills respectively.

Style-personality features of self-regulation are also evaluated differently by the subjects with different indices of motor sample. The respondents with left index motor test assessed their style-personality of self-regulation higher than by the subjects with the right indicator, the availability of skills – 51 and 62 per cent. At the same time it is interesting to note the fact that on initiative, awareness, responsibility, independence, readiness for education, these subjects (with the left indicator of motor test and with a higher score) indicated they lacked such skills.

In connection with the identified indicators of the students’ functional asymmetry we were interested in the results of the SAT technique on the following scales: flexibility of behaviour, self-sensitiveness, spontaneity, self-esteem, self-

acceptance, understanding of human nature, synergy, acceptance of aggression, sociability, cognitive needs, creativity, values, time competence – with the indicators of functional asymmetry.

According to additional SAT scales, some differences were obtained only for a number of indicators in the groups of respondents with different individual laterality profiles (asymmetry), which allow a more differentiated approach to the analysis of connection of individual differences in functional asymmetry with indicators of human self-actualization. Of particular interest are the data on the scale of spontaneity (the ability to express their feelings spontaneously). High scores on this scale indicate the possibility of another method of behaviour, not calculated in advance. The findings suggest that the prevalence of left lateral leads to a decrease in spontaneous behaviour. At the same time the subjects with the left indicator of motor sample show higher scores on the scale of creativity that characterizes the person’s creative orientation. Some statistically significant differences were also obtained on the ‘flexibility of behaviour’ scale that measures the degree of a person’s flexibility in the implementation of his values and his capability to respond quickly to changing aspects of the situation. It can be assumed that the subjects with the right indicator of the sample “folded arms” (as indicated by the data) have a higher ability to react quickly, and at the same time properly, to the changing aspects of the situation. It is possible that the subjects with the right sample indicator while accumulating right lateral signs are more aware of their needs and feelings. On the self-esteem scale, measuring the subject’s ability to appreciate his/her merits, statistically significant differences were identified in the sample of girls with accumulation of right lateral signs. Thus, we see that the accumulation of left lateral signs contributes to a less critical attitude towards themselves and a higher self-esteem. This is confirmed by the data on the scale of self-acceptance. Higher indicators of cognitive needs can be observed in the girls’ samples with the right indicator of the sample “folded arms”. In

this case it is interesting to point out the fact that in the sample of both boys and girls, – the respondents of the group of unilateral right-handers, – higher rates on the scale of sociability were recorded among the respondents with the left indicator according to A.R. Luria. This proves the ability of the subject with high indicators on this scale to establish contact with people quickly, at the same time the intensity and duration of these contacts can vary. In terms of motor sample indicators the connection with SAT's additional scales was not identified.

According to the data on the first-base scale (Time Competence), no statistically significant differences were obtained among the boys. But the data of the respondents belonging to different profiles of functional asymmetry, clarify the results, stressing that better results are found among the respondents with the accumulation of right lateral indicators. High scores on this scale indicate, firstly, the person's ability of "living in the present", to experience the moments of his/her life in full; secondly, to feel the continuity of the past, present and future, that is, to see his/her life in a sufficiently holistic way. Such an attitude is an indicator of a personality's high self-actualization. A higher degree of the respondents' self-actualization with the right motor sample indicator are confirmed by significant differences ( $p < 0.05$ ) on the scale of value orientations, measuring the extent to which a person shares values which are characteristic of the self-actualizing person.

Thus, it should be noted that such SAT indicators as time and value orientations are more connected with the personality's characteristics that can also be identified with the connection of asymmetry indicators according to A.R. Luria. As for the rest of the indicators, they are more linked with the individual laterality profile, as they are no longer recorded as personality's level, but as socio-specialized (socially acquired) characteristics, that are formed during lifetime.

For the diagnostics of life orientations the technique with the same name has been used. The test results only showed an overall decrease in the indicators of the life orientations technique of the respondents with a

predominance of left lateral signs. Comparison of average data with significant differences (at  $p < 0.05$ ) indicated that the respondents with the right indicator of the "folded arms" sample displayed higher scores on the "Result" scale of this technique. On the rest of the scales of the life orientations technique some differences were obtained only on a number of parameters in the groups belonging to different functional asymmetry indicators according to V.A. Moskvina. The latter make it possible to apply a more differentiated approach to the analysis of the connection between the individual differences in functional asymmetry and indicators of human life orientations. Thus, the girls with the accumulation of left lateral signs showed significant differences on the scale of "Locus – Control – Life". At high test scores the subjects tend to believe that a person is given control over her life, that she is free to make decisions and implement them. In this group of the girls, statistically significant differences were identified on the "Consciousness of Life" scale, "Process", "Result", and "Locus-Control – I", confirming that the accumulation of left lateral signs leads to a decrease in the indicators of the individual life orientations.

The respondents' time orientations were assessed using three bipolar scales as described in the "Time Direction" technique. Time orientation indicators, according to this method, showed no statistically significant differences but the data on "The Future" scale in the sample of the boys with different indices of motor tests for Alexander R. Luria and the scale of "The Past" in the unilateral group of the right-handed girls.

Thus, the analysis of the results obtained with the help of psycho-diagnostic methods for the study of personality characteristics associated with self-regulation of life revealed a link between the respondents' personality traits, their level of self-actualization, life orientations, and time direction with their functional asymmetry profile. That confirms the results of the previous studies (Osnitsky, Korneeva, 2015, Pp. 31-40).

In order to find out whether there is a connection between the personal characteristics of the respondents, their life orientations, features of

self-actualization and time direction with the features of self-evaluation of regulatory skills, we used correlation analysis (Pearson correlation).

The correlation analysis of the data obtained during the investigation led to the conclusion that there is a definite relationship between the students' personal characteristics and the specifics of their own self-assessment of regulatory skills.

An inverse relationship (at -0.50 and - 0.57, respectively) was found in the samples of both boys and girls with the right indicator of the "folded arms" sample between the emotional factor of stability and strength of "I" and the dynamic characteristics of self-regulation (the "Estimation Error" scale). That is, the higher the emotional stability, the more confident and stable in regulating the activity the subject will be, and the less difficulty he/she will encounter while reflecting the self-regulation skills and, as a result, will be less likely to make mistakes in the assessment of his/her skills and be more successful in regulating this activity.

Besides, a direct correlation between the indicators of such scales as "Value Orientation Scale", "Consciousness of Life" and "The Real" was found in the samples of the girls with both the right (0.65) and the left (0.60) index of motor sample. Therefore, the higher the score on a scale of value orientations, the more meaningful is the respondent's life and the more he/she lives in the present, "here and now".

## CONCLUSION

Thus, analysis of the results allowed us to show that there are significant differences in the processes of self-regulation among the respondents with different variants of lateral profiles and common features of these processes in individuals who have the same options of the lateral profiles.

The present study was devoted to the study of the relationship between the individual differences in the functional asymmetry and the processes of high school students' self-regulation. At the same time in our work we studied the connection parameters of functional asymmetry with the most common processes of

self-activity in the reactive and impulsive behaviour patterns, in both activity- and personally organized.

In formulating the research problem we operated on the assumption that with the help of well-known techniques, it would be possible to identify the personality traits that correlate with the multilevel phenomenology of high school students' self-activity, and suggested that the different levels of the self-regulation activity's phenomenology the adaptive, activity and personality levels could be variously linked with the features of functional brain asymmetries.

## SUMMARY

1. We prove the assumption about the existence of connection of individual differences in the processes of self-regulation with peculiarities of laterality profiles characterizing the functional asymmetry of human regulation activity. The combination of general psychological and differential psychological approaches made it possible to establish multilevel links between the features of functional asymmetry and behavioural and personal characteristics of self-regulation, implemented in the action systems for the organisation of temporary and human living space.

2. The findings of the study data confirmed the assumption of the lateralization of the neurophysiological bases of individual differences, which display in intellectual and emotional activities, as well as in the features of the regulatory processes. The respondents with different indices of motor samples revealed a number of significant differences in the self-evaluation of self-regulation skills. The students with the right motor sample indicator ("folded arms") to a greater extent have more developed processes of goal-setting and goal retention, analysis and conditions modelling, the choice of means and methods of action, as well as the evaluation of the results and their correction. They often display self-confidence, flexibility, practicality and firmness in the regulation of activity, initiative, awareness, and responsibility than the respondents with the left motor sample indicator.

3. When comparing the indicators of motor tests and lateral organisation profiles evidencing asymmetry in the organisation of brain structures, with the respondents' personal characteristics a number of significant differences was identified in the expression of communicative properties and features of interpersonal interaction, differences in emotional-volitional and intellectual spheres of the respondents.

4. The differences revealed in terms of organisation and intensity, further evidence of better organisation and higher self-control among respondents with the right measure of the sample "folded arms" and the accumulation of right lateral signs of the lateral organisation profile. These respondents have a sufficiently developed volitional control over their emotions and behavioural responses.

5. The respondents with left-sided asymmetry in the brain organisation revealed a higher ability to act spontaneously and express their feelings that indicates the respondent's capability to act impulsively, using methods not planned in advance. The left-handed subjects were often characterized by a high score on a scale of creativity that shows the creative orientation of a person.

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