

Free Action and its Psychophysiological Correlates

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The concept of “free action” was introduced by L.S. Vygotsky to explain the driving forces of mental development. Using the method of reconstruction, we determined that the trinity of awareness (awareness – logicity – arbitrariness) in each mental function is transformed in the process of development into the trinity of reflection – motive – will, which represents “free action”. We investigated three properties of free action: reflection of the whole psyche in itself (permeation of triangular connections of mental functions); fulfillment of a dynamic function as a way of development; connection with neuropsychic and vegetative structures of the organism. Results: the contradictions between L.S.Vygotsky’s methodological reflection and our reconstruction of his ideas about psyche as a dynamic triangular network are highlighted; the regulatory function of free action is substantiated; the connection of free action with electrophysiological and vegetative parameters of the organism is established; the age limit of qualitative changes in free action is marked.

Keywords: cultural-historical psychology, triangular dynamic network of the psyche, free action, reflection, autonomic nervous system, heart rate variability, electrical activity of the brain.

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Свободное действие и его психофизиологические корреляты

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Понятие «свободное действие» было введено Л.С. Выготским для разъяснения движущих сил развития психики. Методом реконструкции мы определили, что триединство «осознанность—логичность—произвольность» в каждой психической функции трансформируется в процессе развития в триединство «рефлексия—мотив—воля», представляющий собой «свободное действие». Мы исследовали три свойства свободного действия: отражение в себе всей психики (пронизывание триангулярных связей психических функций); выполнение динамической функции в качестве способа развития; связанность с нейропсихическими и вегетативными структурами организма. Результаты: выделены противоречия между методологической рефлексией, по Л.С. Выготскому, и нашей реконструкцией его представлений о психике как динамической триангулярной сети; обоснована регуляторная функция свободного действия; установлена связь свободного действия с электрофизиологическими и вегетативными параметрами организма, обозначена возрастная граница качественных изменений в свободном действии.

Ключевые слова: культурно-историческая психология, триангулярная динамическая сеть психики, свободное действие, рефлексия, вегетативная нервная система, вариабельность сердечного ритма, электрическая активность головного мозга.

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Introduction

The concept of “free action” was introduced by L.S. Vygotsky to explain the driving forces of mental development. This theoretical construct has its empirical evidence. The theoretical method of studying free action as a whole, in our opinion, is the study of its modal properties. In the article we reveal three modal properties of free action: reflection of the whole psyche in itself (penetration of triangular connections of mental functions); fulfillment of a dynamic function as a mode of development; connection with structures that do not belong to the natural essence of free action, but go beyond it and make up a greater whole — connection with electrophysiological and vegetative parameters of the organism.

In studying free action, we study the unity of motive, will, and reflection, and this unity is not the sum of these compo-

nents, but something else, which can take a more pronounced form of will, motive, and reflection; therefore, it is necessary to consider it more broadly, precisely within the framework of the conditions of free action in a social situation.

Contradictions between L. S. Vygotsky’s Methodological Reflection and the Reconstruction of his Ideas about the Psyche as a Dynamic Triangular Network

G.G. Kravtsov recalled as a parable a case related to the reading of L.S. Vygotsky’s works. About L.S. Vygotsky, “one of those present exclaimed in surprise: “But he writes simply and clearly, in good literary language.” “And this is the main difficulty!” — claimed

Daniil Borisovich [Elkonin] and explained: “I have to force myself to stop after reading each paragraph, go away from it, then come back again and, reading a second time, I discover a new meaning, which had not been revealed to me before” [18, p. 21].

The reconstruction of L.S.Vygotsky’s views on the psyche as a dynamic, developing according to certain laws under certain conditions, formation in a person we presented in our works [23-25], showed the logic of triple connections between psychological functions and revealed its transformational processes in the dynamic triangular network of the psyche. This reconstruction comes into conflict with Vygotsky’s methodological reflection of his views:

1. Vygotsky writes not about a network, but about a system with a system-forming feature: “In the process of development, all these functions form a complex hierarchical system, where the central, or leading, function is the development of thinking, the function of formation of concepts” [9, p. 113]. At every change of any mental function that affects other functions, Vygotsky wrote about such a system [10].

If we pay attention not to methodological reflection, but to the unfolding of the analysis that led to the conclusion about the system, we will meet with the application of trinity as a method of revealing the connections of mutual influences of mental functions. Thus, Vygotsky writes: “the convergence of memory and attention with intellect is the most essential and distinctive feature of the transitional age. From the system of perception these functions pass to the system of thinking” [9, p. 144]. There is a triple, or rather triangular connection: memory – attention – thinking, memory and attention find thinking for their development, at the same time, thinking is “looking” for something to influence. Similar things happen with other functions.

2. Another contradiction is built into the above contradiction. Vygotsky indicates that he is writing about dual connections between mental functions, but the text of his discourse moves in a gradual labeling of triple connections.

L.S. Vygotsky initially takes the trinity of nature – psyche – social environment and prescribes these connections to a greater or lesser extent. For example, in his work “Pedology of Adolescence”, Vygotsky, without labeling it himself, gradually folding the trinity and revealing the links between them, built all the trinity in the form of a network covering the content: nature – psyche – culture + I – other – environment + understanding of reality – understanding of others – understanding of oneself + speech – communication – thinking in concepts (logical thinking) + thought – speech – environment.

Based on the above contradictions, the conclusion about the equality of the system and the whole in Vygotsky’s ideas would be wrong. Analysis by means of network construction is more in line with Vygotsky’s works. We will rely on it to reveal the transformation taking place in the trinity, which Vygotsky called “free action”.

The Role of Free Action in the Triangular Dynamic Network of the Psyche as a Developmental Driver

In our work “The Nature of Free Action and Reflection” [23], we showed that free action is a trinity of such mental functions as reflection, will, and motive. The trinity is formed at the early stages of human development. The works of the followers of cultural-historical psychology reveal certain aspects, genesis and peculiarities of relations in the trinity: its dyads and each phenomenon [14; 26].

According to Vygotsky arbitrariness, logicity and awareness are the driving forces of the development of mental functions in childhood.

From Vygotsky’s [9] description of the process of intellectualization of functions, we can distinguish the acquisition of new qualities by functions: 1) separateness from elementary, 2) logicity, 3) freedom as controllability by conscious thought, i.e., arbitrariness. Accordingly, logicity and arbitrariness as control of mental function with the help of conscious thought. What is conscious thought in Vygotsky’s understanding? It is a thought formalized into concepts, and formalization into concepts is associated not only with consciousness, but also with awareness [9]. In the description of connections we not only meet with the trinity of speech (verbal thinking) – will – self-consciousness, but also with the fact that to the trinity of consciousness – logicity – arbitrariness Vygotsky allocates the role of a regulatory mechanism, therefore, penetrating and triggering the development of the entire psyche. Vygotsky [6; 9; 11], revealing development, assigns qualitative characteristics to mental functions, for example, conscious perception, logical thinking, arbitrary attention and at the same time logical perception, arbitrary thinking, conscious attention and so on, assigning all three qualities to each function.

Similar changes are realized in the personality. Vygotsky writes: “On the basis of reflection, on the basis of self-consciousness and understanding of one’s own processes, new groups arise, new connections of these functions among themselves, and these connections, arising on the basis of self-consciousness and characterizing the structure of personality, we call its tertiary features” [9, p. 24]. “In these new connections, in these tertiary higher functions there is nothing mysterious or mysterious, for, as we have seen, the law of their construction consists in the fact that they are the psychological relations transferred to the personality, which once were relations between people” [9, p. 238].

Changes in the personality are associated with changes in the trinity of logicity, arbitrariness, and awareness, which is embedded in the network of mental functions. It stands out, retaining its regulating function as an independent unit of analysis as reflection – motive – will, endowed with a new quality of freedom and necessity. “A systematized, ordered world of the inner consciousness of the individual develops and takes shape,

and there arises that special form of necessity which we call freedom of will" [9, p. 197–198], writes Vygotsky and, following the logic about the whole, we can assume that freedom, as a form of necessity, is possessed not only by the will, but also by reflection and motive. Free action becomes a special form of internal necessity, regulating the development of personality and intellectual mental functions. Vygotsky, following Spinoza, refers to such freedom as cognized necessity. Free action, as a unit in the triangular network of the psyche, is connected with other mental functions, such as speech, consciousness, behavior, understanding, and others.

For free action, necessity is delineated by the presence of contradictions. Vygotsky supports the idea expressed by Piaget about reflection and, in our opinion, it is true in general for free action: "it is only under the pressure of argument and objections that a child begins to try to justify his thought in the eyes of others and begins to observe his own thinking" [9, p. 88]. Free action develops in the contradictions of ontological trinity of nature – psyche – culture and epistemological I – Other – social environment.

Relation of Free Action to Electrophysiological and Autonomic Parameters of the Organism

Vygotsky does not recognize physiological parallelism and severely criticizes its supporters. At the same time, it would not be logical, based on the methodological basis of the whole and unity, to bypass the connection between brain activity and mental functions. Vygotsky speaks of correlates, i.e. the presence of a connection that mutually influences each other. Thus, he writes about thinking in concepts, which for him is central to the changes taking place in adolescence: "Of course, thinking in concepts has its correlate in brain functions, but this correlate consists in a chronogenic synthesis, in a complex temporal combination and unification of a number of functions, which are mainly characterized by two points. First, <...> in the structure of the brain and in the system of its basic functions are given the possibilities, the conditions for the emergence and formation of higher syntheses. Secondly, chronogenic synthesis distinguishes what distinguishes the parts, the sum of elements from the whole, from the structure. From the point of view of physiology, it is not one basic function of the brain in the form of inhibition, excitation, etc., but many different functions in a complex combination and unification, in a complex temporal sequence that underlies the formation of concepts" [9, p. 178–179]. Vygotsky begins to analyze the development of higher mental functions with the words: "The development of higher mental functions in the transition age reveals extremely clearly and distinctly the basic regularities that characterize the processes of development of the nervous system and behavior" [9, p. 111].

The movement of L.S.Vygotsky's thought is realized in the trinity of organism – psyche – culture. "Since

organic development is realized in the cultural environment, insofar it turns into a historically conditioned biological process. The development of speech in a child can serve as a good example of the fusion of two developmental plans—natural and cultural." [9, p. 22]. L.S.Vygotsky believes that it is only in the case of lesions that the mechanisms of the organism, which form an alloy with the psyche and through its mediation with culture, reveal themselves nakedly.

Our studies [16; 30] were aimed at studying the age specifics of the influence on the central and peripheral nervous systems of the process of reflection as an organized process and the processes of motive and will actualized during the performance of tasks of the technique, i.e., "free action" in general. As a stimulus material we used the projective technique "Imaginal-Reflexive Resource Methodology" (Sizikova T.E.) in the performance of tasks of which the achievement of results is possible only when performing a free action [20]. In this article, we conduct a comparative analysis of the previously obtained results:

1. The results of the electrophysiological study showed that in adult subjects (over 22 years old) after an act of free action, creative activity and "outward" orientation are observed, characterized by a decrease in power in the lower band of the theta rhythm (4–5.5 Hz), an increase in power in the upper band of the theta rhythm (7–8 Hz), and an increase in power in the lower band of alpha rhythm (8–9.5 Hz) and beta rhythm (14–20 Hz). In younger subjects (18 to 21 years old), the main changes are characterized by an increase in the power of only the lower alpha rhythm (8–9.5 Hz), which is associated with the activity of intellectual activity and attention processes directed outward rather than inward [30].

These results are not inconsistent with studies [27–29; 31] showing: 1) that the processes of reflection of "I" and others at a young age involve to a greater extent the affective and cognitive systems associated with the default mode network "2) that in children (11–14 years old) the activation in the medial prefrontal cortex during self-reference (one of the aspects of reflection) is much stronger than in adults (23–30 years old); 3) that in children and adults, the medial prefrontal cortex area is more activated during attributing phrases about self than during describing other people; 4) the medial posterior parietal cortex is more activated during attributing phrases about other people and society, with adults being dominated by the posterior precuneus, whereas children are dominated by the anterior precuneus and posterior cingulate. Similar results were found by Hatherton and colleagues [27]. They found increased activity in the medial prefrontal cortex during direct self-evaluation compared to thinking about traits possessed by a best friend [27]. The authors conclude that the neural correlates of the self remain different for close and nonclose friends.

2. In another part of the study, we investigated the influence of the act of free action on the balance of the autonomic nervous system (ANS) in adults, taking into

account age features and completeness of reflection development [16].

Our results showed that younger subjects are characterized by greater ANS sensitivity and sharper changes in heart rate variability (HRV) parameters compared to older subjects. The main shifts in the balance of vegetative regulation after undergoing this technique are associated with an increase in the parasympathetic component in providing adaptive reactions of the organism.

These results are consistent with studies [15; 17; 27] showing that by adulthood the prefrontal cortex, responsible for emotional regulation and impulse control, reaches full maturity. This allows adults to better regulate their emotions and reactions, resulting in more stable autonomic indices [15].

The principal novelty of our results is the confirmation of the age-related psychological boundary of qualitative changes in reflection at the level of the central and peripheral nervous systems.

Psychological qualitative changes in reflection were previously presented in our works [21–22]. The analysis of experimental data led to the conclusion that the age boundary of 22 years of age is transitional to new qualitative changes in the development of the triangular dynamic network of reflection modalities. Before the age of 22, young people tended to have distortions in reflection. A “right-sided asymmetry on the scales of reflection orientations to “systematicity” <...>, “creativity” <...>, “deductive way of processing information” <...>, “progressive reflection orientation” <...>, the mechanism “reflection – motive – will” <...>, and left-sided asymmetry on the scale “reflection orientation to fragmentation” were revealed [21, p. 84]. After 22 years of age, when performing three methods diagnosing the development of reflection (“Reflection Focus Questionnaire” by T.E. Sizikova; “Reflectivity Diagnostic Methodology” by A.V. Karpov and V.V. Ponomareva, “Differential Reflectivity Test” (DTR) by D.A. Leontiev and E.N. Osin), the subjects showed the results closest to adequate reflection.

Thus, the obtained results of psychological and psychophysiological studies, based on the ideas about the psyche as a whole and its regulating mechanism – free

action, which is a unity of psychological functions reflection – motive – will and its correlates at the level of the central and peripheral nervous systems, allow us to assert a qualitative change in the psyche caused by qualitative changes in free action initiated by changes in reflection.

Our research contributes to clarifying the peculiarities of reactions to explanations of others' actions in reflection of the social environment depending on age presented in the works of other scientists [1; 2; 12; 13; 17]. The studies indicate that at a young age there is a stronger autonomic response in reflection directed at the Other; in adulthood the autonomic response is more stable. The process of reflection in adulthood is associated with deeper elaboration at the electrophysiological level. These data are important for understanding the development of emotional regulation, reflection and, in general, free action in ontogenesis, its role in emotion management; understanding psychosomatic conditions and their correction; training and application of free action in helping practices.

Conclusion

1. L.S. Vygotsky's methodological reflection of his own views (system construction) has a discrepancy with the logic of his text (triangular network), which reveals the psychology of the development of higher mental functions and personality.

2. Free action, which represents the trinity of reflection – motive – will, is regulatory; its genesis is connected with the transformation of the trinity of awareness, logicity, and arbitrariness implanted in mental functions.

3. Free action, which regulates the dynamics of the psyche from the natural to the cultural state, has correlates at the level of the central and peripheral nervous systems.

4. Psychological and psychophysiological boundaries of qualitative changes in free action in adolescence coincide at the boundary of 22 years of age. The qualitative change includes the reaction of the organism to the free action carried out by the psyche: up to 22 years of age the vegetative reaction is more pronounced, after 22 years of age the electrophysiological reaction is more pronounced.

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