Review Article

Arbitrary regulation in the studies of A.R. Luria's school and his followers

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ABSTRACT

This article includes an appeal to voluntary regulation as a phenomenon that A.R. Luria continued to study after revealing the problem of voluntary regulation in Vygotsky's work. Thus, based on the basic conceptual provisions of the cultural-historical approach about the nature of higher mental functions of A.R. Luria extrapolates his understanding of voluntary regulation into the methodological apparatus of the theory and practice of neuropsychology. The article presents attempts to resolve the problem of arbitrary regulation under the leadership of A.R. Luria and his colleagues describe experiments on the mechanisms of voluntary regulation. It was found that during the experiments, the ability to subordinate to verbal control and control of motor behavior became possible as the internal verbal program developed. Thanks to the contribution of A.R. Luria and his colleagues, the study of the mechanisms of volitional regulation of speech received partial confirmation in practice, while at the same time calling into question the complete dependence of the work of the motor apparatus on established speech acts. A hypothesis regarding the participation of speech in the implementation of voluntary regulation is proposed for scientific discussion. Some provisions of the discussion dedicated to the legacy of A.R. are given. Luria in the modern scientific and cultural-historical context at the Faculty of Psychology of Moscow State University named after M.V. Lomonosov. [8]

Introduction

Highlighting the problem of arbitrary regulation in the studies of the prominent neuropsychology school led by Alexander Romanovich Luria, it is important to note the extensive nature of the conducted research and its comprehensive contribution to the conceptual framework of modern neuropsychology in both theoretical and practical directions.

The focus on A.R. Luria's school is primarily motivated by the fact that Luria extrapolates the main conceptual principles of arbitrary regulation mechanisms into the methodological framework of the theory and practice of neuropsychology. This is achieved through the study of speech mediation in children and adults, which, in turn, plays a role in the formation of arbitrary regulation of mental activity. Luria also discussed the brain mechanisms of speech regulation in his works.

The issue of impaired mechanisms of arbitrary regulation was first mentioned in A.R. Luria's volume "Frontal Lobes and Behavior Regulation" in 1967. [7] It is important to clarify that the term "arbitrary regulation" is not explicitly introduced in Luria's research; rather, he equates the process of regulation with management, conscious execution, allowing the control, regulation, and programming of activities.[7] This leads to the distinction between these two terms since arbitrariness is possible through regulation, and, according to A.R. Luria, it is tied to various forms. (Luria A.R. Fundamentals of Neuropsychology). Thus, it can be inferred that regulation can be both arbitrary and non-arbitrary, and its mechanisms will differ.

One of Luria's early books (Frontal Lobes, 1967) presented the concept of regulation through the functions of the frontal lobes and overall revealed the content of this term. The frontal lobes themselves are responsible for the regulation process of all human activities, encompassing components such as programming, regulation, and control, enabling management. In interpreting the meaning of regulation as implied in Luria's works, it involves the execution of all these components. At the same time, regulation is associated with initiative, formed through motivation, coordination of activities, and the evaluation of the results of this activity.[7]

In the book "The Steps of the Path Traveled," A.R. Luria writes about research conducted in the forties and fifties, focusing on studying the involvement of speech in arbitrary activities, particularly in the behavior of typical children and children with intellectual disabilities.[4]

In a series of experiments, speech was the means that organized motor acts in response to stimuli of various origins. The experiments aimed to identify the mechanism of verbal regulation of behavior in general. Experimental and control groups allowed delving into the regularities of the shift from organic to cultural (mediated) behavior. The latter was not observed in the group with intellectual disabilities. The key to the experiment was the sensorimotor methodology under the guidance of A.G. Ivanov-Smolensky. The essence was to present unlimited stimulus material in the form of verbal instructions, to which the child had to either press or not press (according to the instructions) in response to stimuli. According to the experiment protocol, children were not informed in advance about the method of execution (ways of responding to stimuli), assuming the emergence of a logical connection based on verbal reinforcement: in normal development, the child guessed combinations of responses to stimuli and formulated an internal program (strategy) through words. [4]

However, A.R. Luria did not accept the reliability of A.G. Ivanov-Smolensky's experiments, citing the lack of disclosure of the mechanism for forming these reactions. Subsequently, in a series of experiments with a group of typically developing children, the experimenters presented various verbal instructions to understand the boundaries of perception of these instructions. It was revealed that children at an early age lacked the ability to perceive long verbal instructions, which did not lead to the completion of tasks formulated by the experimenter. The ability to submit to verbal control was observed only in children older than four years and, with age, became more effective. From this series, it can be concluded that gaining control over motor behavior became possible as the internal verbal program developed. A similar series of experiments with intellectually disabled children did not yield similar results, demonstrating the possibility of only direct motor reactions and the impossibility of mediated instruction execution. It is worth mentioning that A.R. Luria initially explained the results of this experiment by relying on the balance of processes of excitation and inhibition, rather than on the difference in the level of mediation of speech activity. [7]

However, a little later, the sensorimotor methodology was implemented in a new series of studies by A.R. Luria together with colleague E.D. Khomskaya, focusing directly on the participation of speech regulation in motor acts. The first series was dedicated to the motor reaction to verbal instructions, the second to verbal reactions to instructions, and the third series included a combined reaction - verbal and motor simultaneously. [1]

Analyzing the results of all three series of A.R. Luria and E.D. Chomskaya came to the conclusion that the variant of combinations of verbal and motor reactions allows the instructions to be carried out in the most controlled and organized manner, in contrast to the first and second series. Thus, activity mediated by meaning represents a model of speech control of behavior. [1]

Experiments conducted under the guidance of O.S. Vinogradova and E.D. Khomskaya provide the opportunity to formulate hypotheses regarding the participation of speech and its significance for arbitrary regulation. Investigating the stability of the orienting reflex and the ability to sustain it for an extended period, they concluded that verbal instructions presented to the child enhance the stability of the orienting reflex. [1]

These studies indicate the signaling significance of verbal instructions from the experimenter, which became a decisive factor for the child, enabling them to perform the corresponding instructions. The assumption that the mechanism of arbitrary regulation in this case becomes the subject prompted the introduction of control groups with frontal and non-frontal lesions, responsible for executive regulation. In the experimental group cross-section, it was found that various components of the orienting reflex in frontal patients had completely different characteristics, but when verbal instruction tasks, carrying signaling value for the patient, were included, any fluctuations in the orienting reflex were smoothed out. [1] Continuing logically from E.D. Khomskaya's series of studies on the flow of the orienting reflex, we approach the genesis of the regulatory function of adult speech. A mother gestures to indicate an object, thereby redirecting the child's attention and highlighting that specific object from among others. Consequently, the child's attention is strictly determined by the speech of the adult, rather than the influence of stimuli. According to many physiologists, the mother shapes the child's orienting reflex, which inhibits the flow of instinctive processes. However, all of the above is characteristic only for the early infancy period. The true regulatory function of speech comes into play when the mother names an object, and the child provides a specific response. Nevertheless, a 2-year-old child is already capable of making a conscious choice, so they choose the object that elicits a strong orienting reaction. [1]

Here, the experimenter's work becomes more complicated: they must fixate the object in the child's consciousness (for example, by shaking it). Therefore, repetitive verbal instructions that create inertia and monotony in the action only hinder the execution of the instruction. Even greater assimilation of the experiment conditions by a 2.5-3-year-old child still indicates the

impossibility of complete obedience to the verbal instructions of an adult, as it conflicts with the child's personal experience. Therefore, the difficulty in assimilating more complex verbal instructions lies in the child's ability to overcome the influence of immediate impressions. [1]

Such emancipation typically occurs around the age of 3.5 years (for example, experiments with checkers and drawing a series of pictures according to a strictly defined pattern). Hence, a 4-year-old child is capable of understanding simple symmetry rules. A child at the age of 2.5 years does not yet possess the ability to comprehend complex verbal instructions consisting of 2-3 operations. They cannot coordinate their movements and allocate their attention. This capability only emerges towards the end of the third year of life, and even then, the child can barely control their movements. Therefore, the conclusion can be drawn that verbal instructions form an orienting reflex in the child, prompting them to further actions. The child reacts not to the meaning of the verbal instruction but to the voice and intonation. The process of blindly following verbal instructions is inert for the child, which can eventually lead to the inhibition of all reactions. [4]

Further experiments, where the child independently sets verbal and motor reactions, attempt to integrate them into a functional system. The results indicate a gradual formation of processes related to the regulatory function of speech in the child. A verbal command creates a peculiar motor impulse. In other words, the child is not yet capable of fully controlling their actions, and speech does not act as a driving force for motor reactions; rather, a discordance occurs. [4] For instance, at the age of three, motor reactions reinforced by verbal instructions organize the child's subsequent movements. Consequently, the child begins to grasp the semantic component of speech. This later allowed for the identification of speech disorders in cases of intellectual underdevelopment. A mentally retarded child aged 10-12 with pronounced imbecility can memorize a verbal instruction. However, the selective nature of speech reactions comes into play, acting as a kind of "impulse" for further actions. This leads to a disruption in both speech and motor reactions. Pathologically increased inertia in mentally retarded children results in speech not serving as a regulator of their movements. [4]

A completely different scenario is observed in children with cerebroasthenic syndrome: when combining verbal and motor reactions, there is a compensatory effect on movements. Speech acts as a regulator of their movements, normalizing motor reactions and thereby regulating the child's behavior. The decisive factor here is the role of the other system in forming a voluntary act: either speech or motor. Thus, children with intellectual disabilities and those with cerebroasthenic symptoms find themselves at opposite poles.

In this case, the diagnostic method is the correlation of neurodynamic processes in the speech system with corresponding processes in the motor system, helping to determine how speech processes directly relate to processes controlled by the motor apparatus. [5]

E.D. Khomskaya (1958), studying the latent period of motor reactions in children with cerebroasthenic syndrome, noted that the duration of these periods gradually decreased when exposed to external stimuli; signals of inhibition gradually appeared. At the same time, mentally retarded children developed stability in the latent periods of speech reactions to external stimuli, leading to their gradual stabilization and the disappearance of reactions that did not correspond to the strength and depth of the stimuli in response to signals of inhibition. [5]

Children with cerebroasthenic syndrome develop an opposite mechanism: a series of positive signals result in a longer duration of latent periods in motor reactions. These periods gradually start to manifest with some delay and, eventually, may disappear altogether.

It is thanks to A.R. Luria and his colleagues that the study of the mechanisms of arbitrary speech regulation has received partial confirmation in practice, simultaneously casting doubt on the complete dependence of the motor apparatus's work on established speech acts.

The issue of investigating the role of speech in arbitrary regulation is considered prospective and is actively discussed in contemporary scientific circles among neuropsychologist clinicians, theorists, and practitioners inheriting A.R. Luria's teachings. For example, during the Lomonosov Readings on November 18, 2011, the Faculty of Clinical Psychology raised the issue of studying disorders of arbitrary regulation of activity as a highly debatable topic. It is essential to present the main thesis of the roundtable participants, shedding light on the attempt to overcome the problem of understanding the disturbances in the mechanism of arbitrary regulation among modern proponents of Lurian methodology. [8]

The mechanism of arbitrary regulation, by its nature and functions, belongs to the structure of higher mental functions. However, any disturbance in the category of the mental (i.e., when dealing with psychopathology) somehow implies a violation of the arbitrariness of components of mental activity (A. Sh. Tkhostov). At the same time, the heterogeneous nature of the pathogenesis of various diseases, where the nature of the disturbance of arbitrary regulation is traced, questions the nature of its uniformity. [8]

If we conclude that arbitrary regulation permeates all human activities, it can be noted that mechanisms of its disturbance can be identified at different levels of activity: at the levels of operations, intentions, actions, motivations, etc. This raises doubts about correlations between awareness and arbitrariness or unconscious and non-voluntary. Contrary to seemingly clear consequences, there is a clear indication of the existence of conscious but non-voluntary actions, such as obsessive-compulsive disorders, anxiety, Tourette's syndrome, etc. This points to the impossibility of regulating complex forms of mental activity by humans when their nature is conscious. [8]

Conclusion

The diverse views within the discussion at the Moscow State University (MGU) department, as mentioned above, indicate that the involvement of speech in arbitrary regulation is a complex and interdisciplinary problem. It highlights a polyphonic perspective on the nature of arbitrary regulation and a plurality of opinions. A universally accepted and undisputed fact is the need for inhibitory links to regulate executive functions. An essential observation leading to speculation about the unresolved connections and mechanisms of arbitrary regulation is that the very quality of all mental processes influences arbitrary regulation, suggesting that speech may be involved in this process. Thus, the nature of the modern discussion dedicated to the anniversary of A.R. Luria is often referred to as pilotage, indicating an open problem regarding the mechanisms of arbitrary regulation and the participation of speech in implementing arbitrary regulation. [8]

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