

# Alexander Luria: Creator In The Perspective of Time

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**Abstract.** The purpose of the article is to reanalyze Luria's heritage from the point of view of anticipation. We describe the main concepts of Luria – “higher psychic functions”, the cultural-historical conception of development, the “functional system”. The language he used for his concepts’ exposition is discussed. The assumption is made that, although never using the word “anticipation”, Luria’s work directly addressed this phenomena in its social and neuropsychological aspects.

**Keywords:** Alexander Luria, Anticipation, History of Neuropsychology, cultural-historical conception, high psychic functions, functional system

## 1 Introduction

There are a lot of hypotheses and notions on human mind and brain – ranging from the idea that they simply reflect and react to elementary external stimuli, to the conception that human beings actively construct their own plans and world view. In this regard there are many productive ideas. A productive idea is not necessarily a correct one, but also one which gives birth to new concepts, helps scientists to create new approaches, and to see a phenomenon from new sides. Even if the idea itself could be wrong. Marx’ conception was this kind of productive idea for two Russian – Lev Vygotsky and Alexander Luria. They lived in the special historical periods when all aspects of civil life in Russia were undergoing reconstruction, and they could see how ideas change the society.

They attempt to understand the how the process of creating inner purposes is born in child. Their cultural-historical conception of development answers this question [1,2]. But when we analyze this conception in the present day, we need to remember two things. The first one is the language they used at that time. They could not use their own language to describe their ideas, and were restricted to the language of reflex theory. However, this language can not be well adapted for discussing process of anticipation, purposes, the future, etc.

The second aspect is a theoretical restriction – they could not speak about indetermination, uncertainty, fortuity. We could restore their theoretical construction from their whole texts and from their sequence of reasoning. This could help us to see the roots of modern theories in their works.

## 2 A.R. Luria and Developments of the Socio-cultural Conception of Human Mind

A.R. Luria (1902 – 1977) is the creator of neuropsychology in the USSR, and one of the founders of the cultural-historical approach to psychology together with the psychologist Lev Vygotsky (1896 – 1934). While the majority of scientists at that time, including the Russians Ivan Pavlov [3] and Vladimir Bekhterev [4], attempted to single out the basic elements of a complex psychological process, those which could be objectively recorded, Vygotsky and Luria sought to establish the psychology of a *real* person. In those days, this was impossible to imagine, but it turned out to be a true breakthrough in psychology of the 20<sup>th</sup> century. They began by distinguishing the natural, or basic, mental functions from the higher mental functions. Unlike those that are basic, the higher mental functions are formed during a person’s life as it develops in one or another culture, they are mediated by the word, have a hierarchical and consistent structure, and are to a substantial degree determined by the culture in which a person develops [5].

As L.S. Vygotsky, Luria supposed that the cause of voluntary action lies beyond the organism and its last experiential state. Instead, the sources of voluntary action lie in human social history, in the social forms of communication between a child and an adult at the beginning of ontogenesis. At this period, cognitive functions are “divided” between the child and an adult, since adults guide children’s action through speech. Over time the child acquires language and is able to organize its own action by means of his (her) own inner speech. The function that is

at first commonly shared and divided between a child and an adult is now internalized, and this internalization process forms the mechanisms for the organization of highest forms of active behavior. *This active behavior is social in its genesis, speech mediated in its structure, and voluntary in its type of realization* [6, p.7].

For example, Luria analyzed the social basis of attention according to this model. All organized human activity is defined through a selective relationship with the environment, at the basis of which lies attention. Luria marked out elementary (biological) attention and attention as a higher psychical function. The second form of attention is not the result of the biological development of the human organism, but is formed socially in the course of the child's communication with its caregivers. Adults point out objects for the child, and thus choose them among other possible ones. This maintenance of the child's attention is formed through a shared organization of social action, and leads to the development of voluntary forms of attention and action in the framework of higher mental functions. The same explanatory method for tracing the genesis of functions – through their primary occurrence on the interpersonal social plane to their secondary formation as intrapersonal capacities – was used by Luria to understand all higher psychic functions, such as memory, speech, and thinking, and by implication as underlying all human voluntary and anticipatory behavior [6].

It should be emphasized that Vygotsky, having begun his studies at the Law Faculty, graduated from the Historical-Philological Faculty, and many of his writings are devoted to philological and psychological analysis of literary works. Luria was also interested in the psychology of literature, he was acquainted with Eisenstein, with whom he discussed many of the latest psychological problems, and he was on very good terms with Lev Tolstoy, for whom historical events were directly connected with the individual decisions of specific people. Consequently, the idea of integrating history, culture, and human development in the milieu in which Luria and Vygotsky lived was not at all challenging: it required little more than articulation and substantiation. Moreover, they both enthusiastically availed themselves of the ideas inherent in Marxist theory, in particular the notion about the role of tools as intermediaries in any particular human endeavor. They proved that, as a psychological “tool”, language is the intermediary between people and the framework of their culture. Thus, while most psychologists at this time tried to incorporate all of psychology within the scope of a natural science based paradigm, these researchers created a new paradigm of psychology based on the knowledge of medicine, physiology, psycholinguistics, economics and literature [2].

Conditions in the country at that moment gave them the broadest possibilities for elaborating a cultural-historical conception, according to which a person's mentation is determined by the historical stage in which they are born and the framework of the culture in which they are raised in. All aspects of civil life in the country were undergoing reconstruction; the laws were changing, and so was lifestyle. This was also the time when the ambitious campaign to spread literacy to people in all corners of Russia was being launched. So, it was possible for them to find three groups of subjects, the study of which could test the validity of their cultural-historical conception: those who began to learn how to read and write as adults, those who had learned these skills during childhood, and those who had no formal education at all. Luria set off for Uzbekistan in 1931 and could conduct research there which confirmed the connection between people's mentation and their level of education. The differences in thinking among people who had school education compared to those who had never learned there were marked by the type of categorization they used (it was based to a greater extent on abstract symbols in the former group), the abilities to solve syllogisms, and the structuring of processes happening around them. Already in their first studies, they discovered that people who were unschooled did not have the perceptual illusions that residents of big cities were susceptible to [1].

Luria was ecstatic with the results that he had obtained and planned to invite his foreign colleagues to come to Russia so that he could show them proof that his theory was borne out by practical results. But after the first findings were published in 1932, work in this entire field was shut down, and they were forbidden to proceed further in this direction as well. The situation became so serious that Luria and his students went to Kharkov, where they stayed for some time, hoping that their efforts to validate the cultural-historical conception would be forgotten. In 1936, the use of psychological tests was also forbidden by a decision of the Central Committee of the Communist Party (b), “On Pedagogical Abuses Within the System of the People's Commissariat for Education”. In this document, it was specifically stated: “The Central Committee of the Communist Party (b) holds that the theory and practice of so-called paedology is based on pseudo-scientific, anti-Marxist concepts. First and foremost, this pertains to the main principle of contemporary paedology: the ‘principle’ of children's fatalistic dependence on biological and social factors, heredity, and some sort of immutable environment. This ‘principle’ stands in egregious contradiction to Marxism and the entire practice of building socialism, which successfully re-eduates people” [7]. It is sad that some of the leading psychologists of our time took part in the elimination of this line of research [8]. Today many of

the postulates of the historical-cultural conception seem to be self-evident [9], but at one time they were viewed as racist, since they attested to differences of thinking among people.

Eyewitnesses claimed that Vygotsky, having taken it very hard that they were unable to continue their research, gave in to his illness (he had tuberculosis), and this precipitated his early death in 1934. Up until these events, Luria and his colleagues, drawing upon the historical-cultural conception, had gone on expeditions in an effort to discern mediation patterns in the development of thinking through language, but now, though their task was the same, they conducted research in clinics, on both adults and children. From that point on, no matter what Luria undertook, though he used the language required of science by party officials, he did not stray from the paradigm of this new conception – mediation in the development of higher psychological processes according to culturally organized means of intellectual activity [10]. Only now, much of the research was conducted in clinics on children with developmental problems.<sup>1</sup>

In these circumstances, deprived of the opportunity to continue much of his research, Luria enrolled in a medical program and, immediately before the Great Patriotic War, became a neurologist. During the war, he studied a wealth of valuable material on soldiers' head wounds that led to changes in their psychological processes. The abundant post-mortem material provided an opportunity to establish the exact location of a wound and correlate it with the results of psychological research conducted at the time the patient was admitted to the hospital. He developed tools that make it possible to estimate the locus of a traumatic brain injury based on the person's psychological capabilities [6]. Neuropathologists all over the world used them right up until the advent of the computed tomography (CT) scan in 1970-s.

Immediately following the war, he was at the height of his creative powers, and in 1947 he published a monograph on aphasia [10], which went on to become the bible for neurologists in many countries of the world. In 1949, however, there was a session of the All-Union Academy of Agricultural Sciences, at which Soviet genetics was put to rout and the main schools of genetics were abolished. In 1950, at a similar session, called the Pavlovian Session (a joint session of the USSR Academy of Sciences and the USSR Academy of Medical Sciences), Soviet psychology, physiology and medicine were ravaged [2] in the name of the already deceased Pavlov. In university courses, psychiatry was replaced by another subject: Higher Nervous Activity. Scientists were forced to repent for their mistakes and to consider any science from the point of view of Pavlov's theory, in the way that it was viewed by those who organized this rout. To save their students, their families, and their loved ones, scientists had to penance for sins they had never committed. For Luria, this led to his dismissal from the Neurosurgery Institute, where he had been working up to that time, and his abandoning of some very important research [1].

It was at this time that the so-called Doctors' Plot began to heat up, in which eminent physicians were accused of improperly treating or even killing Communist leaders. Luria's daughter [11] recalls that he went to work carrying an attaché case, in which he had put everything he would need in case he was sent to prison. She writes that it was during this period that he felt the greatest despair. His family was the buttress that allowed him to live through this hard time. Luria got a job at the Institute of Defectology, and he began to study mediation in the thinking process of mentally retarded children. In 1956, Luria's book *Traumatic Aphasia* was published in English [10]. Once again, he began to travel abroad, where he tried to speak about the work that he and Vygotsky had done together.

## 2 The Problem of Anticipation

Although Luria did not use the word “anticipation” in his own research, he analyzed in detail how the processes of perception, construction of events from memory, and thinking involved the modeling of future events in the human brain, and problems related to the social mediation of this modeling. His main contribution in this regard was the description of the work of the frontal lobes. He proposed that the frontal lobes and the prefrontal region of cerebral cortex first of all were responsible for representing the future and verifying the adequacy of neural models to reality,

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<sup>1</sup> Luria was actively involved in psychological research being conducted all over the world, and very often developed what had already been embarked upon by other researchers. One such example was his study of the peculiarities of thought in monovular and diovular twins. Very little is known about this research, since it was conducted at a biomedical institute that was closed in 1936 as a result of the events described above.

in addition to regulating nervous system's tonus and modifying the level of wakefulness in accordance with the task which the human has set for itself.

In the introduction to his important and last book "Foundations of Neuropsychology", Luria writes: "It is obvious now, that human behavior is an *active* parameter, that it is influenced not only by the factors that occurred last, but by plans and intentions; human brain creates relevant models of the *future* and subordinates behavior to those models" [6, p. 7]. Further on he notes: "The direction of research on the mechanisms of how future influences real behavior gave rise to a whole series of important physiological concepts, for example, the concepts of "anticipatory arousal" by P.K. Anokhin or "motor task and its realization" by N.A. Bernstein. This is a sign of fundamental change of interests in physiological science, and its main task is now the creation of a "physiology of activity" [6, p. 8].

Following the works of P.K. Anokhin, Luria introduced the term "functional system" into neuropsychology. Functional system refers to a changing constellation of structures participating in the realization of some behavior. The set of structures and their activity depends on the concrete circumstances and goals of the subject. For each kind of behavior, a specific functional system is constructed for its achievement.

Analyzing the frontal lobes' functions, Luria affirmed that the human being does not react passively to incoming signals, but is able to form plans and programs of future activity, and to verify and regulate his (her) own behavior by adapting these programs to reality. The prefrontal regions of the frontal lobes were understood to enable the human being to orient both towards the present and the future. The latter aspect is reflected in the structure of the action acceptor in the theory of Anokhin.

I have written the above phrases in modern language. However, in much of his work Luria (and all psychologists in the USSR of that period) was restricted to reflex theory and forced to use a different language for expressing his thoughts. After the 1950 joint session mentioned above, it was impossible to teach courses of "psychology" at universities. These were substituted by courses of "Higher nervous activity" in which all mental activity had to be explained using the concepts of reflex theory. Luria's daughter remembered that he managed to explain modern psychology to students using this physiological language. (Interestingly, the course of "Higher nervous activity" remained in university programs till 2010) [11].

In considering Luria's works, including his views on anticipation, another important historical aspect needs to be considered. I have no printed information in this regard (and think it is absent), but it is worth referring to the information which I received in a private conversation with the academician A.S. Batuev (who died two years ago), a younger contemporary of Luria, Anokhin, and Bernstein. After 1950, when the word "psychology" was forbidden from being mentioned [12, 13], scientists-psychologists divided psychology into certain areas and agreed not to go to each-other's "territory" of research, not to criticize the works of each-other. It was an important method of survival, as far as positive scientific critiques could be used in these social conditions for the elimination of scientific directions. That is why Luria referred to the concepts of Anokhin and Bernstein without any corrections or remarks of his own, and used them without any changes in his own work. At the same time it is worth emphasizing that in Luria's texts, we can feel the profound respect he had for his colleagues.

Although he lived in a society preferring simplistic solutions, the distinctive characteristic of A.R. Luria as a researcher was his desire for the investigation of the real human being beyond any reductions or simplifications. With reference to the above-mentioned authors' systemic concepts of feedback, Luria considered that behavior is realized as a circular organization: there are structures planning for the future action, structures executing the action, and structures verifying the action's effectiveness and preparing the next cycle of adapting neural models to reality. As the creator of neuropsychology in the USSR, Luria's works were among the first to highlight the specific roles played by the prefrontal cortex in each of these processes, and laid the grounds for analyzing their structure not as elementary behavioral reactions, but in terms of conscious self-regulation connected with speech. Luria applied this description to all psychical processes [6].

For example, he considered that perception is an active process of the information search, extraction of essential parameters, verificaiton and matching of patterns, creation of hypotheses and comparison of these hypotheses with the initial data. The process of perception begins with the subdivision of incoming information into great numbers of ingredients. These ingredients are coded and synthesized in changing cognitive and neural systems. Luria showed that the process of parameters' selection and synthesis are active and influenced by the tasks human being has set to him/herself, and are guided by available codes (first of all language's codes) which divide incoming information into different systems. Inclusion into a system leads to the appearance of some categorization and generalization. In each perceptual cycle a verification of perception occurs in terms of such categories. When

new objects are perceived, the whole process is developed and reiterated. But in perceiving familiar objects, this process is attenuated.

In this respect, it's interesting to consider the socio-cultural position formulated by Luria: while a little child "thinks remembering", adults "remember thinking". In the most complex processes of synthesis, the child makes use of simple processes, whereas in adults, the simplest operations make use of the most complex forms of cognition. The insights this paradigm is able to offer for analyzing specifically human forms of anticipation still await the attention of modern psychology and anticipatory studies [6].

### 3 Concurrent Lines of Research

It's appropriate to mention here a line of research that Luria himself seldom spoke about, but which, from our point of view, has enormous prognostic significance. As part of his research on aphasia, he began to study the functional asymmetry of the brain and developed a number of tests that make it possible to come up with a profile of functional sensory-motor asymmetry [6]. He assumed that it was this profile (i.e., a set of indicators showing the participation of the left and right sides of the sensory and motor spheres in different activities) that reflects the functional features of the hemispheres in the brain. At the time when he was doing his research, there were no CT scans. It was impossible to verify this idea. Even so, by relying on the diagnostic tool that he had developed, and sometimes modifying it, many researchers have obtained important data about how people with different types of lateralization profiles have different susceptibilities to one or another disease and adapt in different ways to natural and social conditions [14,15]. Luria himself, having discovered yet another scientific "goldmine", was unable to delve deeply into this research, since he died in 1977.

Today, in much of the research being carried out in other countries on the functional asymmetry of the brain, tests are not used. Instead, subjects are asked to fill out questionnaires over and again – although it has been shown that people do not always accurately describe their capabilities. In one of our studies, almost 30 percent of the subjects who wrote in the questionnaire that they do everything with their right hand were unaware that they perform many tasks with their left hand [16]. What is more, rather than evaluate the profile, researchers typically examine the link between psychological characteristics and a specific lateral activity. This makes it difficult to take into consideration a central feature of higher mental functions – their systematic nature. In our view, a return to the idea of a manifestation of lateralization as part of integrated behavior, and not isolated actions, could provide the impetus for a new understanding of the functional structure of the brain.

### 4 Conclusion

What is the real contribution of Luria to the modern concept of anticipation? We have mentioned he never used this term. But in his understanding of human brain functioning, the idea of anticipation is clearly expressed. Human perception includes activity cycles, during which the brain adapts its anticipations to reality. Human conscious behavior includes the formulation of conscious purposes. Then brain anticipates both needed activities the possible results of this activity in reality.

He thought there are many functional systems in our brain that are the constellations of neurons which included in specific behaviors. At the same time, a single neuron could be included in different constellations (different functional systems). Not a neuron but their constellations predict functions. Now, "functional system" are referred to as neuronal networks. This constellation is not a stable set of neurons, but adapts to the situation and changes during human learning.

In our work we have developed Luria's thoughts about unconscious human behavior. However, we have done nothing more to investigate human conscious behavior with conscious purpose. This part of his work is more fundamental, and it is still awaiting our analysis.

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