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**ALEXANDER ROMANOVICH LURIA (1902-1977)
AND THE MICROGENETIC APPROACH TO THE
DIAGNOSIS AND REHABILITATION OF TBI
PATIENTS SUMMARY**

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Олександр Романович Лурія (1902-1977), російський психолог і невропатолог, визнаний у всьому світі як один

із найвідоміших і впливових психологів 20-го століття, який працював в багатьох наукових галузях, у тому числі когнітивній психології, вивчаючи процеси навчання й забування, психічну відсталість і нейропсихологію. Наукова кар'єра О.Р. Лурія була побудована в стилі “здійснені етапи подорожі” (як говорить російська назва автобіографії О.Р. Лурія): спільна робота з Л.С. Виготським (1896-1934) і Фондом культурно-історичної школи (1920-і роки), крос-культурні дослідження, експедиції до Центральної Азії, дослідження близнюків (1930), війна і перші роботи по вивченню пацієнтів, які страждають ураженнями мозку (1940), дослідження розумово відсталих дітей, які страждають черепно-мозковими травмами та їх реабілітація (1950), систематичний розвиток нейропсихологічних досліджень (1960-і та 1970-і роки).

Дослідженнями функціонування мозку, процесами навчання й забування, уваги й сприймання як психологічних конструктів О.Р. Лурія займався протягом сорока років. Аналіз функціональних змін, пов'язаних із локальними ураженнями мозку, представляли найбільший інтерес для вченого. В останні роки життя в центрі уваги О.Р. Лурія був індивідуальний підхід до неврологічних досліджень. у цій статті ми здійснемо спробу показати вплив мікрогенетичного підходу О.Р. Лурія до діагностики й реабілітації хворих із травматичними ураженнями мозку.

Ключові слова: нейропсихологія (історія), мікрогенетична теорія. Там немає надії знайти джерела вільної дії у високих сферах розуму або в глибині мозку. Ідеалістичний підхід феноменологів такий же безнадійний, як позитивний підхід натуралістів. Щоб віднайти джерела вільної дії, необхідно вийти за межі організму, і не в інтимній сфері розуму, а в об'єктивних формах соціального життя треба шукати джерела людської свідомості й свободи в соціальній історії людства. О.Р. Лурія.

Александр Романович Лурия (1902-1977), русский психолог и невропатолог, признан во всем мире как один из самых известных и влиятельных психологов 20-го века, который работал во многих научных областях, в том числе когнитивной психологии, изучая процессы обучения и забывания, психическую отсталость и нейропсихологию. Научная карьера А.Р. Лурия была построена в стиле “предпринятые этапы путешествия” (как говорит русское название автобиографии А.Р. Лурия): совместная работа с Л.С. Выготским (1896-1934) и Фондом культурно-исторической школы (1920-е годы), кросс-культурные исследования, экспедиции в Центральную Азию, исследования близнецов (1930), война и первые работы по изучению пациентов, страдающих заболеваниями мозга (1940), исследования умственно отсталых детей, страдающих черепно-мозговыми травмами и их реабилитация (1950), систематическое развитие нейропсихологических исследований (1960 и 1970 гг.).

Исследованиями функционирования мозга, процессами обучения и забывания, внимания и восприятия как психологических конструктов А.Р. Лурия занимался в течение сорока лет. Анализ функциональных изменений, связанных с локальными поражениями мозга, представляли наибольший интерес для ученого. В последние годы своей жизни в центре внимания А.Р. Лурия был индивидуальный подход к неврологическим исследованиям. В этой статье мы попытаемся показать влияние микрогенетического подхода А.Р. Лурия к диагностике и реабилитации больных с травматическими повреждениями мозга.

Ключевые слова: *нейропсихология (история), микрогенетическая теория. Там нет надежды найти источники свободного действия в высоких сферах ума или в глубине мозга. Идеалистический подход феноменологов столь же безнадежный, как позитивный подход*

натуралистов. Чтобы обнаружить источники свободного действия, необходимо выйти за пределы организма, и не в интимной сфере ума, но в объективных формах социальной жизни надо искать источники человеческого сознания и свободы в социальной истории человечества. А.Р. Лурия.

Alexander Romanovich Luria (1902-1977), Russian psychologist and neuropsychologist, is recognized throughout the world as one of the most eminent and influential psychologists of the 20th century, who made advances in many areas, including cognitive psychology, the processes of learning and forgetting, mental retardation and neuropsychology. Luria's scientific career was built in "the stages of a journey undertaken" (as the Russian title of Luria's autobiography says): co-working with Lev S. Vygotsky (1896-1934) and the foundation of the cultural-historical school (the 1920s), cross-cultural research, an expedition to Central Asia, and studies on twins (the 1930s), the war and the first works on brain injured patients (the 1940s), research into mentally retarded children, brain injuries and rehabilitation (1950s), the systematic development of neuropsychological research (the 1960s and 1970s).

The research on the functioning of the brain, touching on learning and forgetting, attention and perception as psychological constructs, was to engage Luria for forty years. Analysis of functional changes resulting from local brain lesions constituted the area of greatest interest. The single-case approach to neurological studies was to be the focus of his last years. In this paper we attempt to show the impact of Luria's approach on the foundations of the microgenetic approach to the diagnosis and rehabilitation of patients with traumatic brain injuries, and especially the importance of symptom analysis in single-case studies.

Key words: *neuropsychology (history), single case study, microgenetic theory. There is no hope of finding the sources of*

free action in the lofty realms of the mind or in the depths of the brain. The idealist approach of the phenomenologists is as hopeless as the positive approach of the naturalists. To discover the sources of free action it is necessary to go outside the limits of the organism, not into the intimate sphere of the mind, but into the objective forms of social life; it is necessary to seek the sources of human consciousness and freedom in the social history of humanity. To find the soul it is necessary to lose it. A.R Luria

Introduction. Alexander Romanovich Luria (1902-1977) was a world famous neuropsychologist, whose work was to have an impact upon many areas, including cognitive psychology, learning and forgetting and mental retardation, and above all neuropsychology. During the year 2012, which is the 110th anniversary of his birth, a number of congresses have been organized in his honor. A congress in Moscow is one of the main events, including a wide variety of papers, with papers by the authors of the present study among them. Each speaker will point out some aspect of the work of Luria, depending on the way in which they are familiar with his research: as a pupil and/or coworker, as a psychologist or neuropsychologist, or as a historian of psychology, neuropsychology or culture. Despite the variety of presented topics only a part of his vast and complex scientific activity is taken into account, which runs the risk of over-simplifying Luria's theoretical and methodological contributions.

The biography written by Luria's co-worker, Evgenia D. Homskaya (2001), gives us a sufficiently well-informed and well-constructed picture of Luria's scientific career (Mecacci 2005). The index helps us to single out "the stages in the journey undertaken" (as the Russian title of Luria's autobiography says): co-operating with Lev S. Vygotsky (1896-1934) and the foundation of the cultural-historical school (the

1920s); cross-cultural research, an expedition to Central Asia, and studies on twins (the 1930s); the war, the front and the first works on brain injured patients (the 1940s); research into mentally retarded children, brain injuries and rehabilitation (the 1950s); and the systematic development of neuropsychological research (the 1960s and 70s). However, it is difficult to obtain an integrated concept of Luria's attitude towards a theory of the symptom in neuropsychology, from his autobiography or from the monographs hitherto written about him. Some authors are bewildered by the wide dispersion of Luria's work, seeing him as moving from developmental psychology to neuropsychology, and from the child, mostly normal, to the adult, mostly brain-injured.

A brief sketch of Luria's life

Alexander Romanovich Luria was born in Kazan, an old Russian university city east of Moscow, in 1902. He was the son of a prominent physician, interested in psychosomatic disorders, Roman Albertovich Luria. His mother, Evgenia Viktorovna (nee Haskin) was a dentist. In 1918, Luria gained his high school graduation certificate before the usual graduation date, entered the Faculty of Social Sciences at Kazan University at the age of 16, and obtained his degree in 1921 at the age of 19. While still a student, he organized the Society of Social Sciences. Later, as an assistant at the Institute for Labor Organization in Kazan, he established the Kazan Psychoanalytic Association, and planned a career in psychology. He corresponded with Freud. As a result of this interest, he wrote a book, which was published in the United States, entitled *The Nature of Human Conflicts* (1932). He describes in it attempts to study emotional states by recording motor and vascular responses (Cole et al., 2006).

In the early 1930s Luria undertook clinical trials that formed the basis of the creation of a new field – neuropsychology – which in turn was to bring him worldwide fame. Then he completed his education at the Institute of Medicine, obtaining

his medical degree in 1937, and began working at the Institute of Neurosurgery.

In 1941, as a result of Germany's attack on the USSR, Luria was appointed director of a hospital in the Urals. He wrote several works on the diagnosis and treatment of gunshot wounds to the head, and developed a theory of rehabilitation of patients with brain damage, with particular emphasis on aphasia. Among his colleagues were such well-known psychologists as Zeigarnik and Rubinshtein, and the neurologists Perelman and Basin (Pačalska 2007).

In 1944 Luria's first neurological writings in English were published, though fame in the West was to come only with the translation into English of the article "Brain disorders and language analysis," published in *Language and Speech* (1958), and the book *Traumatic Aphasia* (1959). It was then that his work on brain injuries became known. Evidence of specific brain functional organization was found by Russian psychologists in studies of the mental activity of a deaf-mute child, a mentally retarded child, an adult suffering from brain injury, or a psychiatric patient. Examples seen in chronic deformations at birth and lesion cases in adults showed the human brain's ability to program and re-program itself.

Hierarchical model of cortical function

The first to suggest the use of anatomical criteria in the delineation of cortical area hierarchies was Flechsig (see: Kolb & Whischaw 2003), though it was to be Alexander Luria during the 1960s who was to fully elaborate the concept (Luria, 1973). Luria divided the cortex into two functional parts:

- the posterior part of the cortex is the sensory unit, which receives sensations, processes them, and stores them as information;
- the anterior cortex (the frontal lobe) is the motor unit, which formulates intentions, organizes them into programs of action, and executes the programs.

Luria (1966) showed that the two cortical units possess a hierarchical structure, within which three cortical zones are functionally placed above each other:

1. The first zone is equivalent to Flechsig's primary cortex.

2. The second zone consists in the slower-developing cortex bordering the primary cortex, labeled by Luria the "secondary cortex."

3. The third zone, the slowest-developing cortex, was designated the "tertiary cortex."

Consider a simplified example of Luria's model. Say you were walking along and came upon a soccer game. The actual perception of the movements of players and the ball would be in the primary visual area. The secondary visual sensory zone would recognize that those activities constituted a soccer game. In the tertiary zone, the sounds and movements of the game would be synthesized into the realization that one team had scored and was ahead and that the game had a certain significance for league standings. By the time the information is integrated in the tertiary zone, there is considerably more to it than what we would *Pachalska & Kaczmarek, Luria and the microgenetic approach*.

The dark blue-shaded areas are primary zones; medium-shaded areas secondary zones; lightshaded areas tertiary zones. Sensory input travels from primary to secondary to tertiary and is thereby elaborated from sensation into symbolic processes. (B) The second functional unit of the cortex – the motor unit. Symbolic processes from the sensory unit are translated into intentions in the tertiary motor zones and then into patterns of action in the secondary and primary motor zones [*After: Pachalska & Kaczmarek 2013*] think of as "sensory." It is both knowledge of what has been perceived just now and of the rules of the game as well.

The paralimbic cortex is activated for memory processing and the amygdale for emotional assessment by information in the tertiary sensory zone. Subsequently the cortical events would activate intention in the frontal (motor) cortex's tertiary zone with regard to a viewing spot and team support. This plan's execution is formulated in the secondary frontal zones. The crowd's actual movement is initiated within the frontal cortex's primary zone (see also: Luria 1966).

Evaluation of the hierarchical model

Kolb & Whishaw (2003) point out that Luria's model is based on three main assumptions:

1. Information is serially processed by the brain, a step at a time. Sensory receptor information goes first to the thalamus, then the primary cortex, then the secondary, and finally the tertiary. In a similar way, output travels from the tertiary sensory to the tertiary motor, then the secondary motor and finally travels to the primary.

2. Serial processing is hierarchical; meaning that complexity is added by each level of processing, one qualitatively different from that at the previous levels.

The tertiary cortex could be viewed as a "terminal station," given that it re-ceives input from the sensorimotor and perceptual areas while performing higher cognitive processes on that input.

3. The way we see the world is as unified and coherent entities. Luria's formulation agreed with the commonsense view that each percept is created by some active process, and the simplest way for it to be formulated is in the tertiary cortex.

The application of the then known anatomical organization of the cortex constitutes the strong point of Luria's premise, allowing for a rudimentary explanation for Luria's daily clinical observations (Luria 1973). Problems arise in relation to the questioning of fundamental assumptions on the part of more

recent anatomical and physiological findings (Papathanasiou & Whurr, 2000; Ronning et al. 2005; Rosenthal 2005; Rosenthal & Desi 2005).

The following should be considered:

- Firstly, for a strictly hierarchical processing model to work, all cortical areas should be linked serially, but such a serial linkage does not happen. That cortical areas have reciprocal (reentrant) connections with the regions to which they connect has been observed, meaning there is no simple “feed forward” system. The percentage of possible connections among different areas in a sensory modality has been found to be only about 40%. Therefore there is no single area which receives input from all the other areas, which creates difficulty in the conscious forming of a single percept in one area.

- Secondly, every cortex zone has connections to many cortical areas, representing a situation wherein each cortical zone is probably undertaking more than one operation, this being subsequently relayed to different cortical areas. In addition, the results of the same operation are likely to be of interest to more than one cortical area, which would account for multiple connections (Kolb & Whishaw 2003). The primary visual cortex displays these principles, since it appears to compute data related to color, motion, and form. These calculations are transmitted to specific cortical regions, which enable a given object’s recognition, and simultaneously other cortical areas that make naming possible. In addition, the calculations are sent to subcortical regions that make it possible to remember and giving rise to an emotional attitude towards the object. This being the case, does every serially connected new area perform increasingly complex operations?

Probably this is not the case, since an area like the primary visual cortex that processes color, shape and motion can be considered more complex than an area that processes only color (see Brown 2004). It appears that Luria’s views on the

homogeneity of perception are not correct. It is well known that we can still experience one observation, despite the fact that there is one final terminal which makes this observation.

Toward the microgenetic model

The question arises: How can we put this knowledge together in a meaningful way to see organization in the cortex if we do not accept Luria's hierarchical model? According to Felleman and van Essen (1991) there can be two possibilities:

1. there is no hierarchical organization, but instead a kind of non-ordered neural network. As an individual organism gains experiences, the network orders itself in some way, thereby producing perceptions, cognitions, and memories. Many neural network models of brain function propose this to be what actually happens. However, the results of a wealth of perceptual research suggest that the brain filters and orders sensory information in a species-typical fashion.

2. The cortical areas are hierarchically organized in some well-defined sense, with each area occupying a specific position relative to others, though with more than one area being allowed to occupy a given hierarchical level (see also: Kolb & Wishaw 2003).

These authors suggest that a pattern of "forward and backward" connections could be used to determine hierarchical position. Thus, ascending (or forward) connections terminate in layer IV whereas descending (or feedback) connections do not enter layer IV, usually terminating in the superficial and deep layers (see Figure 3). They also recognize a third type of connection, one columnar in its distribution and terminating in all layers. A basis for placing areas in the same location in the hierarchy is provided by this rare type of connection. A model was then developed by Felleman and van Essen based on these assumptions, called a Hierarchical Distributed System. Here various information levels correspond to different phases in the formation of perceptions though a correspondence to different

qualities of the perception created in the streams of information. It is noteworthy that some signals bypass the intermediate levels; with hierarchical development, the number of areas increases. In summary, the higher up in the hierarchy in this model, the more fragmented is the system.

This model and those similar to it have the disadvantage that by becoming increasingly complex that are unable to explain “holistic” phenomena, such as consciousness, identity and personality. Ultimately it is unclear which are the “bottom-up” and which the “top-down” connections as a result of the relativity of the whole approach. Those models presented earlier likewise assume that the brain gradually makes the overall observation from incomplete pieces of information; as perception develops, the brain uses a hierarchical system, which gradually dissipates. Here there is a logical contradiction because the premises are defective, e.g. the brain is viewed as an engineer-designed machine rather than the product of evolution and development. Kolb & Whishaw (2003) in reviewing the literature on animal research show that the spinal cord initiates the levels of function, while they terminate in the cortex.

This hierarchy of functionality may be demonstrated by the examination of animals that have been subjected to the removal of increasing amounts of brain tissue. We are here reminded that the cortex is made up of two basic types of neurons – the spiny and the aspiny – organized into about six layers. The cortical layers can be considered sensory, motor, and associational (Purves et al. 1999). The cortex is vertical in organization, referred to as columns or modules (Berridge 2000). Cortical modules can be seen in the spots and stripes visible in specific histological preparations (Peters & Jones 1984-1989) and through the application of neuroimaging technologies (Kropotov 2009).

Multiple representations of sensory and motor functions exist in the cortex. Among evolutionary changes that have been

taking place in mammals there has been an increase in the number of representations. Cortical connectivity is characterized by reentry: each cortical area is reciprocally connected with many, but not all, other regions in a given sensory modality. The cortex processes information about the world in multiple representations, and these representations are not formally connected; yet we perceive the world as a unified whole. This conundrum is the “binding problem.” Feedback loops influence cortical activity, not only from other cortical regions, but also from subcortical forebrain regions, such as the amygdala and hippocampus. The cortex is functionally organized as a distributed hierarchical network (Brown 2001; Kolb & Whishaw 2003).

These assumptions correlate with the microgenetic model developed by Jason W. Brown since the 1970s, and then elaborated by his students and colleagues, and presented in a series of monographs and articles (see Paçhalska & Weber 2008; Paçhalska et al., 2012). The conversations and correspondence between Brown & Luria (Brown 2001; Paçhalska 2002; Brown & Paçhalska 2003) also constituted a forum for the examination of this problem.

Research on traumatic brain injuries

Luria concentrated his work on the psychological effects of brain lesions from the early 1940s. Like Goldstein, he was a strong opponent of strict location views. In many of his publications he strongly disputed the tradition derived from the theory of Wernicke. In 1947 came the first monograph on this topic, “Travmaticheskaya afaziya” (Traumatic Aphasia) published in 1947 (Luriya 1947), which has been translated into English (Luria 1959). In 1948 he wrote “Vostanowlenye funkcyi posle voennoi travmy mozga”), which also has been translated into English (Luria 1963).

Luria’s works devoted to the descriptions of patients following traumatic brain injury can be considered in three periods.

- the war, the front and the first works on brain injured patients (the 1940s),
- research into brain injuries and rehabilitation (the 1950s),
- the systematic development of neuropsychological research (the 1960s and 70s).

A very significant aspect of Luria's approach was the close connection between the assessment of disorders and therapeutic procedure (Kaczmarek 2012). This made it possible to achieve a deeper insight into the difficulties encountered by patients, and led to the refinement of the course of therapy at the same time. For forty years, Luria conducted research with great success on the functions of the brain, including such psychological constructs as learning and forgetting, attention, and perception. He was most interested in analyzing changes in function as a result of focal brain lesions.

Luria's classic cases in neuropsychology

In the late 1950s, Luria was permitted to return to the study of neuropsychology, which he pursued until his death from heart failure in 1977. In the years just prior to his death, he returned to his earliest dreams of constructing a unified psychology, in which brain studies would provide a common basis. The most significant factor was for him the impact of brain damage on psychological functions.

He believed that higher cortical functions incorporate complex systems, and for this reason each focal brain lesion may lead to the disorganization of a great variety of higher cortical functions, which include a component (factor) immediately affected by the lesion in a cerebro-cortical area. It is in connection with this that each and every symptom manifesting a disturbance of important cortical functions may be of a multivalent nature, and special work is needed to analyze the mechanisms resulting in the appearance of a given disorder (qualification of the symptom), so that clinical significance might be attached to

the observed defect. Detailed analysis of the symptoms allows one to reach to the causes of disturbance despite its ambiguity. However, it is necessary to separate the symptoms caused by whole brain damage (e.g. increased intracranial pressure) from the symptoms caused by focal damage. At the end of Luria's life, he was especially focused on the problem of the single-case approach in neuropsychology. He published two case studies. The first of these publications presented a man with an exceptional and idiosyncratic memory (Luria, 1968). The other book described Lieutenant Lova Zasetki, who suffered a brain injury at age 23, during World War II (Luria, 1972) occipital area of the brain. The process of inflammation following injury caused adhesions in the meninges and inflammatory changes in the adjacent brain tissue. Neurological examination revealed hemianopsia. In the initial phase of the disease there were also hallucinations. Zasetki (Luria 1984:50) describes it in his diary in the following way:

For two days I did not close my eyes. At that time, hallucinations seemed to be bound to me. Oh, hurt! I close my eyes and open them again soon, because in my eyes there is something strange – the face of a man with huge ears (I think) and with huge eyes, or just show to me the different faces, objects, various freaks, so, because of fear, I quickly open my eyes.

In addition, the patient exhibited impaired memory and speech – he forgot necessary words. Moreover, he also experienced difficulties with writing and reading, and he searched long in his memory for the relevant words, despite knowing three languages. Understanding what others had said also required a great effort.

Pąchalska & Kaczmarek, Luria and the microgenetic approach Zasetki states (Luria, 1984:140):

I listen to what the teacher says, and it seems to me that I understand: words seem familiar to me, but when I start to listen to every word, I stop even for single words – I cannot remember

its meaning, its real image ... the teacher says ... words run .. run and disappear along the way. Words evade somewhere in the memory and in no way can they recall themselves.

This statement clearly shows how the processes of perception, attention, memory and speech are coupled with each other. The patient had also lost the capacity for spatial orientation and got lost even in familiar surroundings. He displayed an impaired body schema. Zasiocki himself described it as follows (Luria 1984: 53):

I often forget where, in what place is my forearm or buttock. I know what is the arm, and I know that it should be close to the forearm, but where, around the neck or hand? The same applies to the word „rear”. Are they closer to the knees, or rather the pelvis?

The patient described being lost not only in relation to visual-spatial orientation, but also was unable to determine the source of sounds coming to him. Hewrote (Luria, 1984:65-66):

During the walk I even more lose orientation: where am I now? I often wander a few steps from the house. After the injury my orientation disappeared in the position of sound sources, and so it has remained ... Often I have to turn around, until I realize how sounds are flowing ... I see another weak point - I stopped to orient myself in the direction of the sound, simply say in the space of the sound. I do not know why it happened, but it is like that, I can only guess from where the sound comes, seeing mouth movements or other external symptoms of it.

He lived in a world without memory, and for thirty years he tried to recover at least the crumbs of it. He had also a destroyed imagination. Because he could not remember the events of the recent past, he gained a strategy of recalling events from the end. He writes about it in the following way (Luria 1984:113):

Most of it reminded me of the distant past, from early childhood, and of the period of elementary school. I define it as a

life and remembering 'backwards', because it's easier to remind myself of the facts from the distant past, from the kindergarten.

As Luria stated (1984:48), he was completely lost in the world, could not understand it because the whole world had broken into a thousand tiny pieces. This was expressed by him in the following words (Luria, 1984:48):

After the injury I do not see any object as a whole, not one thing, I'm now forced to guess all the time these objects, phenomena, everything that is alive, that is, to imagine them, connect in the memory as a whole, to receive them not directly, but through imagination. Even a small inkwell is not seen in its entirety.

The important question that should be put is this: what happened to the brain of Zasetki, that his world broke into a thousand tiny pieces? Luria attributes these disorders to the impairment of tertiary cortex, the parieto-temporo-occipital juncture (temporo-parietalo-occipitalis, TPO) in particular. This zone is responsible for the analysis and synthesis of impressions received. In classical neuropsychology these disorders would be defined by the term Gerstman's syndrome, due to the symptoms of anomia, body agnosia, acalculia and visuospatial deficits (Kaczmarek et al., 2003). A similar interpretation would be presented by modern neuropsychology. It should be noted, however, that the syndromological analysis presented by Luria is closest to the concept of the neuropsychology of process (Pačalska & Kaczmarek 2013). In sum, the case study presented by Luria illustrates the blend of classic, experimental approaches with clinical and therapeutic approaches so characteristic for Luria. It is just such a form of synthesis that may stand as a model for contemporary cognitive science.

The microgenetic approach: the origin of the symptom

One of the fundamental problems in neuropsychology is the origin of the error or symptom, comprehended as an unexpected deviation from normal behavior. For Luria, a theory

of symptom was a sine qua non for neuropsychology, though he himself did not possess a definitive theory. Instead, he applied in various situations the insights of others, including Pavlov, Wernicke, Vygotsky, Goldstein and Brown (see also: Paçhalska & Kropotov 2013). However, Luria pointed out that the normal and the pathological should not be considered as two poles, one positive and the other negative, but rather as two qualitatively different dimensions, through which the interaction between the human being and the environment is developed. If the normal becomes a normative parameter (for example, to be able to read and to write in a Western industrialized country), that is what has to be followed or adopted by an individual in a given historical and cultural context, and depends on the demands of that particular context. In other words, alexia may be considered a “pathological” condition only in a context where reading is considered a “normal” ability of every individual (Mecacci 2005).

In microgenetic theory, the symptom is a link from the pathological to the normal, a piece of preliminary behavior that becomes a momentary terminus. In both normal and pathological behavior, microgeny deposits a cognition in the same way that phylogeny and ontogeny deposit the human mind/brain. There is progressive zeroing in on the target over growth planes in brain evolution, moving generally from whole to part, context to item, depth to surface. The microgenetic approach reconsiders the regression hypothesis advanced in a different form by such earlier thinkers as Hughlings Jackson and Roman Jakobson (Brown & Paçhalska 2003).

In contrast to the prevailing assumption that brain function is dynamic and structure is static, the process of structural growth (morphogenesis) and behavior turns out to be one and the same process, reiterated over time, such that behavior is four-dimensional morphology. In order to understand the morphogenesis of brain and behavior, it is necessary to

consider the role of two concepts: parcellation and heterochrony. Parcellation is the achievement of specification from the sculpting of exuberant initial growth. Heterochrony refers to the timing of development. In particular, neoteny (the prolongation of an early phase of development) creates the potential for new behavioral possibilities, adaptive or maladaptive. A symptom occurs when a lesion delays a segment of process (neoteny) with incomplete specification (parcellation). The regression hypothesis is reformulated thus: pathology does not expose stages in the reverse of the acquisitional sequence, but rather the process leading to the stages. Several long discussions that took place when Brown visited Luria in Moscow, and the subsequent exchange of written correspondence (see Fig. 6), led to a consensus between them:

...further evidence that symptoms undergo a coherent, rather than piecemeal transition is provided by observation of the recovery of function after brain damage. Some aspects of the theory can provide a motivation for research and a strategy for treatment (see: Brown & Pachalska 2003).

At the time Brown visited Moscow, Luria was emphasizing the importance of further studies on the frontal lobes. Shortly before his death he was looking at story recall in cases of frontal tumor and vascular lesion. He was impressed by the fact that such patients showed derailments in recall, but eventually were able to retrieve the core events of the story and its meaning. The importance of these cases pertains to inter-sentential connectedness in the generation of utterances from memory or, conversely, the effect of frontal lesions on memory and conceptual associations in recall. Other “frontal lobe” topics that were of interest to him at the time included the degree of generality or specificity in perseveration (motor, speech, writing, and so on) according to the laterality and depth of the brain lesion, and the application of electrophysiological measures of habituation to phonological and semantic stimuli in cases

of adult brain damage and normal and retarded development (Pribram & Luria, 1973).

Luria did not leave behind a fully developed program of neuropsychological research to be implemented by his followers, but his ideas were so wide-ranging and powerful that they will continue to influence the field for years to come. In Brown's opinion, "The work on the frontal lobes was ingenious and innovative and, more importantly, was on the right track; the work on memory, aphasia and perception will not survive; and the functional system approach will follow the uncertain fate of componential theory" (Pachalska et. al. 2012).

Luria, like Brown himself, was critical of the quantitative neuropsychological test batteries that have dominated work in the field, and believed that psychometric methods should not replace a thorough bedside examination with emphasis on qualitative change (Akhutina & Tsvetkova, 1983). The nature of the symptom was of crucial importance. This insight was in turn an important inspiration for the development of the microgenetic theory of the symptom (Brown & Pachalska 2003). Luria always stressed his debt to Lev Vygotski (1934 -1962), whom he used to call a genius. It is certainly true that the ideas of Vygotsky have a microgenetic dimension, especially studies of the development of inner speech, as well as his belief that the role of language was mediation, through the internalization of egocentric speech as verbal thought (Brown 2002, p. 3). The laws of thinking, of concept formation, and the transformation of word meanings were studied over the course of development and during the performance of a specific task. The implications of these studies for microgenetic theory and their exploration in adult aphasia were described by Luria (e.g. 1962, 1966).

It was a lucky coincidence that Luria had the chance to become acquainted with the great figures of the Russian psychophysiological school (suffice it mention Pavlov, Bernshtein and Anokhin). This provided the basis for the development

of his own ideas. One of them was the notion of “functional system” originally proposed by Anokhin, who considered it to be a circuit board or network of components. For Luria, there was a dynamic element, while pathology in the system led to a qualitative reorganization. Another important implication for microgenetic theory was Luria’s view of action as a system of oscillatory levels. It is worth mentioning that this idea was originally proposed by Bernshtein (Pachalska et al., 2012) and developed in microgenetic theory (Brown, 2005). Presently, it is further elaborated in the theory of mental state (Pachalska et al., 2012). One of the most important assumptions is that mental states overlap, pulse, and coexist, which is in close relation not only to the fourth dimension of hyperspace (that is, time), but also to the fifth dimension (that is, vibration; see Kaku, 1994). To some extent, Luria also had microgenetic ideas, in that there was an unfolding from older to newer systems, and that cognition was hierarchically organized. The strength and dynamics of Luria’s approach follows from the fact that his testing was bedside rather than standardized, so a problem, e.g., in repeating a series of sounds, *ba, pa, ba*, could be due to comprehension, production, serial ordering, memory, perseveration, etc., so it was only in the context of a total examination that one could interpret an isolated symptom. In this respect his approach was consistent with microgenetic theory. In the West, however, his approach has been translated into yet another quantitative battery, known as “Luria-Nebraska,” which he would never have approved of (Glozman 1999).

Neo – Lurianism

Luria’s work was continued after his death all over the world, both by his colleagues with considerable academic achievements (Bejn, 1964; Akhutina & Tsvetkova, 1983) and supporters in the Soviet Union (Glozman, 1999) as well as in other countries, such as Poland (Kaczmarek, 1984, 1987, 1993, 1998, 2003; Kaczmarek et al. 2003; Kaździelawa, 1983, 1986,

1993, 1996, 1997; 2000; 2003, 2012; Klimkowski, 1975, 1976; Klimkowski & Herzyk, 1987; Maruszewski, 1966, 1970, 1972, 1973, 1974; Tłokiński, 1986; Herzyk, 1992, 2000, 2004, 2005, 2011; Pąchalska, 1986, 1990, 1999, 2002, 2003, 2005; 2007, 2008; Pąchalska & Kaczmarek, 2013; Pąchalska & Kropotov 2013; Pachalska et al., 2011; Przesmycka-Kaminska, 1980, 1990, 1994; Seniow, 1978, 1999, 2002, 2003), Finland (Laaksonen, 1986), Denmark (Christensen, 1975), Italy (Bisiach & Luzzatti, 1978) or the U.S. (Brown, 1972, 1975, 1979, 1983, 1985, 1988, 1994, 1996, 2000, 2001, 2002, 2003, 2004, 2005, 2010; Brown & Perecman, 1986; Brown & Pachalska, 2003; Tonkonogy & Goodglass, 1981; Goldberg, 2001). Luria also worked closely with Polish scientists. Mariusz Maruszewski and Marcelli Klimkowski gained in Moscow their clinical and scientific experience, when they studied and received training in Moscow under his direction, developing their neuropsychological knowledge. This was later introduced to the University of Warsaw and the Maria Curie-Skłodowska University in Lublin, where research teams were formed that contributed to the development of the discipline in Poland.

Luria also had other students and friends in Poland, and he kept especially close contacts with the scientific centers of Lublin, Warsaw, Cracow and Gdańsk (his students and friends there included Bożydar Kaczmarek, Danuta Kądziaława, Elizabeth Łuczywek, Maria Susułowska, and Waldemar Tłokiński). A major tribute was paid to his achievements when he was awarded of a doctorate *honoris causa* at the Maria Curie-Skłodowska University to mark the 30th anniversary of the university. One of Luria's most fruitful and interesting contacts in Poland was with Professor Maria Susulowska from the Institute of Psychology at the Jagiellonian University in Krakow. Several long discussions took place when Luria visited Susulowska in Krakow, and in the letters they exchanged, revolving around the importance of single case studies, as opposed to the growing

trend in favor of group studies (see also Pachalska & Kaczmarek, 2013). They both agreed that if a lesion in a specific area of the cerebral cortex damages, for example, the operations of listening to musical language, this fact has a very serious consequence for the personal life and the profession of a musician, while the effects may be very small for a person interested in music only as an amateur listener.

It should be added that Susulowska loved music, and this opinion was shared and discussed when she attended a concert with Luria at the Cracow Philharmonic. It is perhaps from here that Luria's attention was drawn to the significance of a brain lesion on the whole life of the injured person, cognitive, emotional and professional (Luria, 1976).

Indeed Luria's clinical cases are complete "histories" of that specific person, what they were in the past, what they are in the present, and what they might be in the future, as in the most famous case we have described in this biography (Luria, 1974). Of course this perspective recalls Freud's approach in his clinical cases, where the therapy and the rehabilitation are the means of access to the whole psychological life of the individual under treatment. As Freud said in introducing the concept of psychoanalysis, a theory of mind is at the same time a framework for therapy, and therapy is a concrete validation of the theory itself (see also Mecacci 2005).

However, this perspective does not mean that Luria divided the clinical from the experimental, or that he rejected wholly experimental investigation, such as the factorial-model comparison between patients with different brain injuries. However, the necessity for a thorough investigation of a single person, this particular man or this particular woman, with a specific culture, a specific profession, a specific family and social context, remained fundamental: according to Luria only this type of research would enable a scheme of rehabilitation to be drawn up, made to measure for that person, to allow them to

regain their lost world (see also: Pachalska & Kaczmarek 2013). Recently, during the 20th anniversary of the Polish Society of Neuropsychology, which took place on 23 and 24 September 2012, at the University of Gdansk, a session was held during which Professor Danuta Kaździelawa (2012) gave a lecture dedicated to the scientific activity of Prof. Alexander Romanovich Luria and his input on the development of neuropsychology in Poland.

Thanks to the efforts of the founder and long-term President of the Polish Society of Neuropsychology, Professor Maria Paćhalska, there was added, to the long list of institutions and individuals around the world that have honored Luria's scientific achievements during his life or after his death, the Polish Neuropsychological Society, which awarded Alexander Romanovich Luria posthumously its highest honor – the Copernicus Prize 2002.

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