Lurian Journal. 2021. Vol. 2, No. 1. P. 21–41.
DOI 10.15826/Lurian.2021.2.1.2
УДК 57.024

Significance of Activity Theory Concepts for Qualitative Neuropsychology

Yulia Solovieva
Autonomous University of Puebla,
Puebla, Mexico,
Autonomous University of Tlaxcala,
Tlaxcala, Mexico
Luis Quintanar Rojas
Autonomous University of Tlaxcala,
Tlaxcala, Mexico

Значение теории деятельности для качественной нейропсихологии

Юлия Соловьева
Автономный университет Пуэблы,
Пуэбла, Мексика,
Автономный университет Тласкалы,
Тласкала, Мексика
Луис Кинтанар Рохас
Автономный университет Тласкалы,
Тласкала, Мексика

Corresponding author. E-mail: aveivolosailuy@gmail.com

Abstract. The article analyses theoretical and methodological aspects of neuropsychology. Neuropsychology might be considered as a part of neuroscience, but also as the part of psychology. In this last choice, neuropsychology has to conceptualize the ways for studying of psychological process before passing to the level of relation, which exists between psychological processes and brain level in order to identify specific mechanisms or components of psychological processes related to the functioning of special brain zones. Such a study can be based on different general psychological theories. One of the possibilities is historical and cultural approach and activity theory. From the point of view of activity theory approach, brain functional systems might be understood as psycho-physiological dynamic mecha-

nisms of actions and operations fulfilled by a subject. All actions of the subject are always accomplished within the context of one or another cultural activity. Neuropsychological level of analyses might be understood as the elementary functional level of human activity. Neuropsychological analysis might be organized as assessment of actions instead of assessment of isolated functions. The article shows the benefits and significance of activity theory general concept for the field of neuropsychological research and practice of assessment and rehabilitation. The discussion stresses the importance of argumentation of relation between general psychology and neuropsychology.

Keywords*: theory of neuropsychology; activity theory; cultural and historical psychology; neuropsychological assessment; neuropsychological methodology*

Аннотация. В статье анализируются теоретико-методологические аспекты нейропсихологии. Нейропсихология может рассматриваться как часть нейробиологии и как часть психологии. Как часть психологии нейропсихология сначала должна концептуализировать пути изучения психологического процесса, а затем перейти к анализу взаимосвязи, которая существует между психологическими процессами и уровнем мозга, чтобы идентифицировать конкретные механизмы или компоненты психологических процессов, связанных с функционированием специальной зоны мозга. Такое исследование может основываться на различных общепсихологических теориях, в частности на теории деятельности. С точки зрения теории деятельности функциональные системы мозга рассматриваются как психофизиологические динамические механизмы действий и операций, выполняемых субъектом. Все действия субъекта всегда совершаются в контексте той или иной культурной деятельности. Нейропсихологический анализ можно понимать как элементарный функциональный уровень человеческой деятельности, представляющий собой оценку действий вместо оценки отдельных функций. В статье оцениваются преимущества и значение общей концепции теории деятельности для нейропсихологических исследований и практики диагностики и реабилитации. Подчеркивается важность аргументации связи между общей психологией и нейропсихологией.

Ключевые слова: *теория нейропсихологии; теория деятельности; культурно-историческая психология; нейропсихологическая оценка; методология нейропсихологии*

Introduction

In psychological sciences, it was L. S. Vygotsky who started to analyse traditional way of considering of the human psyche and to criticise basic conceptions and concepts of this science. Vygotsky defended independence of psychology from other close disciplines, such as sociology and physiology (Vygotsky, 1997). Independence doesn't mean impossibility of relations and complex research, but it means orientation of proper inner concepts and reference to the same level of analysis. The concepts depend on determination of object

of study, unit of analysis and specific methods of analysis of concrete data. These methods should be proper for the object of study.

Vygotsky was specifically interested in consideration of proper qualitative essential features of human psychological processes, which differ him from all other known human beings. These features are as follows: possibility of voluntary regulation of own processes, inclusion of external and internal cultural means and conscious meaningful reflection of own processes and their results (Vygotsky, 1995). Such are the main characteristics of what Vygotsky has called as superior psychological functions. These functions can't be explained by genetic biological automatic processes; they are acquired during the child's interaction with adults and cultural objects; they are just a potential possibility, as cases of absence of such functions are also possibly. The object of study would always be psychological development, in many different senses, for example in the sense of development of cultural interaction between adult and child in periods of infancy (Vygotsky, 1996); in the sense of development of characteristics of regulation, mediatization and conscious reflection in childhood and adolescence (Vygotsky, 1995); in the sense of development of methods of teaching and usage of empiric and scientific concepts (Vygotsky, 1991).

In the case of neuropsychology, it is possible to study how complex functional systems (Anokhin, 1980) at the level of superior nervous system might be conformed in different ages and according to different interaction and organization of child's own activity. In any case, such a developmental approach proposed a dynamic and dialectic way of analysing and understanding of functional brain mechanisms instead of static and statistical approach, which is a predominant in cognitive neurosciences.

Vygotsky (2016) has exposed surprising hypothesis about dynamic participation of different levels of brain organization in childhood and in adulthood in cases of brain lesions. Vygotsky wrote that the same localization of brain lesion would conduct to different consequences in children and adults. At the same time, same difficulties might appear in children and adults, but in cases of diverse localization of lesion. Vygotsky had no kind of experimental confirmation of such hypothesis at his times, but it's clear today that this dialectical approach is the write one. Nevertheless, consideration of static and equal localization of such psychological processes as language, attention, emotions still is the most traditional and common among psychologists, neuropsychologists and specialists in medicine and neurosciences.

It isn't possible to affirm that Vygotsky has finished all his proposals. His work was continued and spread between his followers and even critics in some of the aspects of this theory (Vygotsky, 2017). Probably, Vygotsky would eager to change or modify some of his initial theoretical positions. It's also true to say that his ideas became an impulse for a huge number of research and concepts, so that new concepts within psychological paradigm called as activity theory (Leontiev, 1975).

Main Principles of Activity Theory

Vygotsky (1991) has defined systemic character of superior psychological functions; the difficulty of his conception consisted in the absence of new level for psychological analysis instead of the term *function*. According to continuation of cultural tradition in psychology (Leontiev, 1975, 1983), the terms *activity* and *action* are much more appropriate for systemic analysis of cortical and subcortical mechanisms in neuropsychology.

The concept of activity in psychology should not be understood as equal to the concept of function. The term function has too broad meaning and might be applied to all levels of consideration: anatomic, physiological, neurological, genetic and so on. The concepts of activity and of action belong to cultural level of a subject and include motive, goal, orientation and result (Gal'perin, 1998; Leontiev, 2000; Talizina, 2009, 2018). Activity and action might only be formed as result of cultural-social interaction between subjects (adult and child) and of learning process; these processes aren't given *as natural process*. There is no sense for separation of *natural development* and *learning process*, because all cultural actions are the result of learning process and are not given *by nature*.

An important position for neuropsychology is that functional systems of brain cortical and subcortical mechanisms do not appear either *naturally*, but only in actions and activities, where child is involved by adults during ontogenetic development.

According to our opinion, the main positions of Vygotsky about the features of human psyche and the object of study as psychological development were completely preserved in activity theory (Talizina, 2018). Some differences and complements to this theory consisted in clear definition of the role of culture as the main feature of development of human society and of possibility of dialectic analysis of human activity at different levels (Leontiev, 1975). On the basis of the concept of activity and action, there was no need to divide the psychic phenomenon into indefinite quantity of isolated psychological functions any more (Talizina, 2009). The concept of activity itself offered two main orientations in the field of psychological research. It was possible to use the term of activity as the object of psychological analysis of different phenomenon and, at the same time, activity became a methodological principal of formulation of psychological development as its essential condition and medium of expression (Salmina & Filimonova, 2001). Another valuable advantage of activity theory was inseparable unite between personality (psychological subject of activity) and activity, which means that activity is always conducted by a subject and directed to an object (external or internal). There is no sense to speak about activity without a subject (personality), but also activity is considered to be the basis for development of personality, so that there is no personality without activity (Leontiev, 1975). It's well known that the absence of clear relation between personality and cognitive functions is one of the main weak aspects of cognitive theory (Dansilio, 2012). Within this theory, it's possible to study any cognitive function with no relation to personality or psychological subject, while it wouldn't be possible within activity theory. There is no psychological activity without psychological subject (Leontiev, 1975).

Methodologically, the main structural element of psychological activity is the motive as essential impulse of activity. Motive, as an object of directed activity, attracts the subject to realization of this activity even if the subject isn't conscious of this motive (Leontiev, 1975). At the same time, consciousness of the subject is a potential possibility, which might be achieved as a possibility of psychological development. High developed personality is always conscious of own motives and goals (Asmolov, 2001).

The motive as an object of directed activity, might be presented by real concrete object presented in front of the subject, by perceptive concrete or abstract image, by recalled image, by another subject, by internal concept or verbal expression. There are many different options for consideration of the object of activity. During ontogenetic development, firstly, concrete persons and real objects appear as the motives of directed activity and impulse activity of a child's development; later on, perceptive images, meanings of external words and finally, internal concepts and images might appear as the motives of subject's psychological activity (Gal'perin, 2000).

According to us and with some kind of modification of previous publications (Talizina, Solovieva, & Quintanar, 2010), the main principles of activity theory might be resumed as follows:

1. Primary character of external activity as the potential basis for appearance of internal activity.
2. Invariant structure of human activity at external and internal plans.
3. Existence of different levels of analysis for same kind of psychological activity.
4. Necessity of consideration of the whole structure of activity, even if concrete study obliges to precise only one element of the structure of activity.
5. Different kinds of cultural activities appear and guarantee psychological development of a child in different qualitative periods.

Neuropsychology and Activity Theory

What are advantages of psychological conception of activity for the field of neuropsychology?

The first advantage is that activity theory is a solid psychological conception of human development. Human development would never be understood within consideration of the history of cultural activity, which is ontological basis of this development. Study of history means understanding of different qualitative changes and modifications of multiple aspects of social life. Neuropsychology, as any other science interested in human development, has to propose a unit between cultural development and brain mechanisms involved in this development in cases of pathology and normality.

From the point of view of activity theory, the subject or personality has to be represented as subject of his own activity. The unit of psychological study is action and not function. According to Talizina (2009), the action could be understood as an elemental level of human activity, which conserves all significant components, such as motive,

objective, result and means of execution. Examples of actions are writing of sentences, drawing of a house, playing with a doll, reading a text. All mentioned actions have same psychological invariant structure, but different content and might be analysed as shared actions or as individual actions of a child in each concrete case.

Different psychological phenomenon might be described in terms of actions instead of the terms of functions. For example, the possibility of remembering and reproduction of information, which is related to traditional function of memory actually depends on specific actions of subject. Such action can be action of semantic or significant organization, action of coping of words, drawing of scheme and so on. Such processes can be realized as conscious or as automatic. In the second case, as automatic processes, they are operations and not actions, according to Leontiev's conception (Leontiev, 2000).

How might we include neuropsychological analysis to these activity theory terms?

Neuropsychological analysis could be proposed as assessment of cultural actions of a child instead of classic analyses of isolated psychological functions. For example, it is possible to propose the assessment of learning activity instead of assessment of memory, attention, perception and so on. The neuropsychological analysis of learning difficulties can be based on activity theory approach. In this case it is necessary to identify the structure of learning activity, which includes motive, object (material, perceptive, verbal or combined), objective, orientation base of action and the sequence of operations. Each component can be fulfilled only in the case of conservation or adequate development of different neuropsychological mechanisms.

Through neuropsychological analysis, it is possible to identify brain specific mechanisms or components of psychological processes related to the functioning of special brain zones. Such a study can be based on different general psychological theories. Relation between level of brain mechanisms and psychological processes can be established by different manners. One of these possibilities is activity theory.

Neuropsychology, as a particular branch of psychology, studies dialectical relation between psychological processes and brain level of organization of these psychological processes. Dialectical relation means neuropsychology studies possible relations between brain level and psychological level of activity. Different kinds of cultural activity and different levels of acquisition and automatization of this activity may involve different brain functional mechanisms. According to this dialectical conception, there is no static and unique way of localization of psychological processes in brain structures or neural nets. This opinion is the opposite to a common conception about unique role of anatomic structures or neural nets for some elemental or complex psychological processes (Bassett & Gazzaniga, 2011; Damasio, 2010; Gazzaniga, 2012; Gazzaniga & Mangun, 2014).

According to Leontiev (1983), one of the levels of psychological activity is the level of psychophysiological mechanisms or systems of this activity. The level of psychophysiological mechanisms doesn't exist independently from cultural activity and can't be understood as a result only of maturation of brain structures. The introduction of this level as an object of analysis opens broad possibilities for understanding that functional brain systems appear and might develop only as specific level of cultural actions

of psychological subject. This argument is direct consequence of methodological usage of the concept of activity into neuropsychology. It offers the new possibilities for study of the process of psychological development in childhood and of neuropsychological rehabilitation in different ages.

One of the tasks of neuropsychology is to study activity and action from the point of view of brain cortical and subcortical mechanisms, which take place for their realization. The level of psychophysiological and neuropsychological mechanisms of actions is the level, which permits to establish dialectic relation between culturally formed actions and the level of organism functioning. The mechanisms might be studied at different levels, for example, from the point of view of neurophysiology (Anokhin, 1980; Bernstein, 2003) with complex of the unity of action and brain mechanisms (Machinskaya, 2012).

From the point of view of activity theory approach, brain components might be understood as psycho-physiological structural and systemic mechanisms of conscious actions and subconscious operations fulfilled by a subject in the context of one or another general activity. In other words, neuropsychological level of analyses could be understood as the elementary level of human activity.

According to Luria (1973), none of psychological functions could be localized directly in the human brain. Such proposition is based on theoretical comprehension of psychological functions or psychological processes. Psychological functions represent complex acquisitions, which pass through gradual development on different stages during the child's life (Elkonin, 1989; Vygotsky, 1996). All psychological processes appear firstly as external shared and collective material actions between adult and child (Vygotsky, 1996). Cultural objects are an integrative part of these actions and we might understand them even better as extra brain processes. Only later, psychological processes might be represented as internal individual processes.

From the point of view of social development and of ontogenetic acquirement through the "history" of each particular child (Luria, 1973; Vygotsky, 1991), each cultural action has its "own cultural history" and possibility of development and gradual interiorization. Such particular "history" always depends on particular features of social general culture and social situation of development in each concrete case (Elkonin, 1980; Obukhova, 2006; Vygotsky, 1996).

According to modern neuroscience, it is possible to notice that complex processes are not localized in these models but are represented as distributed systems with diverse components. The problem with this modern position is that there is no conceptual clarity for distinction between basic and complex cognitive processes. Which processes are basic and which are complex? There is no clear definition of these differences in cognitive approach. These basic processes appear to have specific content, but they also might be understood as independent components of kinds of attention. According to such models, the brain processes are given directly by brain's functioning and maturation and there is no place for dialectical understanding of complex process of psychological development or consolidation of functional systems starting from the early childhood. In other words,

there is no conceptual difference between the level of brain mechanisms and complex psychological processes.

According to Vygotsky (1995), complex processes are those of cultural origin, mediatized structure and voluntary functioning. Such processes represent psychological actions of the subject and might be fulfilled on different plans of development: material actions, perceptual actions, verbal external and verbal internal actions. Functional systems and brain mechanisms involved in these systems would be different as this stages of development, or fulfilment of each concrete action of the subject. At the same time, alteration or lesion of one the components, might be overcome by inclusion of another new element into the complex functional system. This argument became methodological basis of proposals for rehabilitation of motor actions (Leontiev & Zaporozhets, 2012) and intellectual actions as a consequence of brain damage (Luria, 1969; Tsvetkova, 1998). These principles of rehabilitation as the principles of re-organization of functional systems at different levels of nervous system (Leontiev & Zaporozhets, 2012). According to Luria, psychological functions are understood as complex cultural actions as writing, reading, speech comprehension, problems solving and so on. Each cultural action is represented in the brain as a complex functional system with dynamic functional elements or factors (Luria, 1973). The term of psychological activity helps to precise systemic and dynamic relations between psychological processes and brain functional mechanisms. The category of activity is the primary on in relation to the category of functional system. The common way of thinking is an opposite: brain, as biological structure, is the primary category in relation to intellectual development or actions, even if these actions are helpful for intellectual development (Ferreiro, 2004; Piaget, 2008).

All present arguments allow to speak not only about cultural-historical psychology, but also of cultural-historical neuropsychology.

Activity Theory for Child Neuropsychology

One of the main positions in cultural psychology and neuropsychology is that there is no possibility for maturation of functional brain systems out of consideration of the type of activity, in which the child is included as it's psychological subject. In other words, there are no actions, which are "free of culture" on the level of human activity. Such affirmation also means that there are no functional brain systems as the basis of cultural actions; these functional systems aren't "free of culture" either.

Cultural and historical origin of psychological actions is important position for neuropsychology. All actions of the child such as communication, playing with toys and roles, speech understanding and production, drawing, problems solution, reading and writing have their own cultural history. Each child has unique history of development (Vygotsky, 2017). Gradual psychological development and levels of acquisition of these actions continues to be an important object of multiple psychological investigations.

Functional system with diverse cortical and subcortical components should become an object of research within developmental cultural neuropsychology.

Not only cultural actions, but also functional systems are the result and consequence of interaction, learning and joint social life. It is clear that functional systems might be *historically* changes together with the changes of cultural actions. Writing, reading, drawing, typing and calculation are only some of examples of cultural actions, which have suffered essential changes through history of mankind and are changing nowadays. Cultural differences of writing and reading are studies by different branches of sciences, but cognitive neuroscience speak of their precise fixed localization and dependence of genetic processes. On the contrary, in neuropsychological studies it was shown that brain representation of same abilities and actions, for examples, actions of visual perception, is different in adults and children (Akhutina, 2001, 2002; Simernitskaya, 1985; Stiles, Reilly, Paul, & Moses, 2005). Different functioning mechanisms might be involved in cases of attention deficit disorder (Glozman & Shevchenko, 2014; Machinskaya, Semenova, Absatova, & Sugrobova, 2014; Solovieva & Quintanar, 2014a, 2015a). Our recent studies of children with attention deficit disorder have shown that brain mechanisms of this syndrome differ from age to age and that there are qualitative differences in troubles shown by pre-scholars and children of primary school and pre-adolescents (Solovieva, Pelayo-González, Méndez-Balbuena, Machinskaya, & Morán, 2016; Solovieva & Quintanar, 2015a, 2015b, 2019a).

The task of neuropsychologist, during qualitative assessment, is to determine precise functional stage (preservation or level of development) of each mechanism within specific functional system. Functional system is the level of brain representation of cultural action. From this point of view, cultural action would be represented in central nervous system as complex functional system; such system would include different (never only one) *neuropsychological factors* or functional mechanisms.

From the point of view of cultural-historical neuropsychology, it would be possible to study specific cases of formation of functional brain systems as results of specific interaction between child and adult of group of children in different ages (Solovieva & Quintanar, 2014a, 2014c, 2016a). This topic is extremely new and not yet completely studied by psychologists or neuropsychologists. We consider that it's important to study different levels of interaction between adult and child in normal conditions and in situations of neurological and social risk of development. It's also very important to provide the studies of conditions for successful psychological development and its effects for conformation of brain functional systems.

It's possible to notice that the circle of interests has become wider in recent twenty years. The children with and without learning disabilities and development problems are frequently included as subjects of neuropsychological assessment. First years of life and cases of genetic syndromes became also attractive for researchers (Pelayo-González & Solovieva, 2018; Solovieva & Pelayo, 2019). Groups with cognitive and behavioural problems without clear neurological signs are described in literature (Akhutina & Pilayeva, 2012; Quintanar & Solovieva, 2000).

The problems in school learning and development should necessarily have neurological base, which depends partly on the process of maturation of correspondent brain structures. Such opinion shows a big contrast with commonly used typology of disorders according to DSM–V (American Psychiatric Association, 2014), which doesn't provide any objective relation between behavioral external description of difficulties and the status of central nervous system.

Another proposal exists within Luria's methodological approach. According to this approach, neuropsychological analysis should be conducted on particular level, that is, level of psychophysiological level of activity. These elemental mechanisms of human activity were called as neuropsychological factor (Tsvetkova, 1998).

For Luria (1973), disturbance of factor is a cause of systemic difficulties in patients with brain damage, as for example, alterations of kinetic melody is the cause of speech difficulties in motor efferent aphasia. This level should be differentiated from the level of cultural actions and from neurological neuroanatomic level of brain structures.

The term neuropsychological factor refers to the result of work of brain structure (Mikadze & Korsakova, 1994). We believe that it is useful to add that this is a result of functional participation of structures for completing specific roles inside different kinds of cultural actions (writing or reading of sentences or words, for example). These cultural actions might never be represented in the brain by one component or mechanisms, but by functional union of widely distributed mechanisms form diverse cortical and subcortical levels. One mechanism may participate in different actions and each action should include multiple mechanisms (Luria, 1947, 1969).

This kind of factorial functional analyses is nowadays successfully applied in the field of child neuropsychology for analyses of cases of children with learning disabilities and retardation in psychological development (Akhutina, 2001; Akhutina & Pilayeva, 2003; Mikadze & Korsakova, 1994; Santana, 1999; Semago M. M., Akhutina, Semago N. Ya., Svetlova, & Bereslavskaya, 1999; Quintanar & Solovieva, 2000, 2008).

In case of child neuropsychology, as not all cases of difficulties in development and learning at school are related to brain damage, the term of factor might also be useful. It's possible to detect dysfunctional stage of diverse brain mechanisms as result of immaturity at levels of subcortical regulation. Actually, inclusion of different levels of subcortical regulation as essential level brain functioning in childhood is an important contribution into child neuropsychology (Akhutina, Korneev, Matveeva, & Agris, 2015; Luna-Villanueva, Solovieva, Lázaro-García, & Quintanar, 2017; Pronina, Korneev, & Akhuitna, 2015).

An action is the essential process of activity, and its motive corresponds to the same of activity. For example, the action of solution of arithmetic problem is only one of the actions, which belong to the activity of learning at school. At preschool age, one of examples of actions might be drawing of an object or of a landscape (Solovieva & Quintanar, 2012, 2019a).

We might remember proposal of Gal'perin to understand developed attention as internal function of control (Gal'perin, 1998). Before converting into internal action of control, external objectal type of control is always necessary. According to this conception

of cultural development, brain mechanisms of external collective action and individual internal action could not be same.

Psychological functions as attention, memory, thinking and so on can represent direct object of psychological study, but even psychological studies often don't consider ontogenetic and qualitative changes of these processes. Neuropsychology has to study not only the brain as material structure, but mostly types of relations between these processes and take into account developmental aspects. It's necessary to recognise that such relations aren't permanent or static, but dynamic and flexible. In order to understand these dynamic changes properly neuropsychology has to propose its own level of analyses by its own units different from psychological terms. In Luria's words, neuropsychology studies specific factors or components of psychological processes, which can be related to the functioning of central nervous system (Luria, 1973). We propose to apply this proposal to dynamic changes of confirmation of functional systems in different ontogenetic periods.

Neuropsychology might be integrated into conception of cultural development of psychological activity not only in words, but also in a proper way of consideration of consolidation of complex functional systems in different psychological ages. According to our opinion, it is impossible to work as a child neuropsychologist without acceptation of general psychological explicative system in which brain factors or components of actions would be inserted. In our opinion, it could be useful to apply general psychological activity theory to qualitative neuropsychological approach especially for cases of assessment and correction of learning disabilities and developmental problems in children of different ages.

Examples of Analysis of Learning Process

Let's explain how activity theory concepts might be useful for neuropsychology.

The learning process can be represented as specific activity of a child which consists of variety of different actions such as writing of words, pronunciation of sounds, counting, problem solution, reading and analyses of texts and so on. Each action and operation is realizing with the help of variety of elementary components at brain level. Neuropsychological analyses can provide the means and instruments for identification of preserved and disturbed mechanisms. Such an assessment can be useful for understanding of the learning process and of children with learning disabilities.

We can also suppose that in these terms and following Gal'perin's ideas (Gal'perin, 1998) traditional psychological functions represent automatized internal actions of organization (memory), control (attention). These actions depend not only on biological base but also on development or stage of other components of action: motive, objective and means. No action can be fulfilled by only one of traditional psychological functions. The action includes different combinations of all functions according to the nature and grade of acquisition of the action.

The learning process can be represented as specific activity of a child which consists of variety of different actions such as writing of words, pronunciation of sounds, counting, problem solution, reading and analyses of texts and so on. The high grade of internalisation and acquisition of these actions convert them in subconscious automatic operations. This level of functioning of activity permits to achieve new high goals and senses of personality. In our opinion, this has to be the real goal of teaching and could be new perspective for organization of learning process at school.

The structure of the action depends on its real goal and on the grade of acquisition of action. For example, each particular task refers to particular goal. The task can be: "write the sentence" or "write the first letter of each word" and so on. Operations or means of each action might be different for the subject, for instance, the subject might pronounce loudly each sound, each word or might count the sound or words with the fingers or lines on the paper. Each learning action might be fulfilled by a subject on different moments of learning process by many different means, levels and external helping.

The *Table 1* represents action of writing in situation of dictation of a new sentence at school. The conscious goal of the action is to obtain correct sentence. This action includes at least four operations, which are necessary means of this action, they aren't its conscious goal. In other words, the pupil isn't conscious of these means of the action. The problem or difficulty with any of these operations affects the action as a whole.

Each action includes series of operations, which are the essential means of realizations of the action. As we have said the action is always conscious while the operation is no reflected in the consciousness of the pupil. Such relation is dynamic and changes from the beginning to the end of the process of child's education. The teacher has to know that conscious actions can convert into automatic operations correctly only in case of their adequate representation at the initial level of education. That is, all four aspects of the action of writing has to be reflected in consciousness of the pupil ate the initial stage of learning process in order to pass to internal level at the end of this process.

What might neuropsychology introduce to such analyses of learning process?

In order to explicit neuropsychological analysis of school action, we present psychological structure of action of coping of a sentence and the action of drawing of a house. Each action is fulfilled on graphic level. Action of copying is related at verbal level and the action of drawing at perceptive concrete level. Different operations are involved in both processes; two different functional systems correspond to them.

The *Table 1* presents an example of analysis of psychological structure of action of coping of a sentence. The action is directed to a conscious goal; in this case the goal is coping of exact sentence. The operations involved in this action are operative automatized processes, such as observation, organization and verification of the sentence aren't reflected in the conscious of a subject, if the process is properly understood and automatized. At the same time, each operation might represent independent psychological action if the subject needs specific orientation and understanding of each element of the action. According to Leontiev (1975), actions and operation aren't static phenomenon, but changeable and flexible. Same psychological process might be action or operation in dif-

ferent situations and according to different goals and levels of automatization. Different levels of automatization mean different functional systems, so that neuropsychological assessment should take all these aspects into account. This also means that brain basis of action of writing of a sentence aren't same in different periods of school learning, different method of school learning and different functional stage of each pupil.

Table 1
Psychological structure of action of writing

Copy of a sentence (operations)
1. Visual observation of a sentence
2. Organization of writing (representation of graphic sings)
3. Verification

The *Table 2* presents an example of analysis of psychological structure of action of drawing of a model. The action is directed to a conscious goal; in this case the goal is representation of exact image of a house. The operations involved in this action are operative automatized processes, which aren't reflected in the conscious of a subject. As in case of the action of writing of a sentence, the action of drawing might consist of diverse operations, but also might be represented as different independent psychological actions.

Table 2
Psychological structure of action of drawing

Copy of a model of a "house" (operations)
1. Visual observation of a model
2. Organization of drawing (representation of concrete image)
3. Verification

It's possible to notice, that operations in both actions are similar. The difference consists in different content of the process. In the case of copy of the sentence, the content is presented by graphic symbols (letters). In the case of drawing, the content is presented as concrete perceptive image (house).

Both actions are accomplished on the basis of specific functional systems. Each action and operation are accomplished by variety of elementary components at brain level. Such components might be understood as psychophysiological mechanisms of actions and operations or as elemental level of human activity. Neuropsychological analyse consists of these actions in identification of precise functional components involved in these actions and the functional stage of each of them. The *Table 3* presents functional components of the actions of copy of a sentence, while the *Table 4* for the action of copy of the house.

According to the *Table 3*, different brain functional mechanisms take place in the action of copy of the sentence. Any kind of functional deficit or complete alteration of any of these mechanisms might lead to difficulties in this action. At the same time, isn't often to find situations, in which all these mechanisms would be disturbed. Normally, neuro-

Table 3

Neuropsychological structure of action. Action of copy of a sentence

Operations	Neuropsychological mechanisms
Visual observation of a model	Eye movements Visual primary perception
Organization of writing	Spatial global perception Motor kinetic organization Spatial analytic perception
Verification	Programming and control General cortical activation

psychological qualitative assessment permits to precise functional stage of each of these mechanisms and decide about strong and weak aspects of each child (Akhutina & Pilayeva, 2012). Discovery of weak mechanisms in each case of developmental disorders or learning disabilities is very useful, because it converts in the basis for creation of the program of correction and positive development. At the same time, the clarity with brain functional mechanisms allows to provide useful hypothesis about possible brain zone (level), involved in each particular case.

Table 4

Neuropsychological structure of action. Action of copy of a house (drawing)

Operations	Neuropsychological mechanisms
Visual observation of a model	Eye movements Visual primary perception Spatial global perception
Organization of drawing	Spatial analytic perception Motor kinetic organization
Verification	Programming and control General cortical activation

As in *Table 3*, different brain mechanisms take part in the action of drawing an image by model. Actually, we may notice same functional mechanisms in both tasks. Difficulties might appear as the cause of functional deficit of the same mechanisms in both tasks.

As for the level of difficulty, we have to admit that the task of copy of the sentence in more difficult than the action of drawing by copy, as the first actions involves more functional mechanisms in comparison with the second action.

At the same time, one neuropsychological mechanism takes part in different actions. Diverse variations of the possibilities of formation and development of these mechanisms with relation to aspects of cortical and subcortical maturation should be taken into account, especially in cases of youngest children (Lebedinsky & Lebedinskaya, 2018). The mechanisms mentioned in the *Table 2* might be included in diverse actions and

operation in different ages according to systems of education and nursery (Quintanar & Solovieva, 2008; Solovieva & Quintanar, 2013, 2019a).

According to neuropsychology each mechanism is related to the functioning of concrete zone or conjunction of zone at brain level. Luria called such mechanisms with particular term *factor* (Luria, 1948, 1973). We have proposed to use the term brain cortical or subcortical mechanisms instead of the word "factor" (Quintanar & Solovieva, 2008; Solovieva & Quintanar, 2007, 2014b, 2015a, 2016b). Possible relation between functional mechanisms and brain cortical and subcortical zones are shown in *Table 5*. We proposed to the term *possible relation* because these relations may change in dependence from ontogenetic age and the level of automatization of the process. Cortical and subcortical levels of analysis of mechanisms should be involved together with continuation of research and analysis of each mechanism in different ages. It's important to remember that traditionally, neuropsychology and neuroscience don't show the possibility of broad involvement of different zones for one functional mechanism. The literature pretends to study unilateral relation between psychological function and brain zone.

Table 5

Possible relation between brain zones and some neuropsychological mechanisms

Neuropsychological mechanisms	Brain zones
Phonemic discrimination	Temporal cortical-subcortical zones of both hemispheres
Kinestesic analysis and synthesis	Parietal cortical-subcortical zones of both hemispheres, thalamic zones of kinestetic integration
Audio-verbal retention	Broad temporal inferior, different levels of brainstorm, broad subcortical levels, limbic circle
Global perception	Posterior zones of both hemispheres
Analytic perception	Posterior zones of both hemispheres
Visual and spatial retention	Occipital zone of both hemispheres, different levels of brainstorm, posterior zones of both hemispheres
Motor kynetic organization	Frontal posterior (pre-motor), subcortical structures of organization of movements, basal ganglia, thalamus
Programming and control	Broad frontal lobes and nearest subcortical structures, basal ganglia, thalamus
General activation	Profound subcortical structures/ broad levels of brainstorm (diencephalic and mesencephalic levels, limbic circle)

According to the *Table 5*, same functional mechanism might be related to different brain levels and units. This fact may depend on ontogenetic level of development, level of automatization of actions and, probably, many other different aspects related to life

and activity of each subject. The options of the levels of cortical and subcortical levels presented in the table means that it's possible to find real patients, adults and children, in which these levels might be detected during neuropsychological assessment and another objective procedure, such as register of electric brain activation in the state of repose (Machinskaya, 2012; Machinskaya et al., 2014). In different cases, different dysfunctions of these mechanisms might be detected as the causes of development difficulties and learning disabilities.

Discussion

Why activity theory is important for neuropsychology?

Firstly, activity theory might become a solid theoretical conception in historical and cultural neuropsychology. This theory provides general conception of human cultural development, based on interaction between people in direction to established goals. Cultural development is accomplished during one's life, interaction and external help from the others, without which is difficult to explain and understand child's cultural development (Leontiev, 2000; Tomasello, 2013; Vygotsky, 1996). Any kind of cultural activity, participation in a dialogue, dancing or learning of mathematics, cannot be accomplished without participation of initial external help from the others. Such topics are profoundly studies and described by representatives of cultural-historical psychology and activity theory related to cooperation in groups in childhood (Bruce, Hakarainen, & Bredikyte, 2017; Veraksa & Sheridan, 2018; Wertsch & Tulviste, 1992). At the same time, these activities involve its material base (brain structures). According to historic-cultural psychological conception and activity theory, development of neuropsychological mechanisms depends on their inclusion in concrete cultural activity (Leontiev, 1975). Activity is cultural by origin, which depends on the history of humankind and is specific for different historical periods and social situations (Leontiev, 1983, 2000; Tomasello, 1999). Activity is flexible and dynamic process, but this process might achieve high levels of automatization and perfection. At the level of brain functioning, these levels are characterized by appearance of specific functional organs, corresponding to each kind of activity (Leontiev, 1983). The brain is given by nature, but functional systems and organs may emerge only as a result of cultural activity.

Secondly, all ideas exposed above show new way for assessment and diagnosis of difficulties as the necessity of consideration of the level of psychological development of child in each period of ontogenetic development together with precise qualitative description of features of his/her social situation of development (Vygotsky, 1995).

Thirdly, activity theory might serve as theoretical and methodological basis for strengthening relation between assessment and rehabilitation and correction of difficulties, especially on the basis of Galperin's conception of gradual formation of mental actions by stages (Solovieva & Quintanar, 2019b). It's often to find the absence of such relation. The methods and strategies for rehabilitation frequently aren't based on any other psy-

chological conception then behaviourism or therapeutic approach. Behaviourism uses positive or negative reinforcement, while therapeutic approach suggests global interaction with intention of explanation of the situation and accommodation of the patient to new clinic difficulties.

On the contrary, activity theory approach offers broad possibilities for subject's own activity with the help of adult (or specialist) in the way of overcoming of self-difficulties. Such rehabilitation leads to development. We use this idea from Vygotsky's, who claimed that learning leads to development (Vygotsky, 1995). We are convinced that neuropsychological rehabilitation and correction should lead to development and to simple and passive adaptation of the patient to his/her own difficulties.

From the point of view of the theory of neuropsychology, such rehabilitation leads to re-organization of functional systems or even to creation of completely new functional systems, especially in cases of children. Re-organized functional systems or new functional systems became psychological bases of re-organized or new psychological activity of the subject (Anokhin, 1980; Leontiev, 2012; Leontiev & Zaporozhets, 2012).

Conclusions

Our study shows possible relation of historical and cultural psychology, activity theory and neuropsychology. The term of cultural-historical neuropsychology was proposed and justified, as modern neuropsychology can't be understood as isolated branch of knowledge, which studies only dysfunctions in adults and children. Neuropsychology needs to be based on fundamental concepts of general psychology. Activity theory is on of such options of general psychology.

References

Akhutina, T. V. (2001). Neuropsychological approximation to diagnosis and correction of learning difficulties in acquisition of wtitting (pp. 195–213). In: M. G. Jrakovskaya (Ed.), *Modern approach to diagnosis and correction of speech disorders.* St. Petersburg: St. Petersburg University Press. [In Russian]

Akhutina, T. V. (2002). Diagnosis and correction of writing. *Revista Española de Neuropsicología, 4*(2–3), 236–261. [In Spanish]

Akhutina, T. V., Korneev, A. A., Matveeva, E. Yu., & Agris, A. R. (2015). Age-related changes of higher mental functions in 7–9 years old children with different types of state of regulation deficits. *Journal of the Higher School of Economics, 12*(3), 131–152.

Akhutina, T. V., & Pilayeva, N. M. (2003). *Diagnostics of visual-verbal functions development*. Moscow: Academia. [In Russian]

Akhutina, T. V., & Pilayeva, N. M. (2012). *Overcoming learning disabilities*: *A Vigotskian-Lurian neuropsychological approach*. Cambridge, UK: Cambridge University Press.

American Psychiatric Association (2014). *Spanish edition of the desk reference to the diagnostic criteria from DSM-5*. American Psychiatric Pub.

Anokhin, P. K. (1980). *Key questions of functional system theory*. Moscow: Nauka. [In Russian]

Asmolov, A. G. (2001). *Psychology of personality: Principles of general psychological analysis.* Moscow: Smysl. [In Russian]

Bassett, D. S., & Gazzaniga, M. S. (2011). Understanding complexity in the human brain. *Trends in Cognitive Neurosciences, 15*(5), 200–209. https://doi.org/10.1016/j.tics.2011.03.006

Bernstein, N. A. (2003). *Actual search in physiology of the nervous process*. Moscow: Meaning. [In Russian]

Bruce, T., Hakarainen, P., & Bredikyte, M. (2017). *The Routledge International handbook of early childhood play.* London, England: Taylor & Francis.

Damasio, A. (2010). *In search of Spinoza. Neurobiology of emotion and feelings.* Barcelona: Drakontos. [In Spanish]

Dansilio, S. (2012). *Emergence of cognitive sciences.* Montevideo: Universidad de la República. [In Spanish]

Elkonin, D. B. (1980). *Psychology of play*. Madrid: Pablo del Río. [In Spanish]

Elkonin, D. B. (1989). *Selected works*. Moscow: Pedagogy. [In Russian]

Ferreiro, E. (2004). *Jean Piaget and epistemology.* Buenos Aires: Siglo XXI. [In Spanish]

Gal'perin, P. Ya. (1998). *Psychology as an objective science: Selected psychological works*. Moscow: Institute of Practical Psychology. [In Russian]

Gal'perin, P. Ya. (2000). *Four lectures on psychology.* Moscow: Superior School. [In Russian]

Gazzaniga, M. S. (2012). *Who commands here? Free will and the science of the brain*. Madrid: Paídos. [In Spanish]

Gazzaniga, M. S., & Mangun, G. R. (2014). *The cognitive neurosciences*. Cambridge: MIT Press.

Glozman, J., & Shevchenko, I. A. (2014). Executive functions in children with ADHD. *Psychology & Neuroscience, 7*(4), 453–460. https://doi.org/10.3922/J.PSNS.2014.4.04

Lebedinsky, V.V. & Lebedinskaya, K.S. (2018). *Disturbance of mental development in hildhood and adolescence.* Moscow: Academic Project. [In Russian]

Leontiev, A. N. (1975). *Activity. Consciousness. Personality.* Moscow: Politizdat. [In Russian]

Leontiev, A. N. (1983). *Selected psychological works.* Moscow: Pedagogika. [In Russian]

Leontiev, A. N. (2000). *Lectures on general psychology.* Moscow: Smysl. [In Russian]

Leontiev, A.N. (2012). *Evolution, movement, activity* (A. N. Leontiev & E. E. Sokolova, Eds.). Moscow: Smysl. [In Russian]

Leontiev, A. N. & Zaporozhets, A. V. (2012). Movement rehabilitation. Psychophysiological study of restoration of hand functions after war injuries. In A. N. Leontiev & E. E. Sokolova (Eds.), *Evolution, movement, activity* (pp. 323–555). Moscow: Smysl. [In Russian]

Luna-Villanueva, B., Solovieva, Y., Lázaro-García, E., & Quintanar, L. (2017). Clinical features of brain activation deficit in children. *Revista de la Facultad de Medicina, 65*(3), 417–423. http://dx.doi.org/10.15446/revfacmed.v65n3.57057

Luria, A. R. (1947). *Traumatic aphasia*. Moscow: Academy of Medical Sciences USSR. [In Russian]

Luria, A. R. (1948). *Restoration of function after brain injury.* Moscow: Academy of Medical Sciences USSR. [In Russian]

Luria, A. R. (1969). *Higher cortical functions in man and their disturbances in local brain lesions* (2nd ed.). Moscow: Moscow University Press. [In Russian]

Luria, A. R. (1973). *Fundamentals of neuropsychology.* Moscow: Moscow University Press. [In Russian]

Machinskaya, R. (2012). Why does psychologist need a "social brain"? *Cultural-Historical Psychology, 8*(4), 103–108.

Machinskaya, R. I., Semenova, O., Absatova, K. A., & Sugrobova, G. A. (2014). Neuropsychological factors associated with cognitive deficits in children with ADDH symptoms: EEG and neuropsychological analysis. *Psychology & Neuroscience, 7*(4), 461–473. http://dx.doi.org/10.3922/j.psns.2014.4.05

Mikadze, Yu. V., & Korsakova, N. K. (1994). *Neuropsychological diagnostics and correction of younger schoolchildren in connection with school failure.* Moscow: IntelTeh. [In Russian]

Obukhova, L. F. (2006). *Developmental psychology*. Moscow: Higher Education. [In Russian]

Pelayo-González, H. J., & Solovieva, Y. (2018). Proposal for psychomotor development according to A. R. Luria's conception: New data in Mexico. In J. M. Glozman, O. S. Vindeker, & I. A. Ershova (Eds.), *The Fifth International Luria Memorial Congress "Lurian approach in International psychological science", KnE Life Sciences*, 321–328. https://doi.org/10.18502/kls.v4i8.3290

Piaget, J. (2008). *Science and biology*. Buenos Aires: Siglo XXI. [In Spanish]

Pronina, E., Korneev, A., & Akhuitna, T. (2015). Brain state regulation and RAN/RAS performance in primary school. *The Russian Journal of Cognitive Science, 2*(2–3), 22–28.

Quintanar, L. & Solovieva, Yu. (2000). Child discapacity from neuropsychological perspective. In M. A. Cubillo, J. Guevara, & A. Pedroza (Eds.), *Human discapacity, Present and Future. The challangies of rehabilitation in Mexico* (pp. 51–63). Tlaxcala: University of Valle of Tlaxcala. [In Spanish]

Quintanar, L. & Solovieva, Yu. (2008). Cultural-historical approach: Fundaments of theory and methodology. In J. Eslava-Cobos, L. Mejía, L. Quintanar, & Yu. Solovieva (Eds.), *Learning disabilities: Neuropsychological perspectives. Texts of Latin America* (Vol. 1, pp. 145–182). Bogotá: Magisterio. [In Spanish]

Salmina, N. G., & Filimonova, O. G. (2001). *Diagnostics and correction of voluntary activity in preschoolers and schoolchildren*. Mexico: Universidad Autónoma de Tlaxcala. [In Spanish]

Santana, R. (1999). *Neuropsychological aspects of school learning.* San Juan, Puerto Rico: Innovaciones Psicoeducativas. [In Spanish]

Semago, M. M., Akhutina, T. V., Semago, N. Ya., Svetlova, N. A., & Bereslavskaya, M. I. (1999). *Psychological, medical and pedagogical check of the child. A set of working materials.* Moscow: ARKTI. [In Russian]

Simernitskaya, E. G. (1985). *The human brain and mental processes in ontogenesis.* Moscow: Moscow University Press. [In Russian]

Solovieva, Yu., & Pelayo, H. (2019). Early childhood in Mexico: Historical and cultural psychology and neuropsychology. *Perspectives of Arts and Social Science, 2,* 123–133.

Solovieva, Yu., Pelayo-González, H. J., Méndez-Balbuena, I., Machinskaya, R., & Morán, G. A. (2016). Correlation of neuropsychological and electroencephalographic analysis in schoolchildren with diagnosis of ADD. *Revista eNeurobiología, 7*(15), 1–15. [In Spanish]

Solovieva, Yu., & Quintanar, L. (2007). Principles and strategies of neuropsychological check of children. In E. A. Escotto Córdova, M. Pérez Mendoza & N. A. Sánchez Cortés (Eds.), *Lingüística,*

neuropsicología y neurociencias ante los trastornos del desarrollo infantil (pp. 87–101). Mexico, UNAM. [In Spanish]

Solovieva, Yu., & Quintanar, L. (2012). Formation of drawing activity in Mexican pre-school children. *Psychology Research, 2*(8), 479–489. https://doi.org/10.17265/2159–5542/2012.08.005

Solovieva, Yu., & Quintanar, L. (2013). *Anthology of the psychological development of the preschool child*. Mexico: Trillas. [In Spanish]

Solovieva, Yu., & Quintanar, L. (2014a). *Teaching of reading. Practical method for reading training*. Mexico: Trillas. [In Spanish]

Solovieva, Yu. & Quintanar, L. (2014b). Syndromic analysis of ADDH at preschool age according to A. R. Luria concept. *Psychology and Neuroscience, 7*(4), 443–452. https://doi.org/10.3922/j.psns.2014.4.03

Solovieva, Yu, & Quintanar, L. (2014c). Principles and objectives for correction and development in child neuropsychology. In H. Patiño & A. López (Eds.), *Prevención y evaluación en Psicología* (pp. 61–74). Mexico: Manual Moderno. [In Spanish]

Solovieva, Yu., & Quintanar, L. (2015a). Qualitative syndrome analysis by neuropsychological assessment in preschoolers with attention deficit disorder with hyperactivity. *Psychology in Russia: State of the Art, 8*(3), 112–123. https://doi.org/10.11621/pir.2015.0309

Solovieva, Yu., & Quintanar, L. (2015b). Games as a method of correction in preschool children with ADDH. *British Journal of Education, Society and Behavioural Science, 11*(3), 1–14. https://doi.org/10.9734/BJESBS/2015/19124

Solovieva, Yu., & Quintanar, L. (2016a). *The drawing as formative activity in preschool age*. Mexico: Trillas. [In Spanish]

Solovieva, Yu. & Quintanar, L. (2016b). Syndromic analysis in cases of developmental and learning problems: Following A. R. Luria. In D. F. Da Silva Marques, J. H. Ávila-Toscano, H. Góis, J. Leonel, N. Ferreira, Yu. Solovieva & L. Quintanar (Eds.), *Neuroscience to neuropsychology: The study of the human brain* (Vol. I, pp. 387–414). Barranquilla, Colombia: Corporación Universitaria Reformada. [In Spanish]

Solovieva, Yu., & Quintanar, L. (2019a). *Education and child neuropsychology*. Mexico: Trillas. [In Spanish]

Solovieva, Yu., & Quintanar, L. (2019b). *The formative methodology in cultural-historical psychology*. Madrid: GIUNTI-EOS. [In Spanish]

Stiles, J., Reilly, J., Paul, B., & Moses, P. (2005). Cognitive development following early brain injury: Evidence for neural adaptation. *Trends in Cognitive Sciences, 9*(3), 136–143. https://doi.org/10.1016/j.tics.2005.01.002

Talizina, N. F. (2009). *Activity theory applied to teaching*. Mexico: Universidad Autónoma de Puebla. [In Spanish]

Talizina, N. F. (2018). *Activity theory applied for learning*. Moscow: Moscow University Press. [In Russian]

Talizina, N., Solovieva, Yu., & Quintanar, L. (2010). The activity approach in psychology and its relationship with the cultural-historical approach of L. S. Vygotsky. *Novedades Educativas, 22*(230), 4–9. [In Spanish]

Tomasello, M. (1999). *The cultural origins of human cognition*. Cambridge: Harvard University Press.

Tomasello, M. (2013). *The origins of human communication*. Madrid: Katz Editores. [In Spanish]

Tsvetkova, L. S. (1998). *Methods of diagnostic neuropsychological check of children.* Moscow: Russian Pedagogical Agency. [In Russian]

Veraksa, N., & Sheridan, S. (2018). *Vygotsky's theory in early childhood education and research*. London: EECERA, The Routledge: Taylor & Francis.

Vygotsky, L. S. (1991). *Selected works: Vol. 1*. Madrid: Visor. [In Spanish]

Vygotsky, L. S. (1995). *Selected works: Vol. 3*. Madrid: Visor. [In Spanish]

Vygotsky, L. S. (1996). *Selected works: Vol. 4*. Madrid: Visor. [In Spanish]

Vygotsky, L. S. (1997). *Selected works: Vol. 6*. Madrid: Visor. [In Spanish]

Vygotsky, L. S. (2016). The development of the nervous system. In L. Quintanar & Yu. Solovieva (Eds.), *Las funciones psicológicas en el desarrollo del niño* (pp. 21–36). Mexico: Trillas. [In Spanish]

Vygotsky, L. S. (2017). *Notebooks of L. S. Vygotsky. Selected*. Moscow: Kanon+. [In Russian]

Wertsch, J. V., & Tulviste, P. (1992). L. S. Vygotsky and contemporary developmental psychology. *Developmental Psychology, 28*(4), 548–557.

Original manuscript received April 02, 2020
Revised manuscript accepted July 28, 2020
First published online February 08, 2021

To cite this article: Solovieva, Yu., & Quintanar Rojas, L. (2021). Significance of activity theory concepts for qualitative neuropsychology. *Lurian Journal, 2*(1), pp. 21–41. doi: 10.15826/Lurian.2021.2.1.2