

Received: 18.02.2014
Accepted: 28.06.2014

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

DOI: 10.5604/17307503.1111853

CONSTRUCTING THE PSYCHOLOGICAL SUPPORTS IN AN ELDERLY PATIENT WITH COGNITIVE DEFICIENCY BASED ON THE VYGOTSKY-LURIA SYSTEM. A SINGLE-CASE STUDY

Nataliya Alexandrovna Varako^(A,B,C,D,E)

National Research University Higher School of Economics,
Moscow, Russia

SUMMARY

Background:

Cognitive disorders among elderly patients decrease the quality of life for them and their family. Although certain methods and techniques of support provided to this group are being developed and described in the subject literature, nevertheless, there are still many open issues. The Vygotsky-Luria system is one of the models which makes it possible to reorganize activity and develop certain supports. Therefore it is important to evaluate the influence of the rehabilitation interventions on the quality of life of an elderly patient with progressive cognitive disorders. In this article we describe the techniques and ways of neurorehabilitation and demonstrate the influence of 'psychological prosthetics' on improving the quality of life of a patient with cognitive disorders.

Methods:

A single case study of an elderly man, 78 years old, experiencing sight and cognitive disorders.

Results:

We distinguished 8 main difficulties, for which techniques and practices were developed, first of all, to engage external means and to organize the environment properly.

Conclusions:

Focused neuropsychological rehabilitation with the selection of the main 'goals' of rehabilitation and the construction of various supports, including those based on the Vigotskiy-Luria system, enriches the quality of a patient's life, increases their independence, social engagement and improves the emotional atmosphere within the family.

Key words: aging, neuropsychological rehabilitation, Vigotskiy-Luria approach to neurorehabilitation

INTRODUCTION

There are several theoretical approaches to cognitive rehabilitation. Some of them are concentrated on the theoretical models of various cognitive functions. They describe the structural elements of these functions and the understanding of the disorders which occur with their damage. Thus, there exist models of language and speech disorders (for example, Berndt and Mitchum 1995), models of working memory (for example, Baddeley 1986), a model of attention executive functions deficiency (The Supervisory Attentional System of Norman and Shallice 1986).

In recent decades the approach whereby the remediation of emotional consequences resulting from cognitive impairment and brain injury, is the essential component of rehabilitation, has achieved widespread appreciation. One of the first models of that kind was Cognitive Behaviour Therapy (Beck 1996). Although these authors were not the first to mention the importance of overcoming the emotional consequences and damage caused by the injury as well as by the experiencing of the resulting deficiency. One of the pioneers in this field was Ben-Yishay, the creator of one of the approaches in modern rehabilitation, 'Milieu Therapy' (Ben-Yishay 1996; Ben-Yishay and Daniels-Zide 2000). He assumes that work with the emotional and social consequences of brain injury should be the priority task: if those components are not treated, the whole idea of the rehabilitation of cognitive impairment is destined to failure. Moreover, it is important to create a realistic view of one's injury and one's limitations, to work systematically on the limitations, and this can really make the life of the patient more productive and enriched. It is appropriate to recall Luria's famous patient, described in the book 'The Man with a Shattered World: The History of a Brain Wound' (Luria 1987), who wasn't able to read and write, but years of hard work and trainings made it possible for him to write about 3000 pages. This work was to a large extent the meaning of his life.

G. Prigatano, through developing his own rehabilitation concept, can to some extent be called the follower of Ben-Yishay. In his book 'Principles of Neuropsychological Rehabilitation' he formulates 13 principles of neuropsychological rehabilitation (Prigatano 1999). These principles state the importance of understanding the mechanisms of the recovery of cognitive functions, about the psychotherapeutic impact on the patient, about designing an individual trajectory of rehabilitation, considering premorbid cognitive and personality characteristics, previous experience, current situation etc.

Theories and models of behavior and learning are equally important for understanding the problems of the patient with brain damage and cognitive functions impairment as well as for developing an appropriate rehabilitation program (Pachalska 2008; Pachalska and Kaczmarek 2012). Kanfer and Saslow (Kanfer and Saslow 1969) and Wood (Wood 1990) include within the factors essential for the planning of rehabilitation, behavior, motivation etc. Learning theories are important for solving specific rehabilitation tasks. Baddeley said: 'A theory of rehabilitation without a model of learning is a vehicle without an engine' (Baddeley

1993). In recent years principles of errorless learning have been actively applied in rehabilitation and have obtained a widespread occurrence (Baddeley and Wilson 1994; Clare and Wilson 1997). They are used not only in the rehabilitation of patients with brain injury but also for patients with Alzheimer's disease (Clare et al. 2001; Clare et al. 2003).

It is very important to associate scientific theory with its practical application, with the possibility to use its principles in current clinical practice, adapting general postulates to the particular needs of people and current circumstances. We see the approach of higher mental functions, created by the outstanding Russian psychologist Vygotsky (Vygotsky 1997), and later developed by his follower, colleague and friend, Luria (Luria 1971; Luria 1973) to be one of such 'practical' theories. The essence of this concept is the following.

Firstly, higher mental functions (in contrast to other bodily functions) form during one's lifetime, and are influenced by society (i.e., due to the influence of people on the individual). Secondly, higher mental functions are mediated by their psychological structure. It means that to perform any complex activity a human applies various kinds of aids, mostly speech. For example, everyone knows such a common method of memorizing as knot tying. There is one more example. Many people are familiar with the acquisition of new kinds of complex activity like, for example, driving a car. At the very beginning, when many actions are not yet automatic, the man helps himself by saying aloud the whole stages. Similar things can be observed in elderly people in whom the 'disorganization' of the automatized system already occurs. Thus, an aged woman constantly murmurs something while cooking, speaking through the order and particularities of cooking the certain dish. Speaking in psychological terms, she is mediating her activity with the help of speech. In the third place, higher mental functions are voluntary by the way of implementation. In other words, a man sets himself a task (for example, to remember something), controls the result of the accomplishment of the task etc. Arbitrariness (and awareness) of performing the function means that it is possible to enter into the process and analyze it at any moment. The fact that some of the actions we perform are without us being conscious of them points to the automatic and folded character of these actions. Though, if necessary, it can be placed to the 'focus' of consciousness and exposed to voluntary analysis. Let's demonstrate on the basis of several examples. Everyone knows how a child learns to write: at the beginning he writes hooks and circles, then elements of letters, then letters and combinations of letters, and after that whole words. At the beginning this activity is voluntary and includes a high-level of control after the process and after the result of the work. This activity gradually becomes automatic, and the voluntary control starts to be excessive and sometimes even interfering with the task. Nevertheless it doesn't mean that the whole function stopped being voluntary – it is just that some of its elements became somehow 'folded' and moved to the lower level of implementation. It is very important that, if necessary, the whole function can be brought to the voluntary conscious level.

Here we are closer to another important feature of all higher mental functions, due to which it is possible to learn something new as well as recover the lost abilities in the process of neurorehabilitation intervention. This feature is called exteriorization/interiorization. What does it mean? Studies of higher mental functions development in children demonstrate that any complex psychic activity is expanded at the beginning. For example, while learning to solve sums, a child at first gets support from external objective means which are well known and understandable for the child (popular sums 'about apples' etc.). Later, step by step, these objective means are substituted by more abstract algorithms, like the rules of doing typical sums, and these rules, when possible, are made external, as records, schemes etc. Finally, after some time, the child doesn't use any external supports any more. This happens because the logical operations are automatized and turned into 'mental skills'. In such a way the interiorization of particular logical operations – or its transition from the external plan to the internal, takes place. The ability to learn something not only in childhood, but also during the whole of life is based on the possibility for such a transition.

Above we discussed the transition of the function from the external plan to the internal, so-called internalization. There also exists the opposite way – transition of the function from the internal plan to the external, called externalization. This means that mental function cannot only be 'folded' and automatized, but it is also possible, if necessary, to unfold and to disautomatize the function. Everyone is familiar with the situation when they could do something really well, but for whatever reason did not practise it for a while, and then, when they try doing it again, find that something is wrong. In other words, it has become impossible to perform this action automatically, like before. Then, to recall the algorithm, one must 'unfold' the action, take out every element and understand at which step there are difficulties, correct it, and only then can the program be successfully performed again.

The possibility of restoring and modifying damaged functions is also based on the ability to 'fold' and 'unfold' the function. We may illustrate this with the following example. During the 1920-30s Vygotsky and Luria conducted experiments with patients with Parkinson's disease (Luria 1979). Parkinsonism, as is known, affects the basal ganglia, which causes damage to the smoothness of movements and hyperkinesia. When experimenters asked their patients to walk around the room, the patients could make only one or two steps, then the tremor got stronger, and they were unable to continue walking. Then a paradoxical fact was discovered: those patients who were unable to make more than two steps in a row on a flat floor, were still able to walk up stairs. The authors assumed that when a person is walking up the stairs, each step constitutes a separate movement task. Vygotsky used a simple trick to reorganize the movements. He would put pieces of paper on the floor and ask patients to stride over them. A miracle happened. A patient who had not been able to even make more than 2-3 steps before, was walking around the room for a very long time, striding over the pieces of paper as if they were walking up stairs. The compensation for movement impairments was made possible because of reorganization, a modification of the

mental processes. The authors 'unfolded' or exteriorized the process of walking, and after selecting its fragile, damaged element (the involuntary act of walking) substituted it with a more intact one (the voluntary act of striding over). These experiments demonstrate very well the special features of the organization of higher mental functions and the concept of exteriorization/interiorization.

The idea of designing psychological supports, some kind of 'psychological prosthesis', to modify activity and learn new actions, developed by Vygotsky, found its application in the higher mental functions recovery process, as well as in the teaching of healthy children and those with mental retardation. The first line was developed by Luria and his followers (Luria 1963); the second – by the outstanding Russian psychologist Gal'perin. Gal'perin created a theory of the step-by-step formation of mental actions and concepts (Gal'perin 1992; Haenen 1996; Haenen 2001), which includes six stages. In the first stage the motivational basis of the action is laid down, i.e., formed are the subject's attitude towards the goals and tasks of the following action and towards the material planned for learning. In the second stage a scheme of orienting the basis of an action is developed (systems of reference points and guidelines, consideration of which is necessary for the successful execution of the action, are selected). During the process of learning this scheme is constantly inspected and specified. The third stage is forming the action in a materialized form (the subject performs the required actions with support on the externally present examples of the action, for instance, on the schemes, written algorithms etc.). The fourth stage is overt speech, when the numerous correct solutions to various problems result in the absence of a necessity to use a material orienting scheme: the content of the scheme, of the algorithm is reflected in the speech, which becomes the basis for becoming action. At the fifth stage (soundless utterance) the external, sounding speech gradually disappears. In the final, sixth stage the process of speech leaves the consciousness, leaving only the final result - the substantive content of the action, i.e., internalization occurs. At each stage, the action is performed first unfolded (deployed), and then it gradually diminishes, folds. This approach allows one to organize the learning process, including learning in the case of rehabilitation and can be successfully applied for the rehabilitation of various disorders in different categories of patients: adults and children, patients after a stroke or with Alzheimer's disease etc. – and improve their quality of life.

Hereby we propose an analysis of a single-case study, which may serve as a concrete demonstration of such a possibility. In our rehabilitation work we used several approaches, but the approach of Vygotsky-Luria was among the essential ones.

CASE STUDY

General information. Patient P., a man, 78 years old. Doctor in the technical sciences. P. stopped working when he was 72 years old. He is followed up by neurologist due to complaints about bad memory, vertigo, unstable walking. He

is diagnosed with cerebral atherosclerosis, minor cognitive disorders. Eyesight impairment also takes place: the right eye is almost completely blind, the left eye has a narrowed visual field and glaucoma. P. constantly takes Memantin and Ip-idacrine or Pantoham (specific medications alternate), undergoes urological and cardiological therapy. As the therapy constituted a constant background, we do not consider that it might have impairment on the rehabilitation.

The patient and his family consulted the neuropsychologist asking for help in coping with a number of difficulties, which the patient and his family face in every-day life.

During his whole life P. has been a bright active person, who worked much and was successful at his work, he often went on business trips. He was a sportive, trim person. P. was fond of alpinism and mountain hiking, horseback riding and boating. The last time he went on a hike was when he was almost 74. He always loved to travel. When he was younger, he was an active, lively, cheerful participant in discussions. In recent years this kind of activity started to decrease, to fade. P. often looks like a quiet, somewhat slightly lost person. At the same time P. may successfully communicate with 1-2 people while functioning as a 'mono-channel' system. The improvement is particularly considerable in the case of communication on topics which are strengthened by past experience (for example, discussion about the current situation in his former professional field). Then the acuity of his mind, his understanding of the situation, his holistic view of it, his ability to extract the main problems etc. may be seen as it was long time ago.

P. is currently living at home with his daughter's family which includes her husband and two daughters. P. lives in a separate room.

METHODS

The examination. The patient was examined by means of a complex neuropsychological examination following the method developed by Luria (Luria 1999), and adapted for his age (Korsakova et al. 2009). It included an evaluation of memory, thinking, attention, the motor and visual-spatial sphere, of the functions of programming, regulation and control. Classical examination in Luria's system involves a qualitative analysis of disorders and symptoms, which results in a description of the general neuropsychological status of the patient. In order to collect an objective anamnesis, life history, premorbid features, habits, value and meanings' orientation and to formulate precisely the request for help, we carried out detailed conversations with P. and his family members.

Procedure. In order to create psychological supports for P., we applied the principle of exteriorization, unfolding the activity. It was necessary to substitute a damaged element in the system. Neuropsychological diagnostics, performed according to the Luria approach, facilitated the search for the damaged element as well as exploration of the intact elements of mental functional systems. After the damaged element was found, we aimed to replace it with another one, this time intact.

Speech is widely used for self-regulation even among healthy people. There was also a scheme of orienting the basis of an action designed for the modification, which was written in tables and action algorithms (in an external, material form). Later these actions were practiced in the external plan together with speaking aloud. The fact of basing the action on a scheme/algorithm and speaking out the actions aloud was itself trained as a new habit, a new skill.

NEUROPSYCHOLOGICAL STATUS

As it has been already mentioned, P. is a sociable person; he can easily make contacts and keeps them well. He is well aware of place and his own personality. Time awareness has minor distortions. P. confuses dates (up to 4-6 days) and the time of the day. Those disorders manifest themselves particularly intensely after sleep: when P. wakes up, it takes him quite a while to become oriented as to time of the day. At the same time P. complains about his memory and general inadequacy. He behaves reasonably in different situations (with his family and friends, at the doctor's, in the shop etc.), and is ready to cooperate. Judgment towards his own state and mistakes is declined. First of all, it affects the emotional component of judgment: knowing his mistakes, almost does not awake any feeling of being inaccurate and wrong. Usually P. laughs at his own mistakes and does not pay much attention to them. In order to draw his attention to this problem one has to be forthright when describing it and its consequences. Then P. gets upset and tries to take care of similar situations for a while. On the other hand, growing infirmity, feebleness and an incapability to perform everyday tasks and take care of himself makes P. worried.

This is the main subject of his complaints to the doctor and the formulation of a request for assistance.

44speechless and stagnate, falling asleep in his armchair with the radio on, or just in the silence of his room.

During the examination P. demonstrated diffuse neuropsychological symptoms. In the neuropsychological status a deficiency in energy supply and a decrease of neurodynamical parameters become apparent.

First of all this is reflected in the increased inhibition of the memory traces by the interfering impact of the sort of amnesic syndrome (forgetting the material as well as the fact of memorizing and the pathological influence of the heterogenic information), the long period of focusing on the task, pace recession, fluctuation of the mental activity level, fatigability, occasional fluctuations of the productivity, up to 'on-off' phenomenon, inertia, rigidity, a considerable slowdown and a significant drop in psychic activity (a decrease inattention, perception capacity), freezing.

Difficulties in the voluntary regulation of activity, programming and control also take place. Those symptoms occur in the various types of intellectual activity as well as in the everyday life and behavior. The level of their severity may vary and depends heavily on a vast range of factors such as volume and the pace of ac-

tivity, the level of wakefulness, the general emotional background (an increase in anxiety affects performance efficiency up to complete disintegration), general somatic well-being, the quantity of the simultaneous sources of information.

Thus we may often observe field behavior, mildly expressed and responsive to the correction as well as self-correction. At the same time even occasional distraction from the target can trigger sometimes life-threatening field behavior.

For example, P. was going to cross the street and waited for the green light. At that moment his daughter called him and, after enquiring about his current location, told him to go home as fast as possible. P. took it literally, and rushed across the street right into the heavy traffic. He was only not hit by a miracle. Yet another example of everyday field behavior are the constant attempts to open and enter/exit any door which happens to be on the way or within his field of view.

Intended activity regulation and control disorders also appear in the examination process. Impulsiveness, difficulties with the development and maintenance of the voluntary program of movements and actions, decrease in the control of the praxis tests, a slight decrease of the generalization level in solving sums, constructing solution algorithms and performing the basic level of Raven's Progressive Matrices and Kohs Block Design Test are present. Those symptoms were feeble and appeared mostly in the types of activity which are based on the functions of spatial synthesis and quasi-spatial analysis and synthesis. Another example of the control function disorder is the fact that while reading a meaningful text, a story, P. often loses the line where he is reading when it is time to change it, but nevertheless continues reading (sometimes 'jumping over' several lines) and stays insensitive to the loss of meaning in the text.

At the same time we should pay attention to a certain variability of symptoms: in a number of situations the voluntary regulation of activity was successful enough, including the memorizing of the material and intellectual activity, most notably in the cases when he was guided by the verbal instructions given by the experimenter or by his own self-sustaining speech.

P.'s mnestic activity is also affected (this fact is mentioned by the patient himself who presents complaints about bad memory as being his main problem). We can talk about modality-nonspecific memory disorder, which manifests itself with the following symptoms: a significant decrease of immediate and delayed recall span (3 and 1-2 stimuli respectively); a decline in learning efficiency (learning a series of 6 words require up to 8 repetitions); pathological inhibition of the memory traces by the interfering impact: in the case of homogeneous interference the span decreases and selectiveness of the traces of the former experience is disturbed; in the case of heterogeneous interference the recall span can be equal to zero (0-1 stimulus). Sometimes interference can 'delete' not only the presented material, but also the fact of memorizing itself. (In everyday life a similar problem occurs, for example, when P. forgets the fact of taking his pills. Thus P. takes the necessary dose of medicine, and 1-2 minutes after he begins to search for the pills on the table claiming that he hasn't taken any).

In the visual gnosis a narrowing of the volume of visual perception occurs (objectively a narrowing of visual field and gaze movement difficulties up to a paralysis of upgaze), considerable reading difficulties can be found. There are difficulties of spatial navigation in the real world and in solving quasi-spatial orientation tasks; spatial memory and imagination also declined considerably (according to the patient and his family). Difficulties in spatial navigation are first of all manifested in difficulties in forming spatial representations (for instance, while attempting to explain how to get to a little-known place like to the doctor's or to the shop) and in the development of new spatial representations (even in a year after moving to a new apartment P. still confuses the entrances to the kitchen, to his room, to the toilet and to the bathroom). P. usually doesn't lose his way in well-known places, but he can 'turn off' during the periods of reduced activation and then experience troubles with finding his way back to his current location. Similar problems appear when P. is absent from some familiar place for a long period (for example, moving to his country house in summer and coming back to the city in autumn). The described spatial navigation deficiency also takes place in motor skills.

P.'s praxis is also affected. First of all, it is related to the above-mentioned neurological symptoms, involving the subcortical brain structures. At the same time we may specify the particular neuropsychological features of the disorders. One of the most remarkable disorders is dressing apraxia, or apractognosia. P. often doesn't understand how to put on a shirt, or if one of its sleeves is partly/entirely turned inside out. It is difficult for P. to pass his hand into the sleeve: he misses it and cannot tell the top and the bottom of his clothes; how to position his hand towards his shirt or jacket to get to the sleeve.

Disturbances occur in speech in the form of forgetting the names of objects, word-finding difficulty and also literal paraphasia. This is particularly distinct when the arousal level drops. Reading and writing are almost totally impossible for P. because of considerable vision loss.

We need to specify the intact elements. This is a high motivation to be an autonomous and independent person, the ability to perform actions at a slow pace, in a 'single-channel' mode, following the preset algorithm.

Emotional and personal features. P. has an increased level of anxiety (according to his family members, this was characteristic of him for his whole life), rigidity, stubbornness. In cases of arising anxiety most of symptoms augment and severely disorganize the activity. During the examination (according to the family members, the same thing happens in everyday life) the serious and possibly dangerous mistakes provoke irrelevant laughter, which looks like a defensive response to his deficiency. Emotional lability, narrowing of the field of interests, blunted affect also takes place.

At the mundane level P.'s difficulties are related to his general neurological and somatic status and to the deficiency of his cognitive sphere. This includes night mental confusion (P. is used to getting up to go to toilet, and as he does it abruptly, he falls because of vertigo, confused he cannot find the door to the

toilet and to his room; instead of which he goes to the front door, shuts the door and then has to ring to get back in), frequent vertigo and a specific subwaking state during the periods of wakefulness. Any somatic problems (for example, cold or indigestion) immediately make things worse. Another set of problems is related to personal hygiene (for example, washing and cleaning the teeth: P. can take someone else's toothbrush, without being reminded he doesn't clean his teeth, doesn't wash his hands after using the toilet or after coming home from outside). P. cannot warm up his food using the gas cooker (it might be dangerous because he cannot clearly distinguish whether the gas is turned on or not).

NEUROPSYCHOLOGICAL REHABILITATION.

Considering the results of the neuropsychological examination and interviews we point out the main difficulties, determine the main 'goals' of rehabilitation, develop more narrow, specific tasks for each 'goal' and select the certain ways for the implementation and techniques of rehabilitation. We should emphasize that the patient as well as his family were initially very highly motivated to participate in the work and to overcome present difficulties, something which facilitated the work of the neuropsychologist.

The main direction of neurorehabilitation was determined by the goals and aims which were set up during the common discussion with P., his family and specialists: a neurologist, and a neuropsychologist. Among the general demands we accentuated, when possible, were those, which were at the top of the hierarchy, based on the criteria 'safety measures for health and life' and those which involved considerably independence and P.'s emotional state and that of his family. The rehabilitation work lasted three months. After three months the common meeting with P. and his family was set to sum up the results of the rehabilitation work and to make adjustments to the following program.

Below is the list of problems which became the goals of P.'s neuropsychological rehabilitation.

1. Risk of vertigo and fall.
2. Frequent attempts to leave the apartment instead of going to the toilet (Numerous times at night P. dressed in underclothes happened to find himself in front of the shut front door).
3. Willingness to open the front door without checking by whom and why the doorbell is being rung.
4. When the entire family is leaving for the whole evening (for example, it goes to a party), it is necessary to leave food and pills so that P. has dinner and takes medicine without forgetting or becoming confuse.
5. How to provide an optimal work load so that P. has something to do without disturbing the result (for example, to prevent him from buying things he was asked not to buy).
6. Taking care of personal hygiene.
7. Using a magnifying glass and reading on his own.

8. General activation of P., bringing him out of his 'slumber', which he falls into when left alone.

Taking into consideration the fact that the patient is able to function only at a slow pace, perceiving a moderate volume of uniform homogeneous information, 'single-channel' perception, personal anxiety and rigidity, poor eye-sight, we developed the following goals and means for each of the problems.

Risk of vertigo and fall, especially when P. stands up abruptly from a lying position. Considering that P. has a good general education, he is explained the principles of orthostatic pressure and incapability of blood vessels to readjust instantaneously and provide the necessary amount of blood to the brain. Such an explanation allows P. to follow recommendations knowingly and feel like an active participant in the rehabilitation process. To decrease the risk of vertigo one must stand up slowly, gradually changing the position of the head and the body. The optimal technique of standing up from a lying position is the following: turn to the side; raise yourself on an elbow and wait for at least 30 seconds in this position; sit on the bed and stay sitting for at least 30 seconds; then stand up smoothly, stay for a while and make sure that vertigo is absent; then slowly start moving. If when walking a feeling of instability appears, one must sit and stay seated for at least 2 minutes, and only then continue moving. To stand up from a sitting position the procedure is the same, but instead of raising himself onto an elbow he must sit straight, slightly leaning forward. For P. the main problem with the following recommendations is that he forgets them. Without consciously being reminded before each act of standing up P. starts to act automatically, raising himself abruptly from the bed or the chair. In order to develop a new motor stereotype it was recommended to act in two ways: 1) all the members of the family should constantly remind P. about the new rule; 2) the main external means of reminding him was the scheme, printed in big letters and placed on the door of P.'s room and at his desk where he is used to sit.

His frequent attempts to leave the apartment instead of going to the toilet. A solution to this problem begins with the organization of space, the environment around P. As such problems appear mostly at night, it is necessary to leave the door to the toilet open, with the light on, to leave the night light in the corridor and in P.'s room. In this way P. receives a kind of 'light passage' in the darkness of the night which he can follow without straying. Another necessary safety requirement is the readjustment of the door handles inside the apartment (it is necessary to change all the door knobs). It is also necessary to remove all the keys to the apartment from the places where P. can find it.

His willingness to open the entrance door without checking by whom and why the doorbell rings. This problem required a drastic solution: P. had no keys to the apartment. This was a common decision, made due to the crime situation in Moscow, especially regarding widespread fraud against the elderly. In recent years cases of entering and theft or extortion under various excuses (calls from the 'relatives in trouble', visits by the social services etc.). P. himself has almost fallen victim to such swindlers twice, fortunately, his relatives came home before it was too late.

When the whole family is leaving for the whole evening, it is necessary to leave food and pills so that P. has dinner and takes medicine without forgetting or becoming confused. Because it is unsafe to let P. use the gas cooker to warm up his meal, it was proposed to leave him such food, which doesn't require cooking (for example, cheese, pancakes, pastries) and to put it in the agreed place (in the fridge or on the table). In such a case the place was always shown to P. and it was explained what exactly had been prepared for his dinner. The dining table was left empty except for the things necessary for P. to have dinner. Usually it was his cup, his spoon or his fork, food (if there was no need to keep it in the fridge), napkin and his pills. To make P. notice and take all the necessary pills, they were prepared in good time and put on a bright plate. The color and the level of contrast were specially selected to take into account P.'s poor eyesight. Attempts to leave medicine in an ordinary cup or on an ordinary plate were unsuccessful because their light or dark color did not provide the necessary figure-ground contrast for the pills of different color. As for the kettle, the family used an electric one, which P. could manage well enough on his own.

How to provide an optimal work load so that P. has something to do without disrupting the result (for example, to prevent him from not buying what he was asked to buy). Most of P.'s occupations are household chores. Usually P. is asked to buy food or go on other small errands like paying a bill at the bank. The main purpose of these duties is the wish of P. and his family to provide P. with a work load sufficient to improve his emotional background, to give him an opportunity to feel in demand and useful. The main problem here is related to P.'s memory deficiencies: P. forgets large amounts of information and confuses details, which leads to frequent mistakes and irritation on the part of family members. To cope with it, the family and P. developed a system of lists which are written on sheets of paper by the family members and then given to P. However, this method doesn't always lead to success. After the special analysis we found the following 'mistakes' and ways of correction.

Lack of cooperation between family members. If one of them said something and the other engaged in arguing with him, P. may easily mix up what exactly he has to do/to buy;

Deviation from the standard list. Any deviation from the ordinary standard (for example, buying a different kind of bread) must be brought to P.'s notice (and be repeated 3-4 times to make him remember that there is in fact a change to the ordinary list), and the changed item in the list should be highlighted or emphasized;

In cases when P. has to go to different shops, several lists on separate sheets of paper have to be written. If possible, lists should be given to P. one after another, after the implementation of the previous one. When this is not possible, each list should be marked with a number (1, 2 or 3 – but not more than 3), and those numbers, (indicating the sequence), should be highlighted with different colors;

Repeat every time if something from the list is out of stock, nothing should be bought to substitute the missing item, even if the shop assistants insist to the contrary;

Use of memory techniques involving emotional stimulation. For example, when it is necessary to buy strawberries, grapes and pears, fruits are associated with the image of traffic lights: 'red, amber, green'. Also the cheese brand, which resembles the last name of an acquaintance, is associated with this name (in this example, even if the name of the brand is replayed inaccurately, the shop assistants understand what is meant).

When P. goes shopping, he often searches for his wallet in his pockets, has troubles in finding it and becomes agitated, which affects the result of the search. In order to minimize such problems and decrease the anxiety level, P. is taught to concentrate his attention on the object he is interacting with, on the process of what he is doing and to speak it aloud: 'Before doing something, stop for a while. Say: what are you doing? Holding a wallet? Put it into the pocket? Into which pocket? Into the upper one, with the zipper'.

Taking care about personal hygiene. Among P's frequent mistakes we selected the following 'goals' for the rehabilitation treatment: using someone else's toothbrush, using someone else's shower sponge, using someone else's towel, forgetting to clean his teeth, forgetting to shave, shaving only one half of his face. The measures taken in order to solve the first three problems mostly included arranging the environment. For the two last problems an algorithm construction and mnemonic were applied.

Using someone else's toothbrush. Especially for P's toothbrush and paste there was a separate toothbrush holder fixed in the place where no other family members kept their toothbrushes and toothpaste. A position more convenient for P. and better lit on the right side of the sink was selected for this purpose.

Using someone else's shower sponge. Following the same rules we found the most convenient, well-lit and visually available place for the hook and chose a shower puff, noticeable by its bright color and clearly distinct from those of the other family members.

Using someone else's towel. Dark towels of a noticeable color, clearly distinct from those of the other family members, were chosen for P. The position for his towel was chosen in such a way that it was the first to turn up it was the most likely to be taken when washing and taking a shower.

Forgetting to clean his teeth and forgetting to shave. In order to accomplish all the hygienic procedures regularly P. obtained a strict algorithm of morning and evening procedures. This algorithm was written in large-print with highlighting (including the algorithm of shaving), laminated and placed on P's desk where he came to listen to the radio and to measure his blood pressure every morning and every evening (this necessary procedure had been stabilized during the last several years).

Reading with a magnifying glass on his own. For his whole life P. had been an avid reader. In recent years his desire to read had decreased, probably be-

cause of a certain emotional flattening. Nevertheless P. enjoyed listening about novelty books and would like to become familiar with them. However P.'s eyesight was already relatively weak, with the distinct narrowing of his visual field and rapid fatigability. We decided to compensate for these difficulties by using a magnifying glass, which also helps to organize the environment (Korsakova and Balashova 1995). P. was offered a choice of various kinds of magnifying glasses and a time-limit was set: reading not longer than 20 minutes 3 times per day. Unfortunately, P. didn't get used to a magnifying glass. During the additional meetings and conversations it became clear that a magnifying glass was an additional source of P.'s 'spatial' difficulties, which inputs one more variable, which he cannot cope with, into the system of spatial relations book/text/line/beginning-end of line/eye movements. P. also demonstrated an increase in anxiety because of a fear that he would make his already poor eyesight even worse. Finally a joint decision was made to abandon attempts to organize P.'s reading on his own and substitute it with audiobooks and readings by one of the family members. The last option gave an additionally strong positive emotional lift.

General activation of P., bringing him out of his 'slumber', which he falls into when being alone. In discussing different kinds of activity suitable for P., we were searching for a field which could be emotionally meaningful for P. and consequently vitalize him. During the discussion and observation we found out that such a kind of activity such as watching films and TV is difficult for P. because his pace performance characteristics go beyond the rate of information in the movies and TV programs, beyond the intensity of visual imagery. P. was used to watching the evening news but gradually even this 'favorite occupation' produced the needed effect only quite seldom: P. often didn't manage to follow the speed of information flow, switched off and fell asleep. The same could be noticed when P. was listening to the radio, which became his favorite activity. It was possible to save him from slumber by reading aloud an interesting and exciting book, or by face-to-face human communication (including simple games with the youngest granddaughter). As a result the family began to take turns to read to him for 30-40 minutes per day (when it was possible), and tried to activate his communication, including telephone conversations with family and friends.

RESULTS

The purpose of this rehabilitation work was to improve the executive functions, memory, to advance adaptation towards everyday life and to improve the emotional background in an elderly patient with cognitive deficiency and in the family members he is permanently living with. After a neuropsychological examination of P., according to the Luria system and a conversation with the family members, we determined 'the targets' for rehabilitation work – 8 different problems. After the end of rehabilitation intervention it is possible to talk about the multidirectional effect of rehabilitation. We managed to achieve a beneficial effect, improvement of functioning and an increase of adaptation towards most of the selected prob-

lems. In relation to some of the selected problems we failed to achieve such an effect. Further we discuss the results of the rehabilitation work.

Risk of vertigo and fall. After putting into practice the orienting chart about the proper way of standing up, the number of abrupt stand ups which led to vertigo and falls noticeably decreased, including those at night. It does not seem to be possible to acquire objective data in this matter, so the main criteria here are the reports of the family members and of P. himself. Thus before applying the rule-reminder such 'risings' happened up to 7-8 times during the day and 2-3 times at night (almost every time), after introducing the assistive means the number of abrupt risings decreased to 3-4 and 0-1 respectively. The main method of stereotype formation was the exteriorization of function (Vygotsky) and the constructing of psychological supports with the aid of external means: a sheet of paper with the written rules of motor skill implementation.

Solving such problems as 'Frequent attempts to leave the apartment instead of going to the toilet (Numerous times at night P. dressed in underwear would happen to find himself in front of the shut front door)' and 'Willingness to open the entrance door without checking by whom and why the doorbell rings' was related to providing safety for P. and his family. Considering the general state of P.'s health, the episodes of a night clouding of consciousness, rehabilitation was constructed not as much towards a modification of P.'s behaviour as towards a modification of his environment (Miotto et al. 2009). This decision was successful with regard to safety, but on the other hand it aroused feelings of grief and helplessness within P. in the face of his inferiority. The friendly attitude prevalent towards P. in his family, involved him in discussions about various topics (for instance, helping the eldest granddaughter with her homework in such fields as history and geography) and engaged him in housework. The reorganization of his environment and the involving of family members was also used to solve the problems 'When the whole family is leaving for the whole evening, it is necessary to leave food and pills so that P. has dinner and takes medicine without forgetting them or becoming confused' and 'General activation of P., bringing him out of his "slumber" which he falls into when staying alone'. These problems were successfully solved: the family could be absent from afternoon up to late at night, and P. felt independent and autonomous, which increased his self-esteem and improved his emotional background. No mistakes were found when taking meals and medication. The task of a general activation of P. was fully accomplished by his family members, though this was mostly seen as a pleasant task, which gave P.'s relatives a kind of 'tool', made their communication with P. more object-oriented.

Solution of the problems 'How to provide an optimal work load so that P. has something to do without disturbing the result (for example, to prevent him from buying what he was not asked to buy)' and 'Taking care about personal hygiene' developed diversely. Firstly, as in the other questions, a serious modification of the patient's environment was undertaken, which minimized the probability for error (P. never confused his toothbrush, towel or shower-puff never confused what kind of product and in which shop he had to buy something). On the other

hand, various external supports were applied (for example, mnemonic or algorithm), which helped to overcome the current impairment (hygienic practices became more regular though we cannot say that 100% efficiency was achieved). For example, before rehabilitation P. almost never brushed his teeth (he would sometimes swill out his mouth after meals, when something felt uncomfortable). As a result of rehabilitation P. began to clean his teeth at least once a day.

The lowest results were achieved for the problem 'Reading on his own with a magnifying glass'. We may even say that our attempt failed – P. didn't manage to use a magnifying glass, and even the process of reading itself irritated him. We may assume that using a magnifying glass as an external aid, should be based on relatively intact functions of spatial analysis and synthesis (the reorganization of external visual space). And it is those particular functions, which are highly disturbed in P.'s case. Thus we based the rehabilitation on an external aid which requires support from the damaged element. Apparently this was the root of our failure.

DISCUSSION

The construction of psychological supports and the very fact of rehabilitation intervention itself turned out to be helpful for the patient with cognitive impairments. We may say that among the 8 problems which were the targets of P.'s neuropsychological rehabilitation over a period of 3 months, 7 were solved successfully enough. As we have already discussed, one part of these problems was solved as a result of environment modification, another part through the application of cognitive rehabilitation supports. The second part appears the more interesting to discuss.

As may be seen from the description, the construction of psychological supports took place mostly through the reorganization and externalization of actions, the design of external supports on the material level and talking aloud the important points and sequences of actions. Modifications were implemented after identifying weak, disturbed and intact strong elements of the system and reconstructing the whole activity within the new functional system.

Considering P.'s general decline of energy supply to psychological activity, evident lassitude and fatigability, we did not set any particular goals of internalization and the overlearning of the new skills. Frequent repetitions stimulated the spontaneous process of over learning, as the newly developed skill was unsteady the external aids were kept as constant supports.

The most successful was the experience of work with 'abrupt standing up' and hygienic practices. In both cases external aids were designed – external means of reminding such as an algorithm, printed in big letters emphasizing the main ideas, stages etc. Those external aids served several functions: 1) they arranged P.'s activity, at the same time decreasing the negative influence of his general dysexecutive syndrome, i.e., they helped to implement activity regulation; 2) they allowed him to construct a program of his activity at the current moment; 3) they

helped to maintain both the intermediate one-step and the general control of an activity; 4) they allowed one to decrease P.'s energy loss on performing activity; 5) they changed previously formed regulation and control strategies, which disturbed task accomplishment due to their high energy absorption capacity; 6) gave P. an opportunity to realize, to look at his own limitations and weak points from the outside; 7) finally, as a result of the application of the external aids, the general level of anxiety and hesitancy decreased; 8) through its binding to everyday life, those supports improved real-life quality.

We may consider the use of mnemonic techniques as one more example of the successful application of mediation, associating P.'s previous experience with the memorizing of current information. The most successful were those mnemonic techniques which were based not only on previous knowledge, but also had some (emotional) affective tone or were constructed upon past emotional experience (for example, a quotation from a book or an anecdote, the last name of a historical, literary character, a politician or of an acquaintance etc.). It is highly probable that one of the recourses to improve P.'s memory will be stimulating him to participate himself in a selection of mnemonic aids of that kind.

Possibly an analysis of the mistakes and 'failed' experiments is the most interesting. The tactic of teaching P. to use a magnifying glass for reading happened to be one of that kind. It is known that many elderly people use a magnifying glass because of visual impairment and a general narrowing of activity, and that this is also related to a successive strategy of information processing (as opposed to a simultaneous strategy, typical for a person of a younger age (Korsakova and Balashova 1995). A magnifying glass helps them not only to increase the size of the letters, but also to organize the space, limiting it to an easily perceivable size. For P., the purpose of using a magnifying glass was to find a solution to those two problems in particular. In effect we faced the totally opposite effect: P.'s activity was almost completely disintegrated, when he tried to read with a magnifying glass. What was the reason for this? Possibly an example taken from experiments conducted by Vygotsky and Luria on patients with Parkinson's disease may help us to answer this question (Luria 1979).

As was already discussed, Vygotsky used a simple trick to reorganize the activity of patients with Parkinson's disease: he put pieces of paper on the floor and made patients stride over them. This method enabled the patients to walk around the room for a very long time, even though they could not even make more than 2-3 steps previously. The spoken instruction of the experimenters was also successful when they asked the patients to knock on the table or squeeze a rubber douche following the experimenter counting 'one-two, one-two'. The main goal the experimenters were trying to achieve was to find methods of self-regulation, so that the patients' movements were independent of the actions of the other people. As methods of such they tried blinking, then the patients' own speech (their counting 'one-two'), and, in the last set of experiments, solving mentally a simple intellectual task, (for instance, knock as many times as a car has wheels). Blinking turned out to be a fair method for the accomplishment of

a motor task, but not a very efficient one. A mental tally was the best method: the efficiency of movements improved considerably, and also the muscle tone level gradually decreased in contrast with the raise of muscle tone typical for Parkinson's disease in the process of performing a movement.

But the patients' own speech, on the contrary, DID NOT improve task accomplishment (while external speech regulation improved it significantly)! Analyzing these results Vygotsky and Luria came to the conclusion that the patients' speech and their movements rely on the same brain regions (damaged in those who have Parkinson's disease), because speech itself is a movement to a large extent. That is why they decided to use intellectual activity as an aid, not associated with movement and relying on other brain regions.

We may analyze our failed effort with the magnifying glass following the same logical scheme: the use of a glass itself should be based on the intact functions of optical-spatial analysis and synthesis, because it changes exactly the spatial characteristics of the text (makes it narrow or convex). If this is so, then the failure with its usage can be explained by the considerable difficulties in the sphere of optical-spatial functions which were found in P. during the neuropsychological examination. It is also probable that development of a new complex stereotype requires great energy expense, the supplying of which is also disturbed in P.

In general, we may say that Vygotsky's theoretical model of the mediated structure of higher mental functions through reliance on external means and symbols, as well as its practical application in the rehabilitation process, is an adequate and effective mechanism for the construction of psychological support, a kind of psychological 'prosthesis' in the case of a deficiency, the 'breakdown' of an element in a higher human cortical function. At least we can affirm the success of this approach in the case of one elderly individual with impairment of cognitive functions.

It is certain that for successful rehabilitation there is such an important thing as incorporating rehabilitation intervention into everyday life and the needs of the patient and his family. This was not only the cause of high motivation and the desire to labor at the deficiency, to surmount obstacles, but also gave meaning to the whole process of rehabilitation: all the participants in the process were aware of the reasons why something is being done (in contrast to the general cognitive sets of training proposed by acquaintances and doctors 'to train the brain'). According to Barbara Wilson, 'Rehabilitation is now seen as a partnership between people with brain injury, their families and health service staff' (Wilson 2003, p.294).

We certainly understand that today the rehabilitation of patients with progressive aging cognitive disorders is obviously an attempt to slow down the onset and worsening of dementia (Gatz et al.1998), the reasons for which are found not in the sphere of psychological problems, but in the pathological processes in the brain, and, possibly, in metabolism, in genetics (Slooter and van Duijn 1997; Tiraboschi et al. 2004; Wischik et al. 2008). It is obvious that the most important role in overcoming brain pathology, the atrophy of nervous tissue be-

longs to the biochemical and pharmaceutical line of research (Doody et al. 2008; Ihl et al. 2011) but this is still a matter for the future; although psychological intervention and cognitive rehabilitation can help such patients and their families to minimize the current difficulties and improve the quality of their life. Through conversations with P. and his family, which took place after 3 months after rehabilitation, we realized that one of the main results of our work was that all the participants of the rehabilitation process understood, WHAT and HOW should be done in the problem situation, and WHY it SHOULD be done. Many of the solutions turned out to be a problem for the family, and could not be really called a good solution, but a possible one. And this was their common conscious solution.

ACKNOWLEDGMENTS

The author is grateful to P. and his family for their participation in this work and for having expressed permission for the data to be published.

REFERENCES

- Baddeley A.D. (1986). Working memory. Oxford: Oxford University Press.
- Baddeley A.D. (1993). A theory of rehabilitation without a model of learning is a vehicle without an engine: A comment on Caramazza and Hillis. *Neuropsychological Rehabilitation*, 3: 235-244.
- Baddley A.D., Wilson B.A. (1994). When implicit learning fails: Amnesia and the problem of error elimination. *Neuropsychologia*, 32: 53-68.
- Beck A.T. (1996). Beyond belief: A theory of modes, personality, and psychopathology. In: P.M. Salkovskis, editors. *Frontiers of cognitive therapy*. New York: The Guilford Press:1-25
- Ben-Yishay Y., Daniels-Zide, E. (2000). Examined lives: Outcomes after holistic rehabilitation. *Rehabilitation Psychology*, 45(2):112-129.
- Ben-Yishay, Y. (1996). Reflections on the evolution of the therapeutic milieu concept. *Neuropsychological Rehabilitation*, 6: 327-343.
- Berndt R.S., Mitchum C.C. (1995). The cognitive neuropsychological approach to treatment of language disorders. *Neuropsychological Rehabilitation*, 5 (1-2):1-16.
- Clare, L., Wilson B.A. (1997). *Coping with memory problems*. Thames Valley Test Company.
- Clare L., Wilson B.A., Carter, G., Hodges, J. R., Adams, M. (2001). Long-term maintenance of treatment gains following a cognitive rehabilitation intervention in early dementia of Alzheimer type: A single case study. *Neuropsychological Rehabilitation*, 11, 3-4: 477-494.
- Clare L., Wilson B. A., Carter G., Hodges J. R. (2003). Cognitive rehabilitation as a component of early intervention in Alzheimer's disease: A single case study. *Aging and Mental Health*, 7:1, 15-21.
- Doody R.S, Gavrilo S.I, Sano M., et al. (2008). Effect of donepezil on cognition, activities of daily living, behaviour, and global function in patients with mild-to-moderate Alzheimer's disease: a randomised, double-blind, placebo-controlled study. *Lancet July*, 372 (9634): 207-15.
- Gal'perin P. Ia. (1992). Stage-by-stage formation as a method of psychological investigation. *Journal of Russian and East European Psychology*, 30, 4: 60-80.
- Gatz M., Fiske A., Fox L., Kaskie B., Kasl-Godley G.E., McCallum T.J. and Wetherell J.L. (1998). Empirically validated psychological treatments for older adults. *Aging and Mental Health*, 4: 9-45.
- Haenen J. (1996). Piotr Gal'perin: Psychologist in Vygotsky's footsteps. Commack, New York: Nova Science Publishers.
- Haenen J. (2001). Outlining the teaching-learning process: Piotr Gal'perin's contribution. *Learning and Instruction*, 11: 157-170.
- Ihl R., Frölich L., Winblad B., Schneider L., Burns A., Möller H-J. & WFSBP (2011). Task force on treatment guidelines for Alzheimer's disease and other dementias. WFSBP Guidelines for Alzheimer's disease and other dementias. *The World Journal of Biological Psychiatry*, 12: 2-32.

- Kanfer F.H., Saslow G. (1969). Behavioral diagnosis. In: C. Franks, editor. Behavior therapy: Appraisal and status. New York: McGraw Hill. 417-444.
- Korsakova N.K., Balashova E.Yu. (1995). Oposredovanie kak component samoregulyatsii psichicheskoi deyatel'nosti v pozdnem vozraste. *Vestnik Moskovskogo Universiteta*, 14, Psikhologiya, 1:18—23. (in Russian).
- Korsakova N.K., Balashova E.Yu., Roschina I.F. (2009). Express-method of assessment of cognitive functions in normal aging. *Psikhologicheskie Issledovaniya*. 3(5).
- Luria A. R. (1963). Restoration of function after brain injury. New York: Pergamon Press.
- Luria A. R. (1971). Metaprinciples in Luria's neuropsychology. *Skolepsykologi*, Argang 8 - NR. 6: 407-409.
- Luria A. R. (1973). The working brain: an introduction to neuropsychology. New York: Basic Books.
- Luria A. R. (1979). The Making of Mind: A Personal Account of Soviet Psychology. Harvard University Press.
- Luria A. R. (1987). The Man with a Shattered World: The History of a Brain Wound. Harvard University Press.
- Luria A.R. (1999). Outline for the neuropsychological examination of patients with local brain lesions. *Neuropsychology Review*, 9, 1: 9-22.
- Miotto E. C., Evans J.J., Souza de Lucia M.C., Scaff M. (2009). Rehabilitation of executive dysfunction: A controlled trial of an attention and problem solving treatment group. *Neuropsychological Rehabilitation*, 19:4: 517-540.
- Norman D. A., Shallice T. (1986). Attention to action: Willed and automatic control of behavior. In: R. Davidson, G. Schwartz, D. Shapiro, editors. Consciousness and Self Regulation: Advances in Research and Theory. New York: Plenum Press, 4: 1-18.
- Pachalska M. (2008) Rehabilitacja neuropsychologiczna. Lublin: Wydawnictwo UMCS
- Pachalska M., Kaczmarek B.L.J. (2012). Alexander Romanovich Luria (1902–1977) and the microgenetic approach to the diagnosis and rehabilitation of TBI patients. *Acta Neuropsychologica*, 10(3): 342–369.
- Prigatano G.P. (1999). Principles of neuropsychological rehabilitation. New York: Oxford University Press.
- Slooter A.J.C., van Duijn C.M. (1997). Genetic epidemiology of Alzheimer disease. *Epidemiologic Reviews*, 19 (1):107-119.
- Tiraboschi P, Hansen L.A, Thal L.J, Corey-Bloom J. (2004). The importance of neuritic plaques and tangles to the development and evolution of AD. *Neurology*, 62 (11): 1984–9.
- Vygotsky L.S. (1997). The Collected Works of L. S. Vygotsky: The History of the Development of the Higher Mental Functions., New York: Plenum Press, 4.
- Wilson B.A. (2003). The future of neuropsychological rehabilitation. In: Wilson, B.A., editor. Neuropsychological Rehabilitation: Theory and Practice. Psychology Press: 293-301.
- Wischik C.M, Bentham P., Wischik D.J, Seng Kwang Meng. (2008). Tau aggregation inhibitor (TAI) therapy with remberTM arrests disease progression in mild and moderate Alzheimer's disease over 50 weeks. *Alzheimer's and Dementia: The Journal of the Alzheimer's Association*, July, 4 (4): 167.
- Wood, R.L. (1990). Towards a model of cognitive rehabilitation. In: R.L. Wood, I. Fussey, editors. Cognitive rehabilitation in perspective. London: Taylor & Francis: 3-25.

Address for correspondence:

Varako Nataliya Alexandrovna

National Research University Higher School of Economics, 20 Myasnitskaya
Ulitsa, Moscow 101000, Russia

phone number 007 910 476 73 65

nvarako@mail.ru, nvarako@hse.ru