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Special section

LURIA'S LEGACY IN CULTURAL-HISTORICAL PSYCHOLOGY

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Special section LURIA'S LEGACY IN CULTURAL-HISTORICAL PSYCHOLOGY

Editorial

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It is now more than half a century since I spent a year in Moscow as a post-doctoral fellow working under the supervision of Alexander Romanovich Luria. That experience and the 15 years during which we corresponded and organized translations have fundamentally shaped my scientific career. Simultaneously the reach and influence of Luria's ideas have continued to diffuse throughout modern scientific psychology. The following remarks are intended to suggest some of the recent accomplishments and current issues facing those who have adopted a Lurian approach, which traces its origins back to the 1920's.

In my view, the development of a cultural-historical psychology will depend greatly on the degree to which it can guide efforts at life-generating, socially sanctioned, new forms of activity in health, in education, in preparation to confront the challenges to human existence posed by human beings themselves.

Variety of Forms of Cultural Mediation of Human Activity in the Modern World

I became a professor of Communication in the late 1970's, just at the time that PCs became the focus of social attention. My prior research had focused on the role of culture in cognitive development (Cole et al., 1971). The media I had studied were oral language and literacy in West Africa and rural Mexico (a point of research and theoretical overlap between Alexander Romanovich and myself).

The central concept of Communication as a discipline is mediation. Beginning from that fundamental concept allowed me to study development in relation to a wide range of media: print, telegraph, telephone, film, music, drama, and digital media (Cole, 1995). From my perspective, there have been too few uses of the cultural-historical approach to illuminate the medium-contingent nature of psychological processes in the field of Communication, psychology, and human development.

Cultural-Activity Approach as an Interdisciplinary Project

So here we encounter the need to combine the study of culture and activity in a combined way for the first time. We could spend 100% of our time on this topic and not penetrate below the surface. Here we come upon the ongoing discussion of Lev Vygotsky versus Alexey Leontiev. My own path, which opened up from interactions with my colleagues in various parts of the world, has been to take up the very problems upon which agreement in the Vygotskian school was impossible. Others have taken a similar route, and referred to the common tradition as Sociocultural Theory. At the same time in Russia, the term non-classical psychology is widely used.

From the beginning of my career I have insisted on the centrality of an interdisciplinary, problem-oriented approach in my work. At first it was necessary to integrate ethnographic anthropology and micro-sociology into my experimental, quantitative practices. In my general writings, where all four of Vygotsky's "genetic domains" are engaged, I have taken to calling an interdisciplinary, cultural-historical approach "bio-social," "cultural-historical theory" and a great deal of my time is taken up with the issues that Vygotsky and Luria tackled in the late 1920's (Vygotsky, 1978; Luria, 1928).

Psychology and Sociocultural Practices of Human Development

It is in the arena of social practice that the value of a Vygotskian-inspired Lurian psychology seems to have the greatest potential. I have used their ideas to engage in design-based intervention research as a basic methodological strategy, for the past 40 years. I have called our approach "positive critical theory." It is positive in the sense that it takes the best of accumulated knowledge and seeks to improve upon some important area of social practices (formal and informal educational practices, in my case). The critical part comes first, in the middle, and at the end of this research practice. It is critical at the outset of existing practices. It poses an alternative, that, if theory is a reliable guide, will produce the socially desired change. It turns critical in two ways at the end. First, to the extent that it is successful, yet the local community does not reorganize to adopt it, it provides a workable alternative practice in support of the children and youth who benefited. And when, after 15 or 20 years, the community abandons the activity despite its successful functioning, one becomes critical of one's community and one's own illusions about the process of cultural-historical development, both in a person and in society.

From Joint Activity to the Co-creation of Culture

I have adopted joint, mediated activity as a unit of analysis in seeking to apply my interpretation of cultural-historical psychology. Culturally mediated activity contains the idea that the forms of mediation matter, and allows us to make use of Vygotskian tools such as the dramatic metaphor. The dramatic metaphor underpinned the way in which we organized activities in the 5th Dimension after school activities (Cole, 1996; 2006; Nicolopoulou & Cole, 1993). There were assigned tasks, but there were also prominent play-inspired activities, with always a role for change and choice, always framed as a lifeworld inhabited by Wizards.

In this activity, small groups and dyads, with different participants mixing together in unpredictable ways, we observed the emergence of a distinctive, activity-specific “culture”. This “residue of the past” was made manifest in the vocabulary, the changing content of the local practices, the art created as products of the activity, as well as the emotional tone of the participants.

It is a big research problem to evaluate such systems as novel forms of activity involving children and youth. They fit more easily into the garden metaphor of culture. Like gardens, cultures are an arrangement of the environment of the focal organisms/plants/humans. The criterion of success is that they reproduce themselves adequately for human consumption. And that the meal they provide is sufficient for the human who eats them to value them.

Translated into real world terms, the innovation has been adopted (taken in), at more than one hundred such efforts by dozens of investigators. It has, in some cases, been sustained over decades. More likely by far is an activity that lasts for a few years, and then gets subsumed in a new wave of technocratic change wrought in the system of formal education. Study of such systems over years, as they multiply and die off, provides a way to move in scale of analysis from micro-genesis (the level of culturally mediated, joint activity) through ontogenesis and cultural history (Bronfenbrenner & Morris, 2006). I have called this approach a “mesogenetic methodology”. It ranges across scales of time, seeking data about the process of learning and development as it is manifest at different temporal scales.

These are my personal thoughts on this occasion. What follows are the thoughts of my colleagues around the world who gathered to acknowledge and celebrate Alexander Romanovich’s contributions to world psychology.

The papers in this number of *Psychology in Russia: State of the Art* have been selected from presentations given at the Fifth International Luria Memorial Conference held in Yekaterinburg, Russia in October 2017. They attest to the continuing influence of Alexander Luria on the elaboration of a cultural-historical approach to the development of higher psychological functions across a wide variety of populations and forms of activity. Central to Luria’s approach was the extraordinarily broad reach and depth of his scholarship, ranging from the study of sociocultural influences on development, to the diagnosis and rehabilitation of children and adults suffering a broad spectrum of insults occurring in the central nervous systems in subjects ranging from young children to adults.

J. M. Glozman replicated and extended Luria’s study of the influence of cultural change on psychological processes of two groups of adults from a remote area of northern Kamchatka. All of the subjects had completed elementary school, but some worked as nomadic herdsman, while some lived and worked in a village. The results revealed that despite the fact they all had a modest level of education, the villagers performed better on a variety of tasks, indicating the kind of influence of social experience on cognitive functioning that Luria had reported more than 8 decades earlier.

O.V. Maslova and her colleagues report significant changes in the social values and acculturation strategies of Vietnamese students attending Russian universities. Her results demonstrate a significant shift in values toward a more materially prosperous life, depending upon gender, the type of environment (rural/urban) the individual comes from, and the strategy of acculturation they adopt.

A.S. Sultanova's research focused on the neuropsychological analysis of mental development among school-age children who had suffered neonatal hypoxia. The author reports that all of the affected children exhibited a "subcortical-frontal" neuropsychological syndrome that negatively affected a broad range of psychological functions.

P.V. Moskaleva and her colleagues studied cognitive and personality changes associated with juvenile myoclonic epilepsy (brief shock-like jerks of a muscle or group of muscles). A major finding of the study was that young adults suffering from juvenile myoclonic epilepsy suffered from a number of co-morbid personality and non-psychotic psychiatric disorders, pointing to the need for psychiatric help in addition to currently employed forms of therapy.

S.V. Prokopenko and his colleagues investigated the potential of modern, interactive computer programs based on Luria's neuropsychological theories. The patients had all suffered vascular cognitive impairments. The training materials focused on computer-based tasks involving visual and spatial perception and memory, attention and impulse control. The training proved effective, as did a comparison group that played a variety of commercially available computer games.

E. Nikolaeva and A. Novikova report age differences in interactions between creativity and intelligence levels.

Y. Solovieva, based on Luria's approach to syndrome analysis, presents a case study of a 12-year-old boy who suffered severe brain trauma when hit by a bus. The author combined Luria's qualitative syndrome analysis based on the ideas of complex functional systems with P.Y. Galperin's approach to the step-by-step formation of intellectual actions. This combined method of diagnosis and rehabilitation allowed the patient to reintegrate himself into his family, participate in school and to enjoy the companionship of friends. He became more responsible and motivated to participate in all kinds of practical and intellectual activities. Negative emotions disappeared. The patient became reflexive, critical and involved in his own achievements and difficulties. Impulsive behavior disappeared. The parents have expressed positive changes in day-to-day communication.

The paper by O. Yu. Zotova, L.V. Karapetyan & I.V. Gaidamashko also study the influence of cultural change on mental functioning, namely that of globalized challenges on personal psychological security.

Taken as a whole, this set of essays confirms the effectiveness of Luria's cultural-historical approach in advancing both theoretical and practical understanding of the development of higher psychological functions.

References

- Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. In *Handbook of child psychology: Vol. 1: Theoretical models of human development* (pp. 793–828). <https://doi.org/10.1002/9780470147658>
- Cole, M. (1989). *Cultural psychology: a once and future discipline? Nebraska Symposium on Motivation. Nebraska Symposium on Motivation* (Vol. 37, pp. 279–335). <https://doi.org/10.1097/00005053-199809000-00012>
- Cole, M. (1995). Culture and cognitive development: from cross-cultural research to creating systems of cultural mediation. *Culture & Psychology*, 1(1), 25–54. <https://doi.org/10.1177/1354067X9511003>

- Cole, M. & The Distributed Literacy Consortium (2006). *The fifth dimension: An after-school program built on diversity. The Fifth Dimension: An after-school program built on diversity* (pp. 1–227). Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-84902637839&partnerID=40&md5=1160cedf2b9196718de383fdf22a3d8b>
- Cole, M., Gay, J., Glick, J.A., & Sharp, D.W. (1971). *The cultural context of learning and thinking*. New York: Basic Books
- Luria, A.R. (1928). The problem of the cultural behavior of the child. *Journal of Genetic Psychology*, 35(3), 493–506. <https://doi.org/10.1080/08856559.1928.10532168>
- Nicolopoulou A., Cole M. (1993). Generation and transmission of shared knowledge in the cultural of collaborative learning: The Fifth Dimension, its play-world, and its institutional contexts. In Forman E.A. (Eds.), *Contexts for learning: Sociocultural dynamics in children's development* (pp. 283–314). New York: Oxford University Press
- Vygotsky, L.S. (1978). *Mind in society. The development of higher psychological processes*. Cambridge, MA: Harvard University Press

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A reproduction of Luria's expedition to Central Asia

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Background. About 40 years ago, Alexander Luria published in 1974 his world known book "On the historical development of cognitive processes". It describes the data of an experimental study of mental functions in illiterate people living in the peripheral parts of Uzbekistan (Central Asia). A.R. Luria together with L.S. Vygotsky worked out the design of this study, performed in 1931-1933. The study proved a significant influence of social life and literacy on the structure of logical reasoning. In the conclusion to this book Luria indicates, that his colleagues often advised him to repeat this study in 40 years, but the author did not consider it reasonable, as radical changes in cultural and educational level of Asia population must equalize the differences in cognitive processes with people from central regions. Is it so?

Study design. A group of psychologists from Moscow, Belgorod and Petropavlovsk Kamchatsky performed an integrated study of endogenous populations of the north of Kamchatka peninsula living in regional centers or nomadic herdsmen in tundra. Thirty subjects (17 men and 13 females) all with primary education in Russian schools were assessed using the same tests on classification and generalization, as Luria did, together with Luria neuropsychological battery, and projective drawing on life attitudes.

Conclusion. Life values of endogenous peoples are more nature centered than in Russians from central regions. Nomadic and settled subgroups with the same level of education differed in some neuropsychological tests, revealing the influence of social life conditions. It confirms Luria's idea about cultural determination of cognitive processes but also shows that life conditions are as important cultural factors as literacy.

Keywords: cultural-historical psychology; social life; cognitive processes; life values.

Introduction

Let us remind first the question by J. Bruner (2015): how psychology turned toward cultural explication? Upon the author, it was not migration into radically different cultures by refugees from Europe, nor the rise of more subjective anthropology in America, but “a worldwide movement in psychology against mindless, mechanistic theory” (p. 8). The role of Vygotsky in this movement was primordial because he was very sensitive to worldwide cultural change that was taking place during his life.

During the late 1920s and early 1930s, L.S. Vygotsky and A.R. Luria put the task to prove experimentally the impact of cultural factors on human cognition, theoretically exposed already in their “Studies on the history of behavior” (Vygotsky, Luria, 1930) and confirmed in developmental researches (Luria, 1929, Vygotsky, 1930/1982). Both scholars planned two expeditions to the peripheral parts of Uzbekistan (Central Asia) in 1931 and 1933 to investigate the influence of culture, and in particular, of education, on the development of higher cognitive functions (Luria, 1931, 1933, 1971, 1974, 1976). The illness did not permitted Vygotsky to go with Luria but they were in permanent correspondence, discussing all the results as well as the report of Luria in the second Moscow medical institute in June 1931. One of the major results was that illiterate people are bound in their reasoning to the concrete situations of real life. Consequently, they have difficulties in abstract reasoning, in solving problems that are beyond their personal experience. The effect of culture on cognition was not limited to verbal abilities: perceptual and spatial abilities in illiterate people were quite different than in Western people (Luria, 1971). For instance, Uzbek herdsman living in non-urban environments were much less prone to visual illusions (remember the famous telegram sent to Vygotsky by Luria from his expedition to central Asia: “Uzbeks do not have illusions!”).

It proved a significant influence of social life and literacy on the main components of human conscience.

L.S. Vygotsky highly appreciated these results, “leading our common work further and rising our previous studies (such as types of relations in the mediated memorizing and reasoning) to a higher level... This is a golden fund of our experiences that can be easily open by the theoretical key” (from the letter of Vygotsky to Luria on 20.06.1931). “I have received the Report #3 and the protocols of experiences. It was my happiest day in the last time. It is really a key to open locks of many psychological problems. This is my impression. The crucial significance of these experiences is without doubts for me. Our new approach is now achieved (by you) not only in idea, but in practice, in experience” (from the letter of Vygotsky to Luria on 11.07.1931). “In our studies it is an enormous, decisive step, turning to a new point of view. In any European study such an expedition would be an event... Nobody never did a systematic study of system relations in historical psychology, in the life phylogenies from any point of view. It is a new, (unexpected for me, I must say), happy and brilliant chapter to our clinical and developmental works (from the letter of Vygotsky to Luria on 1.8.1931 — underlined by L.S. Vygotsky) (Puzyrey, 2004). Vygotsky did such a conclusion concerning the report of Luria about the expedition in Uzbekistan: “In another cultural environment another psychology” (Vygotsky, 2017, p. 222).

This is also the basis for Luria’s neuropsychology. “For Luria the brain was an instrument for making culture accessible to mind. ... for him the “internal-

ization of culture” was a mastering of possible worlds” (J. Bruner, 2005, p. XII). With any doubts, Vygotsky and Luria were the pioneers in cross-cultural studies that became very popular from the 1950th. For instance, it was shown that different languages conceptualize the world in a different way (Whorf, 1956). Significant variations in the patterns of cognitive abilities across national and cultural groups have been described in psychology, anthropology, and neuropsychology (Koshmanova, 2007; Kan, Wicherts, Dolan, & van der Maas, 2013; Gangestad & Simpson, 2016; Matsumoto & Juang, 2016). Ecological conditions and cultural practices are significantly associated with the development of perceptual, spatial, and constructional skills (Cole & Means, 1986). For instance, Rosenqvist, J. et al. (2017) examined language, face memory, emotions recognition, theory of mind, and visuospatial processing in 3-to 15-year-old children from three countries: Finland, Italy, and the United States. The authors revealed significant differences in performance on the tasks between the countries. The differences were more pronounced in the younger than in older children. Furthermore, some subtests showed greater country effects than others. One can expect larger differences with non-western cultures. The study by Polyakov, V.M., Kolesnikov, S.I., Rychkova, L.V. (2017) found periods of sensibilization in child development to environment influence. Such an influence proved to be related with interhemispheric interaction (Nikolayeva, Grekova, 2017) Tikhomirova, T.N., Lysenkova, I.A. & Malykh, S.B. (2017) revealed specific interrelations between cognitive functioning and academic success in schoolchildren in different countries. With this, schooled subjects significantly outperform illiterate individuals in cognitive testing, and schooling can be regarded as a sub-culture itself (Berry, 1979; Ardila, 1995, 2016). Cornelious, S. and Caspi, A. (1987) found that educational level has a substantial relationship with performance on verbal meaning tests but is not systematically related to everyday problem solving

All these data of contemporary cross-cultural studies confirm the statement of Vygotsky that “in the process of historical development the social man [obshchestvenny chelovek] changes the methods and devices of his behavior, transforms natural instincts and functions, and develops and creates new forms of behavior — specifically cultural” (Vygotsky, 1997, p. 18).

Luria wrote in his book: “Our study was performed in the peripheral parts of Uzbekistan: in kishlaks (small Asian villages) and djailau (mountain pastures). The similar results could be received in peripheral villages of Russia, in northern minorities or in herdsmen of the northeast of Siberia” (Luria, 1974, p.3). The last was exactly the task of our study.

Methods

A group of psychologists from Moscow, Belgorod and Petropavlovsk Kamchatsky Universities performed an integrated psychological study of endogenous populations of the north of Kamchatka peninsula living in almost inaccessible (only with helicopter or armored carrier) regional centers or nomadic herdsmen in tundra. The *aims* of the expedition were to compare cognitive functions and life attitudes by nomadic and settled subgroups of endogenous peoples from the point of view of social nature of human mentality and conscience.

Kamchatka is a polyethnic region and all inhabitants of Kamchatka have a long historical experience to live in a polyethnic environment. The figure 1 illustrates the ethnic distribution in the studied population of subjects.

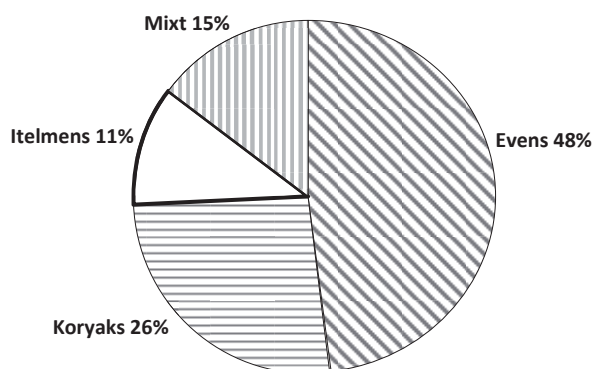


Figure 1. Ethnic distribution in the studied population of subjects

Thirty *subjects* (17 men and 13 females) (10 nomadic herdsman and 20 inhabitants of villages) were assessed using the same tests on classification and generalization, as Luria did, together with Luria neuropsychological battery, and projective drawings. All subjects (both nomadic and settled) had primary education in Russian schools.

The Table 1 shows gender and age distribution of subjects.

Table 1. Subjects characteristics

| Gender distribution | | Age distribution | | | |
|---------------------|--------|------------------|-------|-------|-------|
| Male | Female | 5–12 | 21–30 | 33–48 | 49–55 |
| 17 | 13 | 20% | 26.7% | 23.3% | 30% |

The assessment included the following *methods*:

- Comprehensive Luria's neuropsychological assessment, including Schulte's test (or proof test for preschoolers) to measure level of brain activity and of attention; motor tests (dynamic, kinesthetic, spatial, regulatory praxis, reciprocal coordination and drawing); tests on visual and spatial gnosis; tests on visual and motor memory; tests on expressive and impressive speech and writing; intellectual tests (understanding of verbal and pictured stories, tests on generalization, arithmetic problems solving) (Luria, 1973);
- Profile of hemispheric lateralization (Annett, 1970);
- Verbal fluency test (Benton et al., 1983);
- Pictures classification test (Luria, 1974);
- Luria's test of free questions (Luria, 1974)

- Projective drawing (free drawing — “what do you want to share with me” and “your representations of happiness (joy), grief, friend, enemy»). We did not analyze the quality of the drawings but only the titles given to each drawing.

Results

Let's analyze first the main results of neuropsychological assessment (Table 2).

Table 2. Significant differences in neuropsychological tests between nomadic herdsmen and villages inhabitants (% of symptoms in each subgroup)

| Symptom | Inhabitants of villages | Nomadic herdsmen |
|---|-------------------------|------------------|
| Instability of brain activity | 33% | 25% |
| Defects of dynamic praxis (perseverations, stereotypes) | 10% | 100 % |
| Defects of reciprocal coordination of movements | 0 | 25% |
| Deficiency of visual memory | 33% | 75% |
| Deficiency of motor memory | 22% | 75% |
| Difficult story successive retelling while its good comprehension | 37% | 50% |
| Situational generalization instead of categorical | 0 | 25% |

We can see that in general, the results of neuropsychological assessment were worse in the subgroup of nomadic people to compare with village inhabitants with one exception for the symptom of instability of brain activity. In both subgroups, the subjects had good space representation, kinesthetic functions, and all gnostic functions. Nevertheless all subjects were bilingual; there were no defects of naming.

In all subjects we have determined the profile of *hemispheric lateralization*. The distribution was normative: 29 right handed and 1 left handed. However, it was shown in our previous studies (Danilova et al., 2016), that human laterality — a preference or higher locomotive or sensor performance — is a multidimensional trait, and crossed laterality, especially intermodal (sensor-motor) has negative effect on cognitive functioning.

Table 3. Types of crossed laterality (% of subjects in each subgroup)

| Inhabitants of villages | | Nomadic herdsmen | |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Intermodal crossed laterality | Intramodal crossed laterality | Intermodal crossed laterality | Intramodal crossed laterality |
| 37% | 63% | 25% | 75% |

Intermodal crossed laterality was more frequent in village inhabitants than in nomadic herdsmen: so, in the last ones the lateral differentiation of mental functions was more definite (Table 3).

Verbal fluency test revealed a predominance of semantically mediated verbal associations (plants) on general verbal activity in both subgroups of inhabitants of Kamchatka. With this, the verbal fluency was greater in village inhabitants than in nomadic herdsmen (Table 4). Both facts are a very evident evidence of social life conditions on cognitive functioning.

Table 4. Verbal fluency differences (middle number of verbal associations per minute)

| Inhabitants of villages | | Nomadic herdsmen | |
|-------------------------|---|-------------------------|---|
| General verbal activity | Semantically mediated verbal associations | General verbal activity | Semantically mediated verbal associations |
| 27 | 32 | 22 | 25 |

The results of *pictures classification test* were very similar to those described by A.R. Luria (1974). As well as illiterate inhabitants of Central Asia, the nomadic herdsmen with primary school education did situation-based generalization instead of categorical one. For instance, a picture of a hat is in the same group with a man and a dog, because “a man wears a hat, which is done from a dog”. A man is put together with the objects, that are fabricated by him or with domestic animals, while wild animals are excluded from this group. A thermometer is unified with a baby, a book with a table, or a horse with a physician, because it can be a veterinary which treats the horse. It reminds the example of Luria: “You can’t put together a bottle and glasses, because they rust. You have to cover them with paper” (Luria, 1976, p.64).

This tendency for situation-based generalization was more pronounced in nomadic herdsmen, than in village inhabitants with the same level of education. So, the practical life conditions are more important for reasoning functioning than the level of education.

The results in Luria’s *test of free questions* (“Ask me any 3 questions”) were quite different from Luria’s data. The illiterate people living in the peripheral parts of Uzbekistan refused to put any questions or asked only practical questions (like: “My horse is stolen, how to get for long distances?”), without motivation to receive some new knowledge. The nomadic inhabitants of the peripheral parts of Kamchatka put different questions: “Does the monument to Lenin in Moscow still exist?”, “What is new in clubs?”, “Are the old buildings repaired in the city?” and so on. These data reflect the radical changes in cultural and educational level of people of Kamchatka.

An *analysis of projective drawings* revealed some common features and some age differences. A common feature for all age groups was a feeling of unity with nature. All free drawings included nature with a very positive attitude to it. A friend is tundra, river, a wild animal from tundra or a good hunter. Small children who live permanently in villages draw as a friend a computer or a schoolmate. An enemy is

an enemy of nature, technical means (for adults), alcohol, drugs, smoking, war, a lazy person, a weak person, a hunter on a helicopter, a fire in tundra. If the inhabitants of the central regions of Russia associated happiness with money (Obukhova et al., 2017), no one from Kamchatka actualized happiness as financial values, even more, some of inhabitants of Kamchatka considered money (credit) to be a grief, in the same line as an illness of a relative, a fire, death, war, aggression, solitude. By contrast, the happiness is the life; "to lay on the grass in the forest, looking the stars on the sky, in silence and peace"; the birth of the child; family, harmony; sun.

We compared free drawings of 5–12 years old children from Kamchatka villages with drawings of urban children from central regions of Russia, matched by age and gender (Obukhova et al., 2017):

- Urban children have larger social experience, than rural Siberian children do: such topics as roller skates, a cruise with mam, a visit to delphinium, TV heroes, animals from tales and so on.
- The attitude to nature of Kamchatka children is positive, that of urban children is more negative, for instance, the volcanos were present in many drawings by Kamchatka children, but only a boy from Moscow drew an erupting volcano.
- The urban children do more polychromic drawings with more details than rural children do.
- The rural children unlike urban ones did not represent humans in their drawings.
- The animals in rural children drawings are realistic, those from urban children drawings are anthropomorphic (in human clothes, on two legs, in human situations, like a New Year party).
- Urban children from central regions of Russia often draw different arms (bomb, tank, gun), not represented in any rural drawing. It indicates a greater aggressivity of urban children.
- Urban children drawings are more introspective than in rural children: often the titles of drawings include such words as "I want...", "I love...", "I will be ..."

So, we see the influence of social conditions on cognitive functions and life attitudes and values both in adults and in children.

Conclusions

The cultural-historical approach forces us to reconsider the concept of the social brain as a social and cultural determinant and regulator of brain functioning (Glozman & Krukov, 2013).

The cooperation of outstanding psychologists L.S. Vygotsky and A.R. Luria on theoretical, experimental, and clinical work was an historic event, a scientific phenomenon, and a turning point in the development of psychological science (Glozman, 2016)/

"The pioneer research proposed and carried out by Luria and Vygotsky in Uzbekistan, over 70 years ago, and the concept of extracortical organization of higher

mental functions, has become particularly important in the understanding of cultural differences in cognition” (Kotik-Friedgut & Ardila, 2005, p. 57). It was proved first by research in Central Asia and in 85 years later by the described expedition in Kamchatka.

In the conclusion to his book Luria (1974) indicates, that his colleagues often advised him to repeat this study in 40 years, but the author did not consider it reasonable, as radical changes in cultural and educational level of Asia population must equalize the differences in cognitive processes with people from central regions. However, in the 1930th Luria’s neuropsychological battery still did not exist. The comprehensive Luria’s neuropsychological assessment permits to reveal socially determined differences of cognitive functioning between nomadic herdsman and rural inhabitants with the same level of education, such as: successive organization of movements and actions, vocabulary, visual images, generalization processes and more. It correlates with Peter Tulviste finding that the effects of schooling decreased over the years (Tulviste, 1978).

The life attitudes and values of inhabitants of Kamchatka, living in specific and difficult life conditions, differ from those in people from central regions of Russia. Namely, they realize the unique character of own culture, national values and common interests of own ethnic group with others living at the same place.

“It is already a challenge to understand the past while living in a different world ... This is also a framework in which Vygotsky’s time and theory are to be understood as hermeneutic tools for understanding ourselves, our scientific theories and, most importantly, our societies and cultures that shape us as we shape them” (Jovanović, 2015, p.29-30). “And, again not surprisingly, we became newly aware of the subtle and powerful relationship between mind and culture” (Bruner, 2015, p. 9).

Limitations

In our expedition there were a limited number of independent study samples with a wide variation in the methodologies used across studies. These findings can inform future studies and prove the validity of cross-cultural studies nevertheless the changes in cultural and educational level of national minorities.

Acknowledgments

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References

- Annett, V. (1970). A classification of hand preference by association analysis. *British Journal of Psychology*, 61, 303–321. <https://doi.org/10.1111/j.2044-8295.1970.tb01248.x>
- Ardila, A. (1995). Directions of research in cross-cultural neuropsychology. *Journal of Clinical and Experimental Neuropsychology*, 17, 143–150. <https://doi.org/10.1080/13803399508406589>
- Ardila, A. (2016). The evolutionary concept of “pre-adaptation” applied to cognitive neurosciences. *Frontiers in Neuroscience*, 10, 103. <https://doi.org/10.3389/fnins.2016.00103>
- Benton, A., Hamsher, K., Varney, N., & Spreen O. (1983). *Contributions to neuropsychological assessment. A clinical manual*. Oxford: Oxford University Press.

- Berry, J. W. (1979). Culture and cognition style. In A.J. Marsella, R.G. Tharp, & T.J. Caborowski (Eds.), *Perspectives in cross-cultural psychology* (pp. 117–135). New York: Academic Press.
- Bruner, J. (2005). Preface. In T. Akhutina, J. Glozman, L. Moscovich, & D. Robbins (Eds.). *A.R. Luria and contemporary psychology* (pp. xi–xv). New York: Nova Science Publishers. <https://doi.org/10.3138/9781442674707-003>
- Bruner, J. (2015). The uneasy relation of culture and mind. *History of the Human Sciences*, 28(2) 8–9. <https://doi.org/10.1177/0952695115575348>
- Cole, M., & Means, B. (1986). *Comparative studies of how people think*. San Diego, CA: University of California Press.
- Cornelius, S.W. & Caspi, A. (1987). Everyday problem solving in adulthood and old age. *Psychology of Aging*, 2, 144–153. <https://doi.org/10.1037/0882-7974.2.2.144>
- Danilova, N., Glozman, J., Nodel, M., & Yakhno, N. (2016). Crossed laterality in Parkinson disease. *International Journal of Psychology*, 51 (4), 863–864.
- Gangestad, S.W., & Simpson, J.A. (Eds.) (2016). *The evolution of mind: Fundamental questions and controversies*. New York: Guilford Publications.
- Glozman, J.M. (2016). Vygotsky in applied neuropsychology. *Psychology in Russia: State of the Art*, 10 (4), 73–79. <https://doi.org/10.11621/pir.2016.0406>
- Glozman, J.M., & Krukov, P. (2013). The social brain. *Psychology in Russia: State of the Art*, 6(3), 68–78. <https://doi.org/10.11621/pir.2013.0307>
- Jovanović, G. (2015). Vicissitudes of history in Vygotsky's cultural historical theory. *History of the Human Sciences*, 28(2) 10–33. <https://doi.org/10.1177/0952695115575348>
- Kan, K.J., Wicherts, J.M., & Dolan, C.V., & van der Maas, H.L. (2013). On the nature and nurture of intelligence and specific cognitive abilities: The more heritable, the more culture dependent. *Psychological Science*, 24(12), 2420–2428 <https://doi.org/10.1177/0956797613493292>
- Koshmanova, T. (2007). Vygotskian scholars. Visions and implementation of cultural-historical theory. *Journal of Russian and East European Psychology*, 45(2): 61–95. <https://doi.org/10.2753/RPO1061-0405450202>
- Kotik-Friedgut, B. & Ardila A. (2005). Systemic-dynamic Lurian theory and contemporary cross-cultural neuropsychology. In T. Akhutina, J. Glozman, L. Moscovich, & D. Robbins (Eds.), *A.R. Luria and contemporary psychology* (pp. 55–61). New York: Nova Science Publishers.
- Luria, A.R. (1928). The problem of the cultural behavior of the child. *Journal of Genetic Psychology*, 35(3), 493–506. <https://doi.org/10.1080/08856559.1928.10532168>
- Luria, A.R. (1931). Psychological expedition to central Asia, *Science*, 74, 383–384. <https://doi.org/10.1126/science.74.1920.383>
- Luria, A.R. (1933). The second psychological expedition to central Asia. *Science*, 78, 191–192. <https://doi.org/10.1126/science.78.2018.191-a>
- Luria, A.R. (1971). Towards the problem of the historical nature of psychological processes. *International Journal of Psychology*, 6, 259–272. <https://doi.org/10.1080/00207597108246692>
- Luria, A.R. (1973). *Skhema neuropsykhologicheskogo obsledovaniya* [A schema of neuropsychological assessment]. Moscow: Moscow University Press.
- Luria, A.R. (1974). *Ob istoricheskom razvitii poznavatelnykh protsessov* [On the historical development of cognitive processes]. Moscow: Nauka.
- Luria, A.R. (1976). *Cognitive development: Its cultural and social foundations*. Cambridge, MA: Harvard University Press.
- Matsumoto, D., & Juang, L. (2016). *Culture and psychology*. Nelson Education.
- Nikolayeva, E.I., & Grekova, E.N. (2017). Spetsifika lateralnykh predpochteniy u podrostkov, prozhivayushikh za polyarnym krugom. [Specifics of lateral preferences in teenagers living beyond the polar circle]. In *The Lurian approach in international psychological science. The*

- Fifth International Luria Memorial Congress. October 13–16, 2017, Abstracts* (pp. 115–116). Yekaterinburg: Ural University Press.
- Obukhova, L.K., Glozman, J.M., & Naumova, V.A. (2017). Issledovaniye kulturologicheskikh razlichiy mirovospriyatiya s pomoshyu proektivnogo risunka. [A study of cultural differences in world perception by projective drawing]. In B.G. Mesheryakov & O.A. Goncharov (Eds.), *Psikhologiya tretiego tysacheletiya* [The psychology of the third millennium] (pp. 98–101). Dubna, RF: Dubna University Press.
- Polyakov, V.M., Kolesnikov, S.I., & Rychkova, L.V. (2017). Neiropsykhologicheskii podkhod k issledovaniyu detskikh popullatsiy. [A neuropsychological approach to the study of child populations]. In *The Lurian approach in international psychological science. The Fifth International Luria Memorial Congress. October 13–16, 2017, Abstracts* (125–126). Yekaterinburg, RF: Ural University Press.
- Puzyrey, A.A. (2004). Perepiska Vygotskogo s uchenikami i soratnikami [Letters of Vygotsky to his students and colleagues]. *Vestnik Moskovskogo Universiteta. Seriya 14: Psikhologiya* [Moscow University Psychology Bulletin], 3, 3–40.
- Rosenqvist, J., Lahti-Nuuttila, P., Urgesi, C., Holdnack, J., Kemp, S. L., & Laasonen, M. (2017). Neurocognitive functions in 3- to 15-year-old children: An international comparison. *Journal of the International Neuropsychological Society*, 1–14. <https://doi.org/10.1017/S1355617716001193>
- Tikhomirova, T.N., Lysenkova, I.A., Malykh, S.B. (2017). Kross-kulturnyy analiz vzaimosvyazey kognitivnogo funktsyonirovaniya i akademicheskoy uspezhnosti u mladshikh shkolnikov [A cross-cultural study of interrelations between cognitive functioning and academic success in schoolchildren]. In *The Lurian approach in international psychological science. The Fifth International Luria Memorial Congress. October 13–16, 2017, Abstracts* (pp. 137–138). Yekaterinburg: Ural University Press.
- Tulviste P. (1978). On the origins of theoretic syllogistic reasoning in culture and in the child. In *Problems of communication and perception. Acta et commentationes universitatis tartuensis*, 3-22
- Vygotsky, L.S. (1982). O psikhologicheskikh sistemakh. [On psychological systems]. In L.S. Vygotsky, *Collected papers*, vol. 1 (pp. 109–132). Moscow: Pedagogika. (Original work published 1930)
- Vygotsky, L.S. (1978). *Mind in society. The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Vygotsky, L.S. (1997). The history of the development of higher mental functions. In R. Rieber (Ed.). *The collected works of L.S. Vygotsky*, vol. 4, trans. M. Hall (pp. 1–298). New York: Springer.
- Vygotsky, L.S. (2017). *Zapisnye knizhki L.S. Vygotskogo. Izbrannoye*. [Selected notebooks of L.S. Vygotsky]. E. Zavershneva & R. Van der Veer (Eds.). Moscow: Kanon+.
- Vygotsky, L.S., & Luria, A.R. (1930). *Etyudy po istorii povedeniya* [Studies on the history of behavior]. Moscow: Gosizdat.
- Whorf, B.L. (1956). *Language, thought and reality*. Cambridge, MA: MIT Press.

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Value shifts in Vietnamese students studying in Russia

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Background. The extension of intercultural contacts in the present-day world calls for a thorough study of what effect these contacts produce on the human personality. When an individual is suddenly immersed in a different culture, his or her consciousness becomes a battlefield where new values conflict with the old. The person experiences an axiological shock, a "value clash," which urges him or her to undertake a re-examination of his/her value system as a whole.

Objective. The objective of this study was to determine the changes occurring in the value system of Vietnamese students obtaining their higher education in Russia.

Design. A longitudinal study was performed involving 100 Vietnamese students in Russian universities. The measurement methods used in the study were: 1) the modified M. Rokeach Value Survey (Rokeach, 1973; Kudrjashov, 1992), in which the original set of values was expanded by 20 additional values typical of the Vietnamese people; and 2) the technique for assessing acculturation strategies developed by J.W. Berry (*Strategii mezhekul'turnogo vzaimodejstviya...*, 2009).

Results. In the course of a year of residence in Russia, specific changes (or "shifts") occurred in the value systems of the Vietnamese students which proved to be statistically significant. Among the goal values (the same as terminal values, in the terms of M. Rokeach) which took on more weight were *Productive Life* and *Materially Prosperous Life*, while among instrumental values, *Tidiness* and *Frugality* became more prominent. A difference between the value dynamics in male and female students was also established, with the value pattern of male students proving to be more dynamic. The next finding was the difference in value dynamics between students coming from urban and rural settlements. There was one more quite unexpected finding: The value pattern changed more noticeably in respondents with an acculturation profile of "*Integration and Separation*," than in those with profiles of "*Integration and Assimilation*" and "*Pure Integration*."

Conclusions. Therefore we see that factors such as gender, type of environment (rural/urban) the individual comes from, and the strategy of acculturation used by the individual, act as mediators exerting their own influence upon the dynamics of his/her value patterns.

Abbreviation: PF = Preliminary Faculty

Keywords: acculturation, value pattern, value dynamics, Vietnamese students, acculturation strategies, acculturation profile.

Introduction

The extension of intercultural contacts in the present-day world calls for an emphasis upon a thorough study of what effect these contacts produce on the human personality. Values constitute the core of every culture. Through the process of enculturation, they become the major component of personality, and serve as its compass, its navigator, and determinant of the individual's stance toward the world. The value pattern is a rather stable component of personality. It is a construction which helps the personality take a certain position toward the whole outside world with all its challenges (Leontiev, 1993). At the same time, the personal value system is rather changeable, since it is a derivative of the ever-changing environment, on one hand, and of the actual level of personal development, on the other (Yanickyi, 2012).

When an individual finds him- or herself immersed in a remote culture, which is very different from his own—so strange and alien to him, full of unfamiliar norms, rules, and concepts, and above all, very largely based on another set of values—he or she is plunged into a state of value chaos and confusion. In making the horrifying discovery that the familiar values (both common and personal), which he or she “absorbed with one's mother's milk,” are now coming into a clash with the completely different values of the residential population, and that his or her explanatory models do not work here at all, the person may undergo an axiological crisis, or axiological shock. In the individual mind, the two sets of values, the new ones and the old, clash — a very painful condition, often producing panic or depression. To overcome such a crisis, one needs to indulge in a total re-examination of his or her value system as a whole. This extremely tense and difficult task may become the first step to establishing a set of modified personal values for the individual.

How will the values change? What factors affect the process of value changing in the course of the acculturation process? The phenomenon of value shifts in a changing social environment has been studied well enough in connection to dramatic changes in socio-economic and political life (e.g. Zhuravleva, 2013; Lebedeva & Tatarko, 2007; Le, 1998), but the problem has not been studied very much in the context of acculturation. The study of value dynamics in young people coming to our country from a culture very distant, in every respect, from our own, seems to us to be a great model for research in this field. These young people provide a vivid example of how values may change under the cross-cultural interaction and radical immersion into another culture, particularly in light of the fact that university students are notable for their great sensitivity to social influences, and that the problem of personal values is very acute at this age.

Methods

The empirical study we carried out, in collaboration with Duk T. Bui, was aimed at detecting changes in the value system of Vietnamese students during their study in Russia.

The more specific aims were as follows:

1. Detect changes in the value system of Vietnamese students during their early period of study in Russia.
2. Make a comparison between the value dynamics in Vietnamese male and female students.
3. Compare the value dynamics in Vietnamese students coming from urban and rural settlements.
4. Compare the value dynamics in Vietnamese students with different strategies of acculturation.

Sample: 100 Vietnamese students in Moscow colleges and universities, who had a mean age of 21 at the beginning of the study. 54 subjects were female and 46 male; 52 came from urban and 48 from rural settlements.

A longitudinal method was applied in the study. Two measurements were taken of each student precisely at a one year interval. The first measurement was taken when the subjects were attending preliminary courses (Preliminary Faculty or PF), designed mainly for foreign students to study the Russian language, at which time their living experience in Russia had been four months on average. The second measurement was taken exactly a year later, when they were students of the first course, and had experienced living in Russia for 1 year and 4 months.

The main measuring instrument applied in this study was the modified M. Rokeach Value Survey (Rokeach, 1973; Kudrjashov, 1992). For the purposes of this study, we extended Rokeach's value list by adding 20 more values peculiar to the Vietnamese people, which had been identified in a number of studies by Vietnamese scholars (Le, 1998; Ho, 2010; Phạm, 2012). We added 15 "traditional" and five "conditionally contemporary" Vietnamese values, seven of which belonged to the category of "terminal" or goal values (*Homeland, Peace, Humanity, Justice, Equality, and Following Traditions*), and 13 of which belonged to the category of "instrumental" values (*Industry; Modesty; Self-Esteem; Respect for the Elderly; Simplicity; Construction of Relations Based on Personal Emotional Bias; Gratitude; Frugality; Fidelity; Contemplativeness; Collectivity; Spirit of Community, Solidarity, Mutual Love and Interconnection, and Ideals of the Revolution*). To assess acculturation strategies, we used the technique developed by J. W. Berry (*Strategii mezhkul'turnogo vzaimodejstviya...*, 2009), which aimed to identify four strategies of acculturation, known as *Assimilation, Separation, Integration, and Marginalization*.

We also used various mathematical statistical methods (Wilcoxon T-criterion, binomial criterion, and a method of cluster analysis) for statistical data verification.

Results

Figures 1 and 2 represent the dynamics of the terminal and instrumental values among the students. As one can see, the average meanings, weight, and ranking order of some values changed after a year of study in Russia. We have written about some aspects of our study in previous publications, where we analyzed the changes

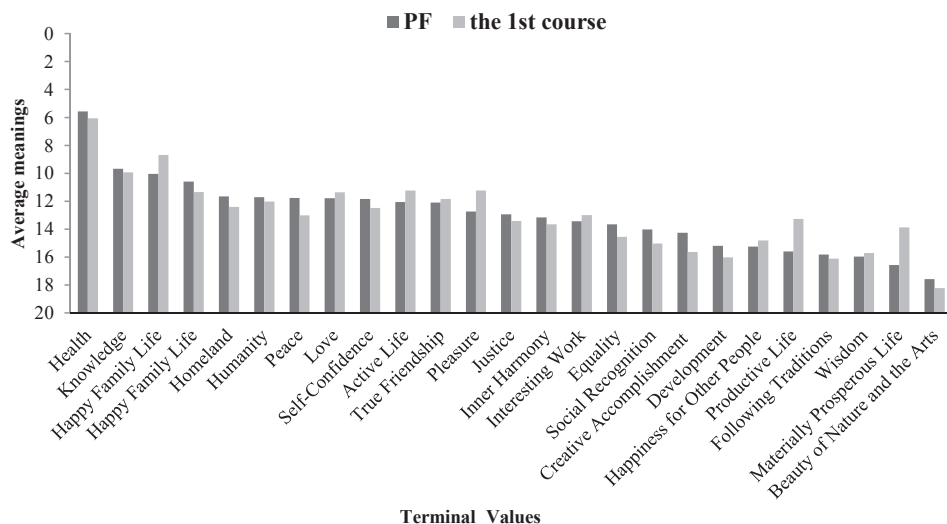


Figure 1. Terminal value dynamics in Vietnamese students after the first year of study in Russia

Note. The closer the indicator is to zero, the higher the rank of value and its significance are. Statistically significant shifts were found in two values, *Productive Life* and *Materially Prosperous Life*.

in ranks and hierarchic structures of the most prominent, high-rank values in detail (Maslova & Bui, 2014). In this paper, we focus attention on the statistically meaningful value shifts, revealed by the means of Wilcoxon T-criterion.

After a year, the statistically most prominent change was the increase in the adoption of the values *Productive Life* ($p < 0.05$) and *Materially Prosperous Life* ($p < 0.01$). At the tendency level, one can see the increased weight given to the value *Pleasure*, and decreased weight given to the values *Peace* and *Creativity*.

Thus, we may state positively that after a year of study in Russia, some significant changes took place in the value pattern of the Vietnamese students. An individualistic principle was strengthened in the goal values, while in the set of instrumental values, some of the Vietnamese people's traditional values increased in significance, too.

We asked whether there were some differences in the value dynamics between male and female Vietnamese students. In Figure 3, one can see which values showed a gender differentiation.

As seen from Figure 3, statistically significant shifts in the value pattern of male students occurred in both terminal and instrumental values. The values of *Materially Prosperous Life* ($p < 0.05$) and *Responsibility* ($p < 0.05$) increased in significance for them over the course of the year. In female students, goal values proved more stable, and only tool values displayed a shift—*Frugality* and *Tidiness* ($p < 0.05$ for both).

One of the aims of this study was to compare the value dynamics between students according to whether they came from a town or a village. Figure 4 shows the changes in value patterns of these two parts of the sample.

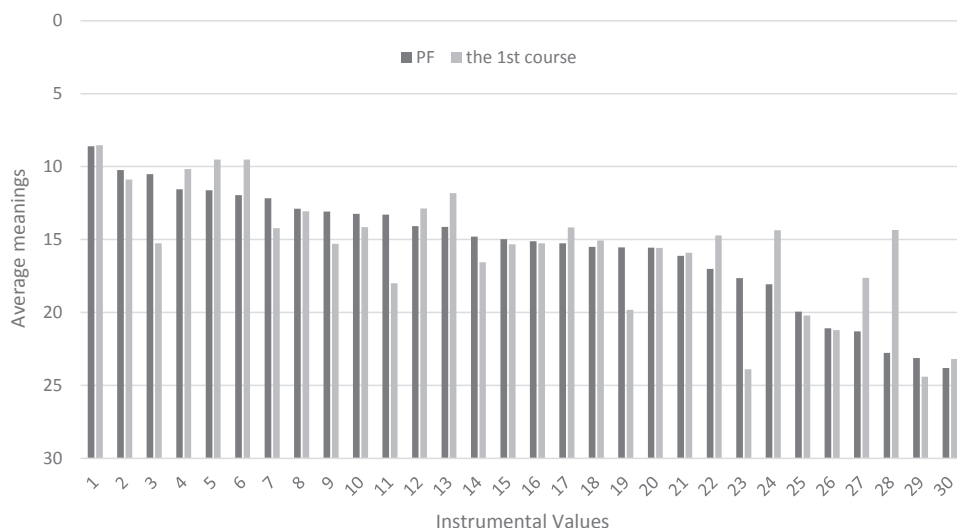


Figure 2. Instrumental value dynamics in Vietnamese students after one year of study in Russia

Note. The closer the indicator is to zero, the higher the rank of value and its significance are. Underlined in the list below are the values whose change proved statistically significant. Columns 1 to 30 represent these Instrumental values: 1. Education; 2. Good Manners; 3. Spirit of Community, Solidarity, Mutual Love and Interconnection; 4. Cheerfulness; 5. Responsibility; 6. Tidiness; 7. Modesty; 8. Industry; 9. Broad-Mindedness; 10. Gratitude; 11. Courageous Standing Up for Your Beliefs; 12. Collectivity; 13. Independence; 14. Simplicity; 15. Fidelity; 16. Tenderness; 17. Honesty; 18. Effectiveness; 19. Rationality; 20. Strength of Will; 21. Tolerance; 22. Frugality; 23. Contemplativeness; 24. Self-Esteem; 25. Ideals of the Revolution; 26. High Aspirations, Ambitions; 27. Self-Control; 28. Respect for the Elderly; 29. Fight against Imperfections in Yourself and in Other People; 30. Construction of Relations Based on Personal Emotional Bias.

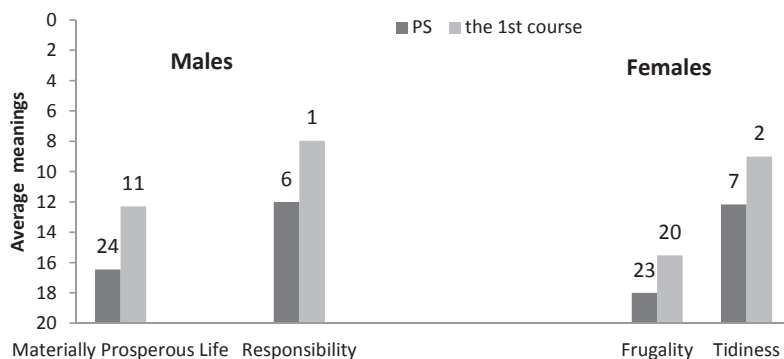


Figure 3. Statistically significant value shifts in male and female students. The numbers above each column stand for the ranking of the value

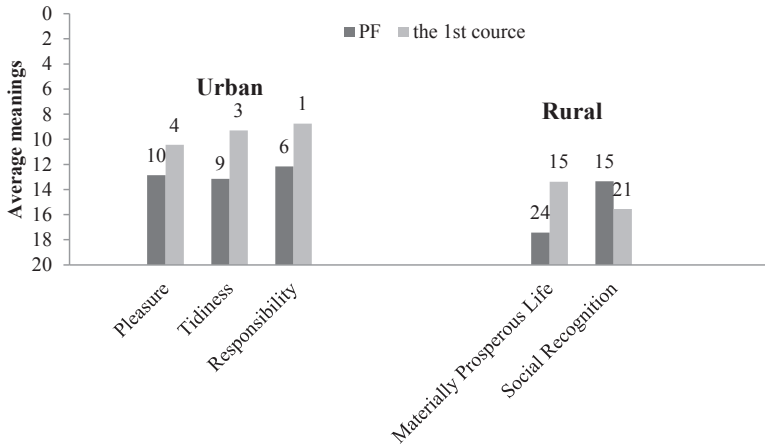


Figure 4. Statistically significant value shifts in students coming from urban and rural settlements. Numbers above each column stand for the rank number of value

We see that students of both urban and rural origin change some of their personal values under the influence of a new culture. Their values shift in the direction of strengthening individualistic values, and decreasing values of a collectivist type, but these changes differ in quality. The students of urban origin become more interested in the terminal value of *Pleasure* ($p < 0.05$), and they become more oriented toward the instrumental values of *Responsibility* ($p < 0.05$) and *Tidiness* ($p < 0.05$). By contrast, students coming from villages become more oriented towards the *Materially Prosperous Life* ($p < 0.01$). This result means that the acculturation process differs for rural and urban students. They pay attention (to some extent) to different aspects of life, and tend to attach different weights to their personal values (Maslova & Bui, 2014).

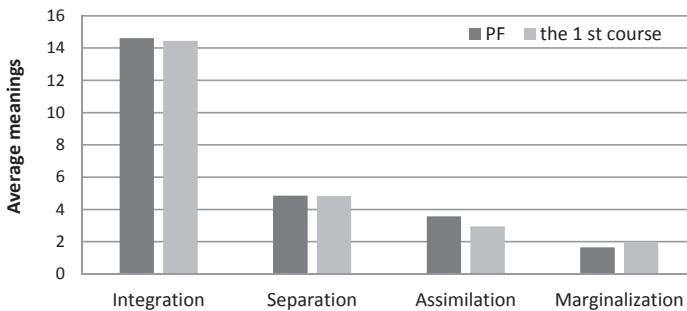


Figure 5. Relative strength of acculturation strategies found in Vietnamese students

The survey's next objective was to examine the value dynamics in the students according to their different acculturation strategies. Figure 5 shows the average intensity of the four strategies described by Berry et al. (2002) in our sample of Vietnamese students.

We proceeded from the assumption that the value orientation pattern would change most dramatically in students using the *Assimilation* strategy, and that minimal changes would be found in those using the strategy of *Separation*. In order to check this hypothesis, we applied Berry's technique to all the respondents. As a result, we assessed the acculturation strategy used by each student. But our intention to divide the sample according to the four types of acculturation could not be completed because 100 per cent of the respondents had the same predominant strategy—the strategy of *Integration*.

Nevertheless, the proportion of other strategies the students used varied to a certain extent, so we found it helpful to examine this proportion. With the use of cluster analysis, we divided the sample into three groups according to the relative expression of all four strategies (Figure 6). Now we could see the specific proportion of the four acculturation strategies in each individual, as well as in the sample as a whole. We refer to this inner proportionality as an *acculturation profile*.

According to the pair of strategies most prominent in each individual (keeping in mind that the strategy of *Integration* remained the guiding principle in all cases), we were able to designate three main acculturation profiles, as follows:

- *Pure Integration* (found in 50 per cent of our respondents);
- *Integration and Separation* (found in 26 per cent of respondents), in which the general intention for integration with a new culture in some cases alternated with a separation tendency;

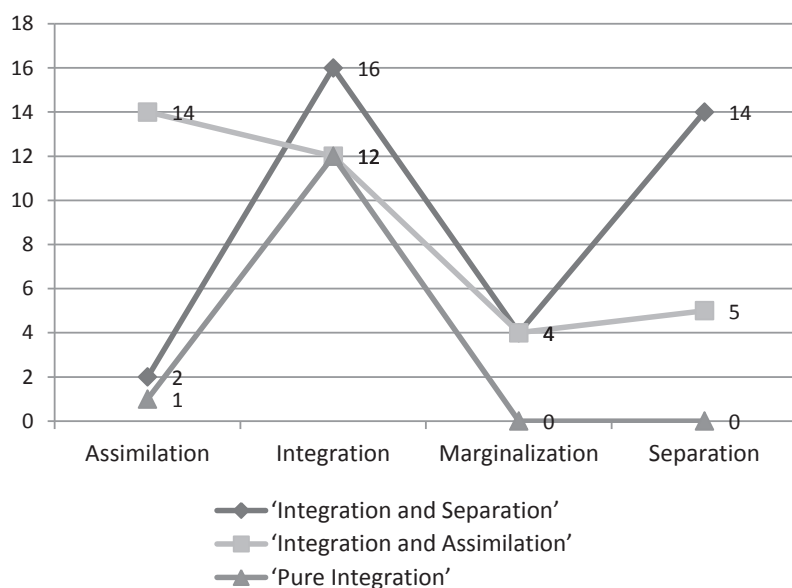


Figure 6. Acculturation profiles of the Vietnamese students

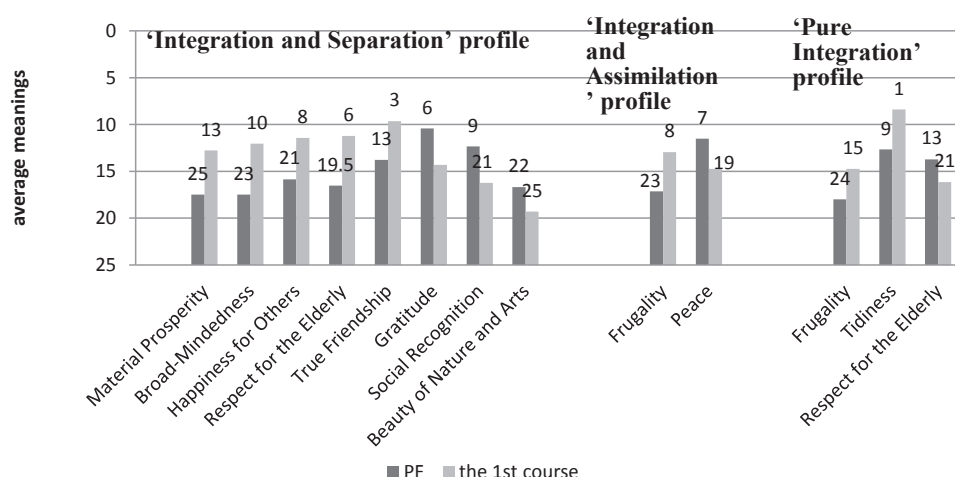


Figure 7. Statistically significant value shifts in students with different acculturation profiles

- *Integration and Assimilation* (found in 24 per cent of respondents), in which the general intention for integration with a new culture in some cases alternated with an assimilation tendency.

Analysis using the binomial criterion showed that the above three types of acculturation profile were equally common in male and female respondents, and in urban and rural students as well. The presence of a fourth strategy, *Marginalization*, did not show up in the sample to any significant degree.

The dynamic of value changes in subjects with different profiles was a surprise for us. The quantity of value shifts was most prominent (average=8) in the respondents with the *Integration and Separation* profile, leaving the owners of other profile types far behind. Only three shifts on average were found in students with the *Pure Integration* profile, and only two in students with the *Integration and Assimilation* profile. That result means that the value system in students with the profiles of *Pure Integration*, and *Integration and Assimilation*, proved more stable than in those with the *Integration and Separation* profile.

Figure 7 represents the spectrum of value shifts in respondents with all types of acculturation profiles. One can clearly see that in respondents with the *Pure Integration* profile, the significant shifts affected only instrumental values. They displayed an increased ratio of *Tidiness* ($p < 0.01$) and *Frugality* ($p < 0.05$), and a decrease of *Respect for the Elderly* ($p < 0.05$). In students with an *Integration and Assimilation* profile, some shifts were seen not only in tool values, but in goal values as well. The weight given to *Frugality* increased in their value system ($p < 0.05$), while the *Peace* value went down ($p < 0.05$).

The most prominent value shift is seen in the subjects with the profile type of *Integration and separation*. The diagram shows the increase of such values as *Broad-mindedness* ($p < 0.01$), *Respect for the Elderly* ($p < 0.01$), *True Friendship* ($p < 0.05$),

Material Prosperity ($p < 0.05$), and *Happiness for Other People* ($p < 0.05$). At the same time, a decrease is seen in the values of *Gratitude* ($p < 0.05$), *Social Recognition* ($p < 0.05$), and *The Beauty of Nature and Arts* ($p < 0.05$).

Discussion

How could it be that the system of value orientations changed in a more dramatic way in those students who were less open to a new culture, as compared to that of those who were more inclined towards intercultural relationships? Qualitative analysis of the whole body of data suggests that it could be due to the fact that the students belonging to the group *Integration and Separation* are more sensitive to acculturation distress; they feel more upset by the “value clash” and try to resist the upcoming changes.

In this painful situation, they need more attention and friendly concern, including support from their family members, friends, and compatriots. Maybe this need for support stands behind the fact that the values *True Friendship* ($p < 0.05$) and *Respect for the Elderly* ($p < 0.01$) had increased noticeably in this group of respondents. They may more often compare their native culture with the new one, discuss the differences, and reflect upon the new situation. This kind of reflection may be useful in the process of reassembling their whole value system. It may also be important that the instrumental value *Broad-mindedness* has increased in this group ($p < 0.01$), indicating a willingness to understand another people, and to respect their habits and customs.

On the other hand, respondents with the profiles of *Pure Integration*, and *Integration and Assimilation*, feel themselves more confident and independent in a new culture; they can rely on themselves in complex circumstances. So, in the students with a profile of *Pure Integration*, the values *Respect for the Elderly* ($p < 0.05$) and *True Friendship* ($p < 0.01$) decreased in their significance, but growth was found in *Responsibility* ($p < 0.1$) and *Effectiveness* ($p < 0.1$).

All this is only a hypothesis. For a more confident answer to the question “Why did the students with more flexible and open acculturation strategies tend to have more stable value systems than the students who were inclined to more restrained acculturation strategies?” , an additional study may be required.

Our results are consistent with earlier findings of gender differences in the process of adaptation to a new socio-cultural environment in Latin-American students (Maslova & Tapia, 2012; Maslova, 2012), where female students showed a greater adherence to traditional values than males in the same communities.

It would be of interest for us to compare our results with the results of other studies of dynamics of personal values in Vietnamese people, but we could not find any longitudinal study on this matter. The only one close to our topic was a paper by K. Sh. Le (1998), who studied the changes of values in Vietnamese people in the course of time by comparing subjects of different ages. This author used the Rokeach method, just as we did, but unlike us, he conducted his study on subjects resident in Vietnam, but belonging to different generations.

In his study, K. Sh. Le revealed a greater incidence of individualistic tendencies in young people as compared to the elderly of population in Vietnam, along with

a decrease in some kinds of traditional values, such as *Frugality* and *Respect for the Elderly*; these lost their significance among the young generation, and even tended to be rejected in this strata (Le, 1998). As shown above, we found a similar tendency in the subjects of the present study, after a year of their living in Russia and studying in Russian universities. We found a significant increase of individualistic values in these subjects (such as *Materially Prosperous Life* and *Productive Life*), but at the same time, no decrease was found in traditional Vietnamese values such as *Frugality* and *Tidiness*. Moreover, their presence became more prominent in the subjects of our study, as shown in Figure 2, while another traditional value, *Respect for the Elderly*, displayed different types of dynamics depending on the acculturation profiles of our subjects (see Figure 7).

This dissociation between the results of the two studies may be due to the difference in the initial experimental conditions. Namely, Le conducted his study among Vietnamese residents belonging to different generations, while our own study was comprised of a sample of the same age, i.e. young Vietnamese students who were separated from their native soil and had the urge for acculturation to a completely new cultural environment. We may therefore assume that our study was rather innovative in its specific combination of objective and method, especially in this country.

Conclusions

The present study enables us to draw the following conclusions:

1. In the course of acculturation of Vietnamese students in Russia, the significance of personal goal values, primarily *Material Prosperity* and *Productive Life*, has increased in a significant way, as well as some tool values (*Tidiness* and *Frugality*) traditional in the Vietnamese people.
2. Gender serves as a mediating factor partially determining the value dynamics. The value system of male students is more dynamic, with changes affecting both their goal and tool values. In female students, only tool values were affected by changes due to the acculturation process.
3. The subjects' original living environment (urban or rural) is another factor mediating the value shift. Students from towns and villages turn their attention to different types of new cultural values, and adopt them in different ways. The town-born students begin to pay more attention to the *Pleasures* value, while those coming from villages turns mostly toward a *Materially Prosperous Life*.
4. The acculturation profile is one more factor mediating the personal value dynamics. The value system of students with an *Integration and Separation* profile changed to a larger degree than that of students with profiles of *Integration and Assimilation*, and *Pure Integration*.

References

- Berry, J.W., Poortinga, Y.H., Segall, M.H., & Dasen, P.R. (2002). *Cross-Cultural Psychology: Research and Applications*, (2nd Edition) N.Y.: Cambridge University Press.

- Hồ Sỹ Quý (2010). *Mấy vấn đề triết học giá trị và sự biến đổi giá trị trong bối cảnh toàn cầu hóa* [Philosophical issues of values and the change of values in the context of globalization]. *Nghiên cứu khoa học* [Scientific research]. Hanoi.
- Kudrjashov, A.F. (1992). (Ed.). *Luchshie psichologicheskie testy* [The best psychological tests]. Petrozavodsk: Petrokom.
- Le, K.Sh. (1998). *Psichologicheskie osobennosti cennostnyh orientacij sovremennoj v'etnamskoj molodezhi* [Psychological Characteristics of Value Orientation of the Contemporary Vietnamese Youth]. Moscow.
- Lebedeva, N.M. & Tatarko, A.N. (2007). *Cennosti kul'tury i razvitie obshchestva*. [Cultural Values and Evolution of Society]. Moscow: Izd. Dom GU HSE.
- Lebedeva, N.M. & Tatarko, A. N. (Eds.). *Strategii mezhkul'turnogo vzaimodejstviya migrantov i naselenija Rossii* (2009). *Sbornik nauchnyh statej*. [Strategies of Intercultural Interaction of Migrants With the Russian Population] Moscow: RUDN.
- Leontiev, D.A. (1993). *Ocherk psikhologii lichnosti*. [Studies in Personal Psychology]. Moscow.
- Maslova, O.V. (2012). *Osobennosti mezhkul'turnoj adaptacii latinoamerikanskikh studentov v Rossii* [Peculiarities of Psychological Adaptation of Latin American Students to a New Social-Cultural Environment]. *Vestnik Rossijskogo universiteta druzhby narodov. Seriya: Psikhologiya i pedagogika* [Bulletin of Peoples' Friendship University of Russia. Series Psychology and Pedagogics], 2, 50–59.
- Maslova, O.V. & Bui, Duk T. (2014). *Dinamika cennostej v'etnamskikh studentov v Rossii* [Dynamics of Values in Vietnamese students in Russia]. *Vestnik Rossijskogo universiteta druzhby narodov. Seriya: Psikhologiya i pedagogika* [Bulletin of Peoples' Friendship University of Russia. Series Psychology and Pedagogics], 1, 49–55.
- Maslova, O.V. & Bui, Duk T. (2014). *Izmenenie cennostnyh orientacij u gorodskikh i sel'skikh v'etnamskikh studentov v Rossii* [Value Orientations in Urban and Rural Vietnamese Students and Their Changes in Russia]. *Vestnik Rossijskogo universiteta druzhby narodov. Seriya: Psikhologiya i pedagogika* [Bulletin of Peoples' Friendship University of Russia. Series Psychology and Pedagogics], 4, 24–33.
- Maslova, O.V. & Tapia López, J.M. (2012). Cambio de valores de la persona en el proceso de adaptacion intercultural [The Change of Personal Values in the process of intercultural adaptation]. *International Journal of Developmental and Educational Psychology*, 1, 593–596.
- Phạm, Minh Anh (2012). *Định hướng giá trị của thanh niên ở những vùng đô thị hóa trong thời kỳ hội nhập và phát triển- một hướng nghiên cứu chuyên ngành* [Value orientations of youth in urbanized areas in the period of integration and development — a direction of specialized research]. *Tạp chí xã hội học* [Journal of Sociology], 5, 45–47.
- Rokeach, M. (1973). *The Nature of Human Values*, N.Y.: The Free Press.
- Yanickyi, M.S. (2012). *Cennostnoe izmerenie massovogo soznaniya* [Value Dimension of Mass Consciousness]. Novosibirsk.
- Zhuravleva, N.A. (2013). *Psikhologiya social'nyh izmenenij: cennostnyj podhod*. [Psychology of Social Changes: A Value-Based Approach]. Moscow: RAS Institute of Psychology.

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Neuropsychological analysis of the features of mental development in school age children with mild perinatal hypoxic damage of the nervous system in their anamnesis

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Background. Perinatal pathology of the nervous system (PPNS) of hypoxic genesis is one of the most significant causes of deviations in mental development. It is necessary to investigate the impact of mild PPNS for the child's mental ontogenesis, because coarser perinatal lesions, as a rule, lead to significant violations of development and should be analyzed separately. From our point of view, the qualitative neuropsychological syndromic analysis adopted in Russian child neuropsychology is the most productive way to study this problem.

Objective. The purpose of this study was to conduct neuropsychological analysis of the features of mental development of school-age children with mild hypoxic PPNS in their anamnesis.

Design. Our research involved 62 children 10-12.5 years old, who were studying in comprehensive schools in Moscow. The main group was comprised of 42 neurologically healthy children who had hypoxic-ischemic encephalopathy of mild severity in their anamnesis. The control group was comprised of 20 neurologically healthy children without indication of pathology of pregnancy and labor in their anamnesis.

Methods. We used neuropsychological Luria tests that have been adapted for children, conducted an interview of parents and teachers about the peculiarities of children's behavior, and analyzed electroencephalogram reports.

Results. Every child with PPNS exhibited similar features, such as neurodynamic disorders and a lack of voluntary control. We called this symptom complex "subcortical-frontal" neuropsychological syndrome. In addition, each child in the main group had a failure of at least one neuropsychological factor. The following functions showed insufficiency most often: voluntary attention, speech development, verbal-auditory memory, kinetic and kinesthetic praxis, visual-spatial gnosis, and phonemic hearing. Left hemisphere functions and interhemispheric interaction suffered to a greater degree. The children with PPNS were divided into two subgroups, depending on the severity of the insufficiency of executive functions (EF). Children with severe insufficiency of EF more

frequently demonstrated violation of development of verbal-logical thinking, difficulties in social adaptation, emotional disorders, and deviant behavior.

Conclusion. The mental development of school-age children with mild PPNS in their anamnesis differs from the development of their peers. We can talk about the long-term consequences of mild hypoxic perinatal damage of the nervous system.

Abbreviations. PPNS — perinatal pathology of the nervous system; CNS — central nervous system; EEG — electroencephalogram; EF — executive functions.

Keywords: perinatal hypoxic damage of the nervous system; child neuropsychology; cultural-historical concept; neuropsychological analysis; school-age children.

Introduction

At present, many specialists who work with children and adolescents (psychologists, educators, defectologists, etc.) note that the mental development of children today shows a number of significant differences from that observed several decades ago. Perhaps only “cabinet scientists”, who do not have the practical experience of interaction with children in actual conditions, can’t see that today the “psychological portrait” of a child at different age levels differs from that described in the “classical” psychological and pedagogical literature. “The child did not become worse or better than his peer of twenty years ago; he just became different” (Feldshtein, 2010, p. 6). Most likely, the general patterns of mental ontogeny, the vectors of development, remain unchanged. However, the meaningfulness of the stages of development, the formation of behavior and the cognitive-operational sphere, and the formation of the child’s and his/her social connections, have undergone significant changes.

From the cultural-historical point of view, which is fundamental to Russian psychology, this is to be expected: the child’s mental ontogeny is largely determined by the social situation of development (Vygotsky, 1984), which has changed significantly over the past decades (Sultanova & Ivanova, 2010). The social situation of development is a special combination of internal development processes and external conditions, typical for each age level (Bozhovich, 2008).

At present, both major components of the social situation of development have been modified. First of all, there are the *external* conditions: over recent decades, rapid changes in all spheres of human life have occurred in our country (as well as all over the world). Economic, political, and socio-cultural modifications have led, in particular, to transformation of the patterns of family formation, marriage, and the conditions of family upbringing, as well as changes in the information environment, changes in the sphere of education, and modification of children’s ways of life.

The *internal* components of the social situation of development have also changed. First of all, there is the state of children’s neuropsychiatric and somatic health. The prevalence of basic forms of children’s mental illnesses grows by 10–15% every ten years; neuro-mental illnesses cause child incapacity in 70% of these cases (Feldshtein, 2010). Specialists assume that over 80% of children now need some psychological, psychotherapeutic, or psychiatric aid (Shevchenko, 2011). The number of absolutely healthy children among modern first-graders is 4.3%, which is half as much as at the end of the last century (8.7%) (Golikova, 2010). Therefore,

the task of improving the somatic and mental health of children in Russia, and in many other countries also, is of great priority.

In our view this problem cannot be resolved without analyzing children's perinatal development. The high prevalence of perinatal pathology is of particular concern. Normal pregnancy and childbirth without pathology have become an exception to the rule. For example, according to the Russian Ministry of Health, the percentage of normal births does not exceed 36.8% (Golikova, 2010). Thus, we have to conclude that the development of most children today takes place against the backdrop of a lack of health. Meanwhile, the problem of how general state of health, and, in particular, perinatal disorder, affects the mental ontogeny, has not been adequately researched.

Perinatal pathology of nervous system (PPNS) is one of the most important causes of deviations of ontogenesis. "Adverse pregnancy and childbirth have often more detrimental effects on the nervous system and the human psyche than endo- and exogenous factors in the postnatal period" (Palchik & Shabalov, 2013, p.7). In the medical literature there are rather contradictory data on the prevalence of PPNS. According to different authors, it varies from 45 to 86%, and the leading role in the genesis of PPNS belongs to hypoxia (Barashnev, 2001; Volodin, Medvedev, & Rogatkin, 2001; Studenikin, Maslova, & Khachatryan, 2003; Shabalov & Tsveleva, 2002). Numerous maternal infectious and chronic diseases and various obstetric pathologies can cause intrauterine fetal hypoxia and asphyxia of newborns; in fact, asphyxia in childbirth is often a continuation of intrauterine fetal hypoxia (Badalyan, 2001; Volpe, 2008).

Depending on the severity of the hypoxia, the degree of asphyxia, adequacy of therapy, and other factors, perinatal nervous system damage can have a wide range of outcomes, ranging from favorable and severe. Severe hypoxic-ischemic encephalopathy leads to significant violations of ontogeny and diseases of the nervous system — cerebral palsy, epilepsy, mental retardation, and other severe maladies (Aicardi, 2013; Petrukhin, 2012; Palchik, 2013; Volpe, 2008). These diseases must be analyzed separately. However, in most cases (about 60%) the prognosis for dealing with the consequences of perinatal CNS damage is favorable or relatively favorable: recovery or minimal brain dysfunction (Petrukhin, 2012; Studenikin et al., 2003).

Thus, investigation of the features of mental development of children with mild perinatal brain damages is necessary for the following reasons: Children with favorable outcomes of perinatal CNS injuries are in the majority; these children are the least studied; they are very seldom put under medical observation after 1 year old; they are not officially registered as disabled children and, so, the social environment's demands on them are quite tough; and there is a lack of rehabilitative programs for these children.

However, despite the urgency and practical importance of this problem, it has seldom been investigated. In the medical literature there are descriptions of a number of studies (Naeye & Peters, 1987; Salova, 2009; Calvigioni & Hurd, 2014; El Marroun, White, Verhulst, & Tiemeier, 2014; Hebebrand & Verhulst, 2014; Sayal, Heron, Draper, Alati, Lewis, Fraser, ..., & Gray, 2014; Tiesler & Heinrich, 2014), proving the negative impact of intrauterine hypoxia, including of toxic origin, on

the child's mental ontogenesis, even in cases of favorable outcome. Medical research cannot replace the psychological study of the issue. Usually, the medical studies focus on the neurological status of the children, and the psychological part of the research is reduced to one or two standardized tests. Very often in scientific medical research, there is a substitution of psychological terms and concepts. As a rule, medical researchers cannot conduct high-grade psychological and neuropsychological studies, just as psychologists cannot conduct competent medical investigations.

From our point of view, the method of neuropsychological syndrome analysis developed by A.R. Luria (Luria, 1966, 2000, 2002) is the most productive way of investigating the long-term consequences of perinatal CNS damage. Qualitative syndrome analysis, adopted by Russian child neuropsychology (Mikadze, 2008, 2011; Akhutina & Pylaeva, 2008; Glozman, 2009, 2012), contributes to our understanding the mechanisms of this or that form of dysontogenesis, and allows us to determine the functional nature of the defect, as well as to take a new approach to developing corrective methods.

Previously, we used a neuropsychological analysis to study the influence of mild hypoxic PPNS on the mental ontogenesis (Sultanova, & Ivanova, 2009, 2013, 2014; Sultanova, 2015, 2016). But our investigations were dedicated to preschool children, and the significant question is: What will happen to these children in the future? Perhaps some dysfunctions can be compensated for at school age, but could they instead be aggravated, negatively affecting mental ontogeny? Certainly, the older the child, the more difficult it is to see the impact of PPNS as the main factor causing an ontogenesis disorder: a lot of other external and internal factors have acted on the child. But the same factors influence the children without PPNS. The children in this study lived and developed in the same cultural, social and educational environment, which allows us to conduct a comparative study.

Thus, the objective of this study was to conduct neuropsychological analysis of the features of mental development of school-age children with mild hypoxic-ischemic perinatal CNS damage in their anamnesis.

Methods

Our research involved 62 children 10-12.5 years old (pre-teens) studying in comprehensive schools in Moscow; all the children were brought up in socially well-off families; all children wrote with their right hands — that is, there were no apparent left-handed people among them. The main group consisted of 42 neurologically healthy children who had hypoxic-ischemic encephalopathy of mild severity (the 1st degree) in their anamnesis; the Apgar scores (Apgar, 1953) in all these children were not less than 7 points (this information was taken from their medical records). The control (comparison) group consisted of 20 neurologically healthy children without indication of pathology of pregnancy and labor in their anamnesis.

We used the following methods: neuropsychological Luria tests adapted for children (Simernitskaya, 1991; Tsvetkova, 1998; Akhutina & Pylaeva, 2003; Glozman, Potanina, & Soboleva, 2006; Semenovich, 2002; Glozman, 2012); an interview of parents and teachers about the peculiarities of children's behavior; and analysis

of electroencephalogram (EEG) reports. Each child's performance on the neuropsychological tests was evaluated by the standard for this type of diagnostic system: from 0 to 3, with 0 points being the perfect result, 3 points showing the most defect (a child cannot cope with the task, even after a prompt). To determine the reliability of the differences between the groups, we used the non-parametric Mann-Whitney statistical test (U criterion) and also the criterion ϕ^* (the angular Fisher transform).

Results

Despite the apparently favorable outcome of perinatal damage of the nervous system (recovery: the children are officially recognized as healthy and are not observed by neurologists), the mental development of children of the main group had statistically significant differences from that of the control group. First of all, every child with PPNS had neurodynamic disorders. The neurodynamic disorders in the children studied were less pronounced than in the preschool children whom we investigated earlier. But they were observed in all the children of the main group (see Table 1 for numerical values) in the form of 1) a decrease in the ability to work; 2) the need for a prolonged preparation ("warm-up") period; 3) changes in the pace of activity; and 4) inertia. The pace of work for these children, as a rule, could be quite high, but only if the child did not work diligently, and performed tasks carelessly. For most children in the main group, the pace of work was significantly reduced if the child was trying to carry out tasks with high quality and attentiveness.

Table 1. Neurodynamic disorders in the children (number of children, % of all children in the group)

| Disorder | The main group, % | The control group, % | Statistical significance of differences |
|---|-------------------|----------------------|---|
| Decrease in the ability to work | 84 | 25 | $p \leq 0.05$ |
| Prolonged preparation ("warm-up") period | 72 | 10 | $p \leq 0.01$ |
| Changes in the pace of activity | 74.4 | 15 | $p \leq 0.05$ |
| Inertia, including: | 79.2 | 15 | $p \leq 0.05$ |
| repetition of the previous finger's position in the tests for kinesthetic praxis | 43.2 | 5 | $p \leq 0.05$ |
| difficulties in switching in tasks for dynamic praxis and assimilation of the motor program | 79.2 | 15 | $p \leq 0.01$ |
| execution of previous instruction, or «jamming» on the task execution algorithm | 69.6 | 10 | $p \leq 0.01$ |
| «viscosity» of emotions | 67.2 | 10 | $p \leq 0.05$ |
| total, those or other violations | 100 | 30 | $p \leq 0.01$ |

Inertia manifested itself in the following phenomena. In the motor sphere it showed up in perseverations: for example, repetition of the previous finger position

in the samples for kinesthetic praxis, repetition of the elements of the motor program, and the difficulty of switching in tasks for dynamic praxis, and «extra» letters or their elements in the writing. In the cognitive sphere it showed up as «jamming» on the previous instruction, or on the same way of performing the task.

For example, some children, after completing assignments for naming images, could not compose a story by picture, because they were just starting to identify the depicted objects; the children did this task correctly after the specialist pointed out that the task has changed, and it is necessary to describe what happens in the picture. In the emotional sphere the inertia showed in the “viscosity” of emotions, the continuation of an emotional response to the already completed situation. This was also reflected in parental reports, where parents noted their children’s touchiness, or that “the child cannot calm down for a long time” after an event.

Due to fatigability, inertia, sluggishness, or hyperactivity, these children experience difficulties in communicating with other children and on lessons. This has a negative effect on the process of cognitive development, on the children’s self-concept and their social adaptation. It can be assumed that these neurodynamic features are directly related to the perinatal CNS damage, since the intrauterine period of development is especially important for the maturation of subcortical structures that support brain activation. The EEG reports of the children of the main group described dysfunctions of the subcortical and/or stem structures of various degrees of severity. This is consistent with the findings of medical research (Sokolova, 2004). Thus, neurodynamic disturbances which are associated with dysfunctions of the subcortical brain structures, can be the primary defect in children as the consequence of PPNS.

Another typical feature of children with PPNS was an insufficiency of voluntary regulation, or self-control. All children of the main group had this trait, but with differing severity (this is discussed below). In the control group, this condition was noted much more rarely (in 15% of children). Goal-setting, programming, and monitoring — that is, functions that are controlled by the prefrontal brain (Luria, 2002; Khomskaya, 2005), the so-called “executive functions” (EF) — were late in developing in children of the main group. This was manifested in the process of neuropsychological research, in school, and at home.

In the process of the neuropsychological research the children were distracted and often acted impulsively; thus, the researcher was forced to repeat the instruction several times or call for careful execution of the assignment. For example, in the study of visual gnosia, children called the crossed-out image of the comb alike “saw”, but when the researcher said “Pay close attention!” the children gave the correct answer. If the researcher could not intervene, the children did not cope. For example, in the study of verbal memory, children often reproduced the same word several times. As a result, their reduced self-control caused the deterioration of performance on the gnosia, attention, memory, and speech development tests. Teachers noted that these children are distracted and distract other children during their lessons, do not write down their homework, do not finish tasks, etc.; this reduced the child’s progress in school.

According to the parents, these children often do not fulfill requests at home; they are very difficult to get to help with housework. Great difficulties arose around

doing homework. Children could not “sit down for lessons” at home, preferring to play with gadgets or watch TV; they perform tasks carelessly and incompletely. It seems that these children can perform something productive only with the participation of an adult who is nearby; it’s as if the adult is “fulfilling” the functions of the prefrontal parts of the brain.

R.A. Barkley (2000) identified such aspects of executive functions as:

- Volition, planning, purposive, goal-directed, or intentional action.
- Inhibition and resistance to distraction.
- Problem-solving and strategy development, selection, and monitoring.
- Flexible shifting of actions to meet task demands.
- Maintenance of persistence toward attaining a goal.
- Self-awareness across time.

Our research does not allow us to say anything about “self-awareness across time”, but all the other five aspects of EF were inadequate to some extent in the children of the main group. A deficit of executive functions leads to negative consequences for the child’s further development because these functions are “those capacities that enable a person to engage successfully in independent, purposive, self-serving behavior” (Lezak, 1995, p.42).

The insufficiency of executive functions may be associated with a lag of development of frontal lobes and connections between the frontal lobes and subcortical brain structures. Thus, according to the research data, two basic disorders underlie the deviations of mental ontogenesis of the children with PPNS: neurodynamic disorders and insufficiency of executive functions. We called this syndrome the “subcortical-frontal syndrome”. Earlier, in the studies mentioned above, we observed similar disorders in preschool children. But in preschool children, neurodynamic disorders have come to the fore, while in school-age children, the deficit of executive functions is more pronounced.

In addition to the disorders described above, each child in the main group had a failure of at least one neuropsychological factor. That is, in general, a “mosaic picture” was observed, in which relatively preserved neuropsychological factors were combined with the insufficiency of others. Insufficiency of the following factors was noted most often: voluntary attention, verbal-auditory memory, kinetic and kinesthetic praxis, visual-spatial gnosis, and phonemic hearing. Auditory and tactile gnosis proved to be the most intact functions in the children of the main group. It should be noted that in tests for the localization of touch, children were not always accurate, but the same was observed in the control group. Statistically significant differences are presented in Table 2.

To our surprise, we found mistakes and synkinesis in the tests for kinesthetic praxis in many children in the main group. These mistakes were often not severe, but did not correspond to child’s age. The children consistently changed their fingers in finding the right position; acted awkwardly; helped themselves by their other hand to fold their fingers to the right position; or were wrong and could not always correct the errors, even if the researcher pointed to them. Synkineses were observed only in children of the main group (60% of children); they were more manual-manual than manual-oral.

Table 2. Statistically significant differences between groups in the performance of neuropsychological tests

| Insufficient function | average score | | significance of differences |
|--|---------------|---------------|-----------------------------|
| | main group | control group | |
| Voluntary attention | 2.1 | 0.5 | $p \leq 0.01$ |
| Motor functions: | | | |
| kinesthetic praxis | 1.4 | 0 | $p \leq 0.05$ |
| kinetic praxis | 2.3 | 0.6 | $p \leq 0.01$ |
| including reciprocal hand coordination | 2.2 | 0.4 | $p \leq 0.01$ |
| Visual-spatial gnosis | 2.1 | 0.8 | $p \leq 0.01$ |
| Verbal-auditory memory | 1.4 | 0.5 | $p \leq 0.05$ |
| Phonemic hearing | 1.8 | 0.6 | $p \leq 0.05$ |

It should be noted that all the children studied were right-handed. But in the group of children with PPNS, “hidden” left-handedness was seen twice as often (see Table 3), and the dominance of the left eye and the left ear was also often observed. Children who had a leading left eye (that is, the dominance of the hand and the eye did not match) had difficulties in mastering writing skills sometimes to the point of dysgraphia. And we cannot ignore the fact that many children of the main group had hypermobility of the joints (possibly due to connective tissue dysplasia), as well as a variety of different obsessive movements.

Table 3. Different forms of left-side dominance in groups (number of children, %).

| Form of left-side dominance | Main group | Control group |
|--|------------|---------------|
| children with latent left-handedness or children with ambidexterity, who were «retrained» on the right hand: the child writes with his right hand, but in activity often uses his left hand, and Luria's tests show the dominance of the left hand | 64% | 30% |
| Domination of the left eye | 48% | 35% |
| Domination of the left ear | 43.2% | 25% |

Kinetic praxis was naturally disturbed in children with PPNS in their anamnesis. We have already mentioned inertia, perseverations, and difficulties in retaining the motor program. A simplification of the program and a lack of smoothness of movements often were also observed in these children. In a graphomotor sample (“fence” with alternating elements Π/Λ) children very often introduced an extra “facilitating” element (this was the most common mistake). The task of “fist-palm-edge” (to repeat the successive movements of the hand) was one of the most difficult for these children. Children in the control group also made mistakes in this task, but they were not as serious as those in the main group, and often the children corrected themselves. Children in the main group often just chaotically changed

the poses of the hand, and only direct speech control could help. Children of the main group showed quite low results when performing a task for reciprocal hand coordination. Only 8.8 % of these children did this task correctly; the rest made mistakes, moved their arms, carried out the movements slowly.

The children of both groups performed tasks for visual gnosis quite well. In the main group there were errors related to the impulsiveness of answering, and insufficient attention, but these errors were corrected by the children. Tests for visual-spatial gnosis were difficult for children from both groups, but the children with PPNS consistently performed worse. In particular, a lot of mistakes and refusals to perform the task occurred in the test "clock with arrows". Perhaps this is due to the fact that children these days rarely use such clocks. However, there were many gross mistakes in the Piaget Bottles test (to draw the water level in a rotating bottle), although children today often deal with different drinks in bottles. Insufficient development of the spatial factor was manifested in other tests: kinesthetic praxis, spatial praxis, copying of figures. This insufficiency can be associated with a delay in the development of the occipital-parietal areas of the right hemisphere.

In the study of audio-verbal memory, significant results were obtained only in the test of memorizing ten words. The performance of the children in the main group demonstrated the following features: 1) a decrease in the results on the first attempt to recollect, which may be due to inertia, and a long indicative period; 2) a large number (up to 50%) of errors, most of which were semantic substitutions (similar in meaning to the word) or substitutions by associative principle (for example, after the correct word "brother", the child spoke the wrong word "sister"); 3) frequent repetition of the same words when recollected; these errors are associated with a decrease in self-control; and 4) with delayed reproduction, children recollected fewer words (6.3 on average) than children of the control group (7.8 on average). Thus, the majority of children with PPNS had a tendency to decline in audio-verbal memory under the influence of two mechanisms: first, the weakness of trace formation, which may be associated with functional deficiency of the left temple area; and secondly, the reduction in the factor of voluntary control, which is provided by the prefrontal parts of the brain.

In children with PPNS in their anamnesis, certain distinctive features of speech development were also observed. These children made mistakes in naming objects, had difficulty formulating a compound sentence, and more often had dysarthria, dysgraphia and dyslexia, than those in the control group. But statistically significant differences were obtained only on phonemic hearing. The children of the main group made serious mistakes (the children in the control group sometimes confused the sounds "o" with "u"). Their insufficiency of phonemic hearing often led to misunderstanding the meaning of the word they heard and to mistakes in writing (dysgraphia).

Thus, according to our results of the study, left-hemispheric functions and interhemispheric interaction suffer to a greater degree in children with the consequences of PPNS. In general, it turned out that the development of the functions of the left hemisphere is more vulnerable to perinatal hypoxia than the development of right hemispheric functions.

We said above that the severity of violations of executive functions differed among the children of the main group. We divided *the main group* into two sub-

groups, depending on the degree of these disorders. Children of subgroup 1 (16 persons, 38% of the main group, most of them girls) had pronounced neurodynamic disorders and little insufficiency of executive functions. Children of subgroup 2 (26 persons, 62% from the main group, most of them boys) also had neurodynamic disorders, but the inadequacy of voluntary regulation of activity came to the fore.

Most children in the subgroup 1 had good school performance and social adaptation (see Table 4), but their quality of life was reduced. It took them a long time to do their homework, and they got “stuck” on negative experiences; they often had psychosomatic and neurotic reactions, increased anxiety, and decreased self-esteem. Deviant behavior was not observed in these children very often; deviant behavior manifested itself in the form of negativism, addictions (Internet addiction, game dependence, and overeating, etc.), absenteeism, and sometimes suicidal thoughts.

Table 4. Some characteristics of the selected subgroups

| Subgroup | Gender composition | School performance, average score (max. 5) | Correct execution of tasks on verbal-logical thinking | Deviant behavior |
|---|-------------------------------------|--|---|-------------------|
| Subgroup 1: mild insufficiency of executive functions | about 75% of girls, and 25% of boys | 4.1 | 70% of children | 37.5% of children |
| Subgroup 2: pronounced insufficiency of executive functions | about 23% of girls, and 77% of boys | 3.3 | 38.5% of children | 84.7% of children |

In children of subgroup 2, the inadequacy of voluntary regulation becomes the main factor hampering productive activity and social adaptation. Children from subgroup 2 did worse in school, and they often broke the rules of the community. Indicators of verbal-logical intelligence were somewhat reduced in these children. These children had a lower school performance, and often deviant behavior was observed (verbal and physical aggression towards parents, teachers and peers, lying, absenteeism, theft, early tobacco smoking, and different addictions, etc.). These children are characterized by a lag in the formation of the ability to control emotional manifestations. Often they had a combination of aggressiveness towards their peers with negativism towards adults, especially when the adults were trying to regulate a child's activities. Also, the “sense of distance” in these children was violated. As a rule, they had a combination of increased emotional susceptibility and vulnerability about themselves, with a relatively low sensitivity to others, an insufficiency of empathy. These children had worse relationships with their peers and teachers, and their social adaptation was often disrupted. We can say that children from the subgroup 1 suffer from their condition while the children from subgroup 2 make the people around them suffer.

In our opinion, the features of children with PPNS we've described are due to two groups of factors:

1. Functional insufficiency of various structures of the brain, which can be both primary (deficiency of subcortical structures) and secondary (mainly the impaired development of the left hemisphere).
2. Social factors. In most cases, the presence of the mild PPNS in a child is not sufficiently taken into account in the upbringing and education of the child. Parents, educators, and teachers make demands on the child as if he or she were a healthy child, demands which do not correspond to his capabilities. As a result, secondary disturbances of the emotional-personal sphere arise in the child, and often a quite pathological adaptation to the surrounding social environment appears.

Conclusion

Thus, the mental development of school-age children with a mild perinatal pathology of the nervous system in their anamnesis differs from the development of their peers. We can talk about the long-term consequences of the mild hypoxic perinatal damage of the nervous system. It is necessary to continue the study, although every year it is increasingly difficult to find children for the control group.

We investigated the effect of *mild* PPNS on ontogeny. However, we have seen cases when severe perinatal lesions of the nervous system did not lead to gross violations of the child's development. Analyzing such cases in a separate work would be necessary and interesting. Also, the impact of family upbringing, child-parent relations, and other social factors on the development of children with PPNS in their anamnesis would be interesting to investigate.

Limitations

The limitations of our research are primarily related to the small sample of children studied. In addition, all the children studied lived in urban conditions. Perhaps children living in rural areas would show slightly different results. Children with social deprivation, for example, who are not brought up in the family, but in orphanages, are also not investigated.

References

- Aicardi, J. (2013). *Zabolevaniya nervnoi sistemy u detei* [Diseases of the Nervous System in Childhood]. Moscow: Izdatelstvo Panfilova; BINOM; Laboratoriya znaniy.
- Akhutina, T.V. & Pylaeva, N.M. (2003). *Diagnostika razvitiya zritel'no-verbal'nykh funktsii* [Diagnostics of development of visual-verbal functions]. Moscow: Akademiya.
- Akhutina, T.V. & Pylaeva, N.M. (2008) *Preodolenie trudnostei ucheniya: neiropsihologicheskii podhod* [Overcoming the Learning Difficulties: Neuropsychological Approach]. Saint Petersburg: Piter.
- Apgar, V. (1953). A proposal for a new method of evaluation of the newborn infant. *Current researches in anesthesia & analgesia*, 32 (4), 260–267. <https://doi.org/10.1213/00000539-195301000-00041>
- Badalyan, L.O. (2001). *Detskaya nevrologiya: Uchebnoe posobie*. [Children's Neurology: A Training Manual]. Moscow: MEDpress-inform.
- Barashnev, Yu.I. (2001). *Perinatalnaya nevrologiya* [Perinatal neurology]. Moscow: Triada-X.

- Barkley, R.A. (2000). Genetics of childhood disorders: XVII. ADHD, part 1: the executive functions and ADHD. *Journal of the American Academy of Child & Adolescent Psychiatry*, 39(8), 1064–1070. <https://doi.org/10.1097/00004583-200008000-00025>
- Bozhovich, L.I. (2008). *Lichnost i ee formirovanie v detskom vozraste*. [Personality and its formation in childhood]. Saint Petersburg: Piter.
- Calvigioni, D. & Hurd, Y.L. (2014). Neuronal substrates and functional consequences of prenatal cannabis exposure. *European Child & Adolescent Psychiatry*, 23 (10), 931–941. <https://doi.org/10.1007/s00787-014-0550-y>
- El Marroun, H., White, T., Verhulst, F. C., & Tiemeier, H. (2014). Maternal use of antidepressant or anxiolytic medication during pregnancy and childhood neurodevelopmental outcomes: a systematic review. *European Child & Adolescent Psychiatry*, 23 (10), 973–992. <https://doi.org/10.1007/s00787-014-0558-3>
- Feldshtein, D.I. (2010). *Prioritetnye napravleniya psikhologo-pedagogicheskikh issledovaniy v usloviyakh znachimykh izmenenii rebenka i situatsii ego razvitiya. Doklad na vyezdnom zasedanii Prezidiuma RAO v Nizhnem Novgorode 19–20 aprelya 2010 g.* [Priority Trends in Psychological-Pedagogical Studies in the Conditions of Child's Significant Changes in the Situation of his Development. A report at the session of the RAE Board in Nizhniy Novgorod on April 19-20, 2010]. Moscow: MPSI; Voronezh: MODEK.
- Glozman, Zh.M. (2009). *Neiropsihologiya detskogo vozrasta. Uchebnoe posobie* [Neuropsychology of childhood. Study Guide]. Moscow: Akademiya.
- Glozman, Zh.M. (2012). O subektnosti lurievskoi neiropsihologii [Subject oriented Lurian neuropsychology]. *The Moscow University Herald*, Series 14, 2, 31–36.
- Glozman, Zh.M., Potanina, A.Yu., & Soboleva, A.E. (2006). *Neiropsikhologicheskaya diagnostika v doskolnom vozraste* [Neuropsychological diagnostics at preschool age]. Saint-Petersburg: Piter.
- Golikova T.A. (2010). O vipolnenii v 2007–2009 godah meropriyatii plana realizatsii Konceptcii demograficheskoi politiki Rossiiskoi Federatsii na period do 2025 goda, napravlennih na uluchshenie sostoyaniya zdorovya jenshin, detei i podrostkov [About performance in 2007–2009 of the actions of the plan of implementation of the Concept of population policy of the Russian Federation until 2025 directed to improvement of the state of health of women, children and adolescents]. *Handbook of a paramedic and midwife*, 5, 8–14.
- Hebebrand, J. & Verhulst, F. (2014). Prenatal risk factors and postnatal central nervous system function. *European Child & Adolescent Psychiatry*, 23 (10), 857–861. <https://doi.org/10.1007/s00787-014-0617-9>
- Khomskaya, E.D. (2005). *Neiropsihologiya. Uchebnik* [Neuropsychology. Textbook]. 4th edition. Saint Petersburg: Piter.
- Lezak, M.D. (1995). *Neuropsychological assessment*. New York: Oxford University Press.
- Luria, A.R. (1966). *Human brain and psychological processes*. N.Y.: Harper & Row.
- Luria, A.R. (2000). *Vysshie korkovie funktsii cheloveka i ih narushenie pri lokalnih porajeniyah mozga* [Higher cortical functions of man and their disturbances in local brain lesions]. 3rd ed. Moscow: Academ. project.
- Luria, A.R. (2002). *Osnovy neiropsihologii. Uchebnoe posobie*. [Fundamentals of neuropsychology. Tutorial]. Moscow: Akademiya.
- Mikadze, Y.V. (2011). Methodology of neuropsychological assessment: qualitative (meta-syndromal analysis of cognitive deficit structure) and quantitative (psychometricestimate) aspects. *Psychology in Russia: State of the Art*, 4, 261–267. <https://doi.org/10.11621/pir.2011.0015>
- Mikadze, Yu.V. (2008). *Neiropsihologiya detskogo vozrasta* [Developmental neuropsychology]. Saint Petersburg: Piter.

- Naeye, R.L. & Peters, E.C. (1987). Antenatal hypoxia and low IQ values. *American Journal of Diseases of Children*, 141(1), 50–54.
- Palchik, A.B. (2013). *Lekcii po nevrologii razvitiya*. [Lectures on neurology of development]. 2nd ed. Moscow: MEDpress-inform.
- Palchik, A.B. & Shabalov, N.P. (2013). *Gipoksicheski-ishemicheskaya entsefalopatiya novorozhdennykh* [Hypoxic-ischemic encephalopathy of newborns] (4d ed.). Moscow, MEDpress-inform.
- Petrukhin, A.S. (2012). *Detskaya nevrologiya: Uchebnik* [Pediatric neurology: Textbook]. Moscow: GEOTAR-Media.
- Salova, M.N. (2009). *Sostoyanie zdorovya detei 9–11 let s posledstviyami perinatalnykh gipoksicheskikh porazhenii centralnoi nervnoi sistemi s uchetom tipa ih psichosomaticheskoi konstitutsii* [The state of health of children aged 9 to 11 years with the consequences of perinatal hypoxic lesions of the central nervous system, taking into account the type of their psychosomatic constitution]. PhD thesis. Ivanovo: Ivanovo State Medical Academy.
- Sayal, K., Heron, J., Draper, E., Alati, R., Lewis, S.J., Fraser, R., ..., & Gray, R. (2014). Prenatal exposure to binge pattern of alcohol consumption: mental health and learning outcomes at age 11. *European Child & Adolescent Psychiatry*, 23 (10), 891–899. <https://doi.org/10.1007/s00787-014-0599-7>
- Semenovich, A.V. (2002) *Neiropsikhologicheskaya diagnostika i korrektsiya v detskom vozraste* [Neuropsychological diagnostics and correction in childhood]. Moscow: Akademiya.
- Shabalov, N.P. & Tsveleva, Yu.V. (2002). *Osnovy perinatologii* [Fundamentals of Perinatology]. Moscow, MEDpress-inform.
- Shevchenko, Yu.S. (2011). *Detskaya i podrostkovaya psikiatriya: Klinicheskie lektsii dlya professionalov* [Child and Adolescent Psychiatry: Clinical lectures for Professionals]. Moscow: Meditsinskoe informatsionnoe agentstvo.
- Simernitskaya, E.G. (1991). *Metodika ekspres-diagnostiki "Luriya-90"* [Method of rapid diagnosis "Luria-90"]. Moscow: Obshchestvo "Znanie".
- Sokolova, M.G. (2004). *Kliniko-patogeneticheskaya diagnostika nevrologicheskikh rasstroistv u podrostkov s rezidualnym porazheniem centralnoi nervnoi sistemi perinatalnogo geneza* [Clinical and pathogenetic diagnosis of neurological disorders in adolescents with residual lesions of the central nervous system of perinatal origin]. PhD thesis. Saint Petersburg St. Petersburg: Medical Academy of Postgraduate Education.
- Studenikin, V.M., Maslova, O.I., & Khachatryan, L.G. (2003). Perinatalnye porazheniya nervnoi sistemy i ikh iskhody [Perinatal damages of the nervous system and their outcomes]. *Doktor. Ru — zhurnal sovremennoi meditsiny*. Retrieved from <http://medprom.ru/medprom/39128>
- Sultanova, A.S. (2015). Influence of a mild perinatal pathology of the nervous system on mental ontogenesis: neuropsychological analysis. *Medical psychology in Russia*, 5 (34). Retrieved from: http://www.mprj.ru/archiv_global/2015_5_34/nomer04.php
- Sultanova, A. (2016). Long-term consequences of a mild perinatal pathology of the nervous system for mental ontogenesis. *International Journal of Psychology*, 51, S1, 118.
- Sultanova, A. & Ivanova, I. (2009). Influence of perinatal pathology of central nervous system on mental health of preschool children. *Psichiatriki*, 20, 99–100.
- Sultanova, A. & Ivanova, I. (2010). The features of a social situation of development of children under modern Russian conditions. In *International Symposium Situating Childhood & Child Development: Socio-cultural Approaches and Educational Interventions*. Potsdam, Germany: Department for Teacher Training University of Potsdam & International Society for Cultural and Activity Research (26–27).

- Sultanova, A. & Ivanova, I. (2014). Application of Vygotsky-Luria's doctrine to study of the features of mental development in preschool children with mild perinatal brain pathology. In *Estoril Vygotsky Conference 2014* (p. 10). Lisbon, Portugal: Lev Vygotsky Institute.
- Sultanova, A. & Ivanova, I. (2013). Features of Mental Development of Children with Mild Perinatal Brain Pathology. In Daphne Halkias (Eds.). *Psychology and the Search for Certainty in Everyday Life* (pp. 217–227). Athens, Greece: Athens Institute for Education and Research.
- Tiesler, C.M.T. & Heinrich, J. (2014). Prenatal nicotine exposure and child behavioural problems. *European Child & Adolescent Psychiatry*, 23 (10), 913–929. <https://doi.org/10.1007/s00787-014-0615-y>
- Tsvetkova, L.S. (1998). *Metodika neiropsikhologicheskoi diagnostiki detei* [Method of neuropsychological diagnostics of children]. Moscow: Rossiiskoe pedagogicheskoe agentstvo, Kogito-tsentr.
- Volodin, N.N., Medvedev, M.I., & Rogatkin, S.O. (2001). Perinatalnaya encefalopatiya i ee posledstviya — diskussionnie voprosi semiotiki, rannei diagnostiki i terapii [Perinatal encephalopathy and its consequences — debatable questions of semiotics, early diagnosis and therapy]. *Russian Pediatric Journal*, 1, 4–8.
- Volpe, J.J. (2008). *Neurology of the newborn* (5th ed.). Philadelphia: Elsevier.
- Vygotsky, L.S. (1984). *Sobranie sochinenii: v 6-ti t. T. 4. Detskaya psihologiya* [Collected works: In 6 volumes. Vol. 4. Child Psychology]. Moscow: Pedagogika.

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Individual neuropsychological characteristics in patients with juvenile myoclonic epilepsy

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Background. An association between juvenile myoclonic epilepsy (JME) and nonpsychotic psychiatric and cognitive disorders has been described in recent years. Scientists are trying to link JME with certain personality traits marked by emotional instability.

Objective. The goal of our research was to assess the state of cognitive functions in young adult patients with JME—excluding the adverse side effects (ASEs) of antiepileptic drugs (AEDs)—and analyze the level of personality and situational anxiety, neuroticism, and depression in young adult patients with JME.

Design. We tested 26 patients with JME and 26 healthy adults with the computer program NS-PsychoTest (Neurosoft Company, RF), a program which is aimed at studying and evaluating neuropsychological characteristics.

Results. Our study showed that the frequency of depressive symptoms, according to the cognitive-affective subscale (Beck's Depression Inventory), in patients with JME was statistically significantly higher than among people without epilepsy. Comorbid personality and nonpsychotic psychiatric disorders are common interdisciplinary problems in JME management. Most practitioners pay attention only to the treatment of seizures caused by JME, and their patients, accordingly, do not receive adequate psychotherapeutic help.

Conclusion. Cognitive disorders are often associated with epilepsy, and are a result of a combination of factors. According to our study, in the presence of statistically significant differences in short-term memory and mental performance in patients with JME, compared to healthy young adults, the main indicators of cognitive function in patients with JME generally correspond to the norm. Our findings highlight the etiological heterogeneity of cognitive disorders in JME and the importance of early screening for them.

Keywords: juvenile myoclonic epilepsy (JME), individual neuropsychological characteristics, cognitive functions, anxiety, depression.

Introduction

JME was first described as a syndrome by Janz and Christian in 1957 (Janz, 1989).

Now JME is one of the most widespread forms of genetically determined generalized epilepsy (Avakyan, 2017), which is accompanied by the classical Herpin-Janz triad of symptoms: frequent *myoclonic jerks*, mostly in the upper limbs; possible *generalized tonic-clonic seizures*; and, less commonly, *absence seizures* (O'Muircheartaigh et al., 2012). The peak of disease onset is between ages 14 and 16, with a range from 8 to 26 years (Commission on Classification and Terminology of the International League Against Epilepsy [ILAE], 1989). Cases have also been diagnosed at a later age.

The typical interictal EEG abnormality consists of a generalized 4- to 6-Hz spike, or polyspike, and slow-wave discharges lasting 1–20 seconds. Usually, 1–3 spikes precede each slow wave. When absence seizures are present, a 3-Hz spike-and-wave activity may be seen in addition to the polyspike-and-wave pattern. Occasionally, isolated fragments of generalized spikes can also be seen. The background activity of the EEG is normal in patients with JME.

The seizures are often preceded by stress and disturbance in the circadian rhythm of sleep, with a predominance of seizures occurring shortly after awakening (83% of patients). Also, a frequent cause of these seizures is sleep deprivation (77%) (Wandschneider et al., 2012). A smaller proportion of patients report that seizures may be associated with “thoughts and concentration” (23%) or hand activities (20%) (Krauss, 2011; da Silva Sousa, 2005).

In our previous review of the literature about mental illness in JME patients (Moskaleva et al., 2017), we noted that, despite the fact that they recognize the factors «which cause more frequent seizures and worsening of the general condition, many patients cannot cope with their emotions singly; they note a decrease in stress resistance and therefore complain about the difficulties of falling asleep, resulting in an undesirable lack of sleep». The reason for such disorders may often be described as JME-concomitant *nonpsychotic psychiatric disorders*. They include various types of anxiety and mood disorders such as: generalized anxiety disorders, phobias, depression, dysthymia, and psychosomatic disorders (de Araújo Filho, 2009; Martínez-Domínguez, 2013; Somayajula, 2015).

Epilepsy is a socially significant disease.

B.V. Zeigarnik et al. have demonstrated how an alteration in physiological parameters can influence the course of mental processes in patients with epilepsy (Zeigarnik & Bratus, 1980). People with epilepsy, especially children, feel themselves different from others (this is interesting especially in the context of JME study), and therefore look for a way to compensate for their condition (Zeigarnik, 1986). Consequently they take one of two characteristic approaches. In the first, the patient concentrates on an accurate, even pedantic understanding of the disease, and establishes a certain habitual, active attitude toward the world around them, a certain social position, i.e., makes JME a character trait. When the patient has preserved cognitive function, this approach even helps him or her in socialization. The second approach is an unsuccessful attempt at compensation, which leads to the formation of agoraphobia and depression.

And in 2017 ILAE experts developed a new epilepsy classification which showed their serious concern over the underestimation of the comorbid conditions' effects on the JME patient's life. Despite the possibility of complete relief from seizures, JME and other epileptic diseases (such as benign epilepsy with centrotemporal spikes and children's absence epilepsy) may be associated with transient or long-term effects on the patient's cognitive domain (Avakyan, 2017).

There is also significant evidence that individuals with JME show subtle anomalies in brain structure, hence in cognition. For this reason, they have poor long-term social outcomes after 25 years, including social isolation and underemployment (Martínez-Domínguez et al., 2013; Somayajula et al., 2015).

The frontal lobes, especially the prefrontal cortex, play an important role in cognitive disorders (Wandschneider et al., 2012). Dysfunction in these areas results in deficits of executive functions (concept formation, abstract reasoning, planning, self-regulation of behavior, control of impulsivity, and emotions), the functions which manage cognitive and behavioral responses and strategies for the achievement of immediate or future goals (Lin et al., 2014; Kim et al., 2007).

According to our previous review of the scientific literature about cognitive impairment in patients with JME (Shilkina et al., 2017), four theories the causes of cognitive disorders in JME are currently being advanced:

1. The impact of epileptiform discharges and disease-related characteristics (Lee, J.M. et al., 2008; Motamedi et al., 2014; Holmes & Lenck-Santini, 2006; Carvalho et al., 2016);
2. Adverse side effects (ASEs) of antiepileptic drugs (AEDs) (Thomas et al., 2014; Valente et al., 2016; Hamed, 2009);
3. A genetic predisposition theory (Iqbal et al., 2009; Wandschneider et al., 2010; Chachua et al., 2014; Noebels et al., 2012);
4. Cerebrocortical microdysgenesis (Woermann et al., 1999; Tae et al., 2008; Kim et al., 2015).

The first three reasons are endogenous, i.e., directly related to the disease itself. And ASEs caused by receiving AEDs are also exogenous, and, accordingly, manageable.

Of course, all AEDs have potential ASEs. However, it has been clinically noted that with an adequately chosen regimen, individually selected dosage, and timely correction of antiepileptic therapy depending on the concentration level of the drug in the blood, the cognitive sphere of JME patients remains quite protected.

The combination of cognitive impairments and personality traits in JME patients (unsteadiness, lack of discipline, hedonism, indifference to their disease) significantly complicates their treatment; for example, they forget to attend control visits, to take their medication regularly, etc.

Study of the internal picture JME patients have of their disease has shown they have a tendency to underestimate mental disorders (Zeigarnik, 1986).

Therefore it is very important to avoid cognitive impairments, and to maximally control the mental health of JME patients for the most effective management of the disease.

Method

The goal of our research was to assess the state of cognitive function in young adult patients with JME, with the exclusion of the ASEs of AEDs, and to analyze the level of personality and situational anxiety, neuroticism, and depression in young adult patients with JME.

The study was conducted within the framework of a complex of studies on the topic "Clinical and genetic characteristics of juvenile myoclonic epilepsy," registration number AAAA-A16-116100710066-3 dated 07.10.2016, based at the Neurological Center of Epileptology, Neurogenetics and Brain Research at the University Clinic. The study was approved by the local ethics committee of Prof. V.F. Voynoyasenetsky Krasnoyarsk State Medical University.

We chose 26 adults with JME (Group One) and 26 healthy adults (Group Two) with unburdened neurological and psychiatric history. An exclusion criterion for Group One was the presence of ASEs associated with AED therapy.

Both groups were tested by the computer program NS-PsychoTest (Neurosoft Company, RF), which is aimed at studying and evaluating: 1) memory features (using *Memory for Numbers*); 2) attention (using *Modified Schulte Tables* as adapted by K.K. Platonov); 3) thinking (using *Krepelin's Tables*); 4) personal and situational anxiety (using Spielberger's *State-Trait Anxiety Questionnaire* as adapted by Y.L. Khanin); 5) depressiveness (using *Beck's depression inventory* (BDI)); 6) neuroticism (using Braithwaite's *The Scale of Emotional Arousability* as modified by A.A. Rukavishnikov and M.V. Sokolova); and 7) mental states (using *Self-assessment of anxiety, frustration, aggressiveness and rigidity* [AFAR]; Mantrova, 2010).

Our results produced a database, which we then processed statistically using the SPSS licensed software package, version 20.

All statistical analyses were carried out using licensed software package SPSS, version 20.0 (USA). We used the Student t-test and Fisher's test for characterization (quantity of normally distributed characteristics) and data comparison between the two groups. We calculated a 95% confidence interval as the borders for expected deviation. Data for ordered samples with nonparametric distribution were presented with medians and quartiles (Me [pp. 25, 75]), and comparative statistics with the Mann-Whitney test.

Results

The average age of the JME patients in the study varied between 14 and 44 years of age, averaging 26.42 ± 8.7 years, with a median of 25 years (19:34). The age in Group Two varied between 19 and 36 years old, with an average age of 23.5 ± 3.6 years and a median of 22.5 years (22:24.5), $p=0.121$.

According to the WHO classification, people between 25 and 44 years old, are considered young; in other words, the age of our study participants is within this framework and corresponds to the stated topic.

The outcome of the testing by each method is presented below:

***Braithwaite's Scale of Emotional Arousability as modified
by A.A. Rukavishnikov and M.V. Sokolova*** (See Table 1)

While assessing emotional arousability, we took into account the totality of the following components: general emotionality, anger, timidity, and lack of control over emotions (Braithwaite, 1987).

The average score in Group One was: 36.64 ± 10.39 (27:44) among males, which corresponded to the fourth sthene (a tendency to low emotional excitability); and 45.0 ± 10.62 (38:55) among females, which corresponded to the fifth or sixth sthene (average emotional excitability).

The average score in Group Two was 33.67 ± 9.31 (25.75:41.75) for males, which corresponded to the third sthene (low emotional excitability); for females it was 39.5 ± 5.99 (35.25:44), which corresponded to the fourth sthene (a tendency to low emotional excitability) ($p > 0.05$).

Table 1. The Braithwaite's method «The Scale of Emotional Arousability» in the modification of A.A. Rukavishnikov and M.V. Sokolova

| Gender | Group 1 ($n_1=26$) | Group 2 ($n_2=26$) | p (Student t-test's criterion) |
|---------|----------------------|----------------------|--------------------------------|
| Males | 36.64 ± 10.39 | 33.67 ± 9.31 | $p=0.447$ |
| Females | 45.0 ± 10.62 | 39.5 ± 5.99 | $p=0.100$ |
| Total | 41.46 ± 11.14 | 36.8 ± 8.09 | $p=0.091$ |

$p > 0.05$

In Group One, especially among females, there was a tendency for an increased level of neuroticism as compared to the control group, but the intergroup differences did not reach statistical significance. Among the JME patients, six people (23%) showed results within the eighth and tenth sthenes, i.e. the high emotional excitability, and three patients (11.5%) were in the seventh sthene, i.e. showing a tendency to high emotional excitability. There were only two persons (7.7%) with a tendency to high emotional excitability in the control group.

Spielberger's State-Trait Anxiety Questionnaire as adapted by Y.L. Khanin
(See Table 2)

The questionnaire was designed to assess the situational anxiety (SA) characterizing the patient's current mental state, and personal anxiety (PA), showing the predisposition of a person to this state.

Table 2. «Spielberger's State-Trait Anxiety Questionnaire» in adaptation of Khanin Y.L.

| Scale | Group 1 ($n_1=26$) | Group 2 ($n_2=26$) | p (Student t-test's criterion) |
|-------|----------------------|----------------------|--------------------------------|
| SA | 37.92 ± 8.11 | 35.96 ± 6.55 | $p=0.224$ |
| PA | 42.5 ± 9.4 | 38.46 ± 8.03 | $p=0.078$ |

$p > 0.05$

The middle score in Group One on the SA scale was 37.92 ± 8.11 (34:41.5); on the PA, it was 42.5 ± 9.4 (35.75:52.0). Therefore, the JME patients showed an average level of these parameters. Group Two showed similar middle values: SA= 35.96 ± 6.55 (30.75:40); PA= 38.46 ± 8.03 (31:44.25) ($p > 0.05$).

Spielberger's questionnaire also provides an opportunity to compare the respondent's current state with his usual state of mind. SA arises as the reaction of a person to various, most often socio-psychological, stressors, when he or she expects a negative evaluation, or perceives an unfavorable attitude towards him or herself. This is a common anxiety among patients with epilepsy. PA gives an idea of the individual's exposure to these factors.

In six patients of Group One (23%), there was a significant (more than 10 points) difference between the SA and PA in favor of PA. This result suggested a lower level of patient anxiety at a doctor's appointment (the patients «feel safer, more confident»), and a very high level of PA. This result requires clarification as to why, and as to how to conduct appropriate psycho-corrective measures.

Self-assessment of anxiety, frustration, aggressiveness and rigidity (AFAR) (See Table 3)

The AFAR method measures four components: 1) anxiety (as a propensity to experience anxiety and a sense of failure); 2) frustration (exposure to stress factors); 3) aggressiveness (inclination to aggressive reactions to life's difficulties); and 4) rigidity (inability to restructure one's own behavior).

According to the test results, the total score, interpreted as an indicator of the subject's general personal anxiety, was 111.42 ± 14.41 (98.25:124.25) in Group One, i.e., the average level. In Group Two, the result was lower: 108.65 ± 12.34 (102:119.25), although it also corresponded to the average level ($p > 0.05$).

It was also notable that nine patients in Group One (34.6%) showed a high level of anxiety, which would require psychocorrectional work to reduce their level of PA. There was only one such case in Group Two (3.85%).

Table 3. «Self-assessment of anxiety, frustration, aggressiveness and rigidity» (the method «AFAR»)

| Criterion | Group 1 ($n_1=26$) | Group 2 ($n_2=26$) | p (Student t-test's criterion) |
|--|----------------------|----------------------|--------------------------------|
| The indicator of the general personal anxiety of the subject | 111.42 ± 14.41 | 108.65 ± 12.34 | $p=0.460$ |

$p > 0.05$

Beck's depression inventory (BDI) (See Table 4)

We used this method to assess the presence of depressive symptoms in the subjects' mental states during the period of testing. The BDI includes two subscales: cognitive-affective (CAS) and somatization (SS).

Group One's overall score for the BDI questionnaire was 8.96 ± 10.09 (1:11.75). This put it in the category (0–9 points) which is characterized by the absence of

depressive symptoms. In Group Two, the result was significantly lower: 2.92 ± 2.54 (1:4.25), but this was also characteristic of the absence of depression ($p=0.04$).

Then we analyzed the data on the subscales. In Group One, the CAS score was 6.69 ± 7.14 (0:10.75), in comparison with a norm ranging from 0 to 5; six people in the Group One (23%) demonstrated a critical level of symptoms on CAS, and another six (also 23%) showed moderately expressed symptoms of depression. The SS score was 2.27 ± 3.46 (0:3), in comparison with the norm, which ranges from 0 to 3. Consequently, there was a predominance of psychological symptoms over physiological symptoms.

In the control group, the CAS score was 1.77 ± 1.48 (1:2.25) ($p=0.025$), and the SS score was 1.15 ± 1.52 (0:2) ($p=0.417$). Such lack of significant difference in indicators corresponds to the norm.

The possible reason for the higher results in the patients' cognitive-affective sphere, along with the absence of somatic disorders, is an overestimation of the self-assessment of depression, a condition which requires the implementation of psychocorrectional assistance.

Table 4. Beck's depression inventory (BDI)

| Criterion | Group 1 ($n_1=26$) | Group 2 ($n_2=26$) | p (Mann-Whitney's criterion) |
|---------------|----------------------|----------------------|------------------------------|
| Overall score | 8.96 ± 10.09 | 2.92 ± 2.54 | $p=0.040^*$ |
| CAS | 6.69 ± 7.14 | 1.77 ± 1.48 | $p=0.025^*$ |
| SS | 2.27 ± 3.46 | 1.15 ± 1.52 | $p=0.417$ |

*=statistically significant intergroup differences.

Memory for Numbers (See Table 5)

We evaluated the subjects' short-term memory using this method.

The average number of correct answers in Group One was 7.42 ± 1.77 (6:9), which corresponds to the normative result for young adults, which is seven correctly marked numbers or higher. Translated into our scoring system, the average score was 4 ± 0.75 (3:5) points, which corresponded to optimal efficiency of short-term memory.

Table 5. The method «Memory for Numbers»

| Criterion | Group 1 ($n_1=26$) | Group 2 ($n_2=26$) | p (Mann-Whitney's criterion) |
|-------------------------------|----------------------|----------------------|------------------------------|
| The number of correct answers | 7.42 ± 1.77 | 8.35 ± 0.31 | $p=0.046^*$ |
| The average score | 4 ± 0.75 | 4.38 ± 0.7 | $p=0.061$ |

*=statistically significant intergroup differences.

However, it should be noted that seven patients with JME (26.9%) demonstrated a very high level of short-term memory, correctly indicating nine or ten num-

bers, and scoring a maximal five points. At the same time, the seven other patients (26.9%) had average results and decreased efficiency of mnestic processes (three points, i.e. five or six correctly marked numbers). No results of two points (one of four numbers), which correspond to low indicators of short-term memory, were recorded.

The average number of correct answers in Group Two was statistically significantly higher and amounted to 8.35 ± 0.31 (7:10), $p=0.046$; the average score in the group 2 was 4.5 ± 0.14 (4:5) points, $p=0.061$.

Modified Schulte Tables as adapted by K.K. Platonov (See Table 6)

We assessed the volume and stability of attention using this “Red-Black Table” technique. The differences in the middle level of attention in Groups One and Two were statistically insignificant ($p>0.05$).

Table 6. The method «Modified Schulte Tables» in adaptation of K.K. Platonov

| Criterion | Group 1 ($n_1=26$) | Group 2 ($n_2=26$) | p (Fisher's criterion) |
|-----------------------|----------------------|----------------------|------------------------|
| 1 (low level) | 7 (26.9%) | 4 (15.4%) | $p=0.5303$ |
| 2 (below the average) | 7 (26.9%) | 6 (23%) | $p=0.5344$ |
| 3 (average level) | 10 (38.5%) | 10 (38.5%) | $p=0.5403$ |
| 4 (above average) | 2 (7.7%) | 4 (15.4%) | $p=0.3498$ |
| 5 (high level) | 0 (0%) | 2 (7.7%) | $p=0.5172$ |

Krepelin's Tables (See Table 7)

Evaluation of thinking was carried out with the help of *Krepelin's Tables*; we assessed mental efficiency and fatigability, as well as stability and switching of attention. The average coefficient of mental efficiency is normally from 0.85 to 1.15. Among the patients with JME, it was 1.08 ± 0.064 (0.9:1.1); in the control group, it was 1.04 ± 0.021 (1.01:1.14), which corresponds to the optimal level of operability, $p=0.129$.

Table 7. The method «Krepelin's Tables»

| Criterion | Group 1 ($n_1=26$) | Group 2 ($n_2=26$) | p (Mann-Whitney's criterion) |
|---|----------------------|----------------------|------------------------------|
| The average coefficient of mental efficiency | 1.06 ± 0.064 | 1.06 ± 0.021 | $p=0.129$ |
| The occurrence's frequency of operability's uneven graphs | 14 (53.85%) | 6 (23%) | $p=0.024^*$ |

*=statistically significant intergroup differences

In 7.7% of cases (two patients, native siblings with JME), a decreased coefficient of mental capacity of 0.8 and 0.81 was shown, which indicated the depletion of thinking and the presence of fatigability, and can be caused by patients' similar endophenotypes. A high coefficient was recorded in six patients (23%).

It is also worth noting that, while showing optimal levels of mental activity, 14 patients (53.85%) had uneven graphs (curve) of operability (Figure 1), which indicates emotional stress; this is typical for patients with JME due to their increased level of anxiety. By contrast, only six cases (23%) of uneven graphs were noted among the individuals in the control group (Figure 2), $p=0.024$.

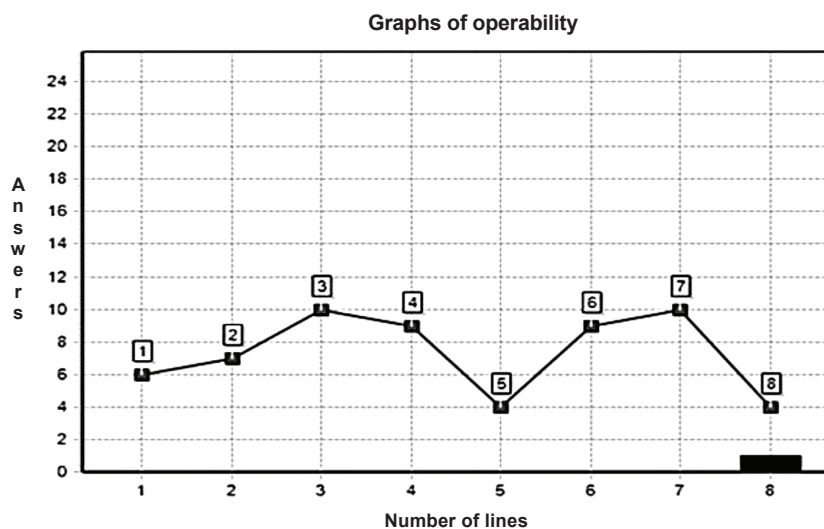


Figure 1. Uneven graphs of operability (patients — Group One)

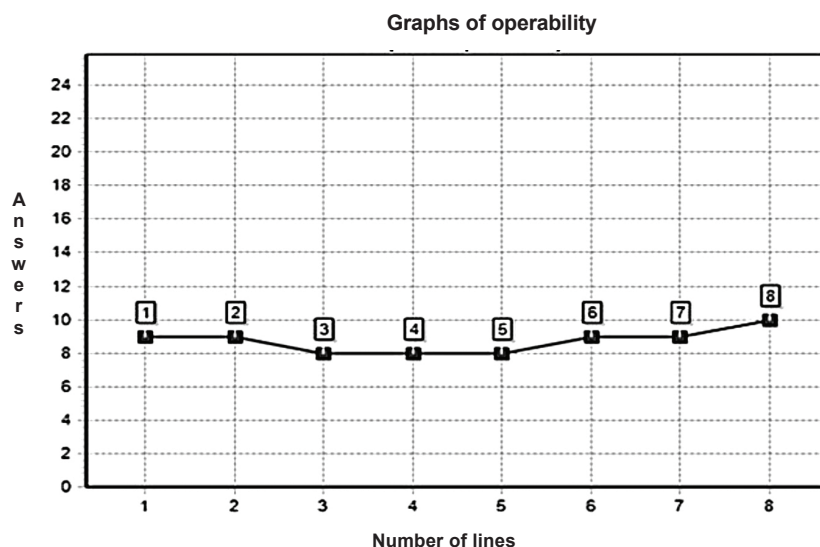


Figure 2. Even graphs of operability (controls — Group Two)

Discussion

With balanced anti-epileptic therapy and the absence of AEDs' ASEs, the stigmatization of JME patients as patients with cognitive impairment does not be assumed to be true. Under modern conditions, it is necessary to revise the common attitude toward such patients in society. JME is not a reason for limiting these people from enrolling in higher education institutions, or from being hired for a job that requires a high intellectual level.

Our study showed that while there are statistically significant differences in short-term memory and mental performance in JME patients compared with healthy young adults, the main indicators of cognitive function among JME patients without AEDs' ASEs, in general, correspond to the norm.

At the same time, the incidence of depressive symptoms on the CAS in JME patients was statistically significantly higher than among people without epilepsy. The results allow us to take a new look at the management plan for patients with JME since the characteristics of their reactions generally were typical of other clinical forms of epilepsy.

Already in the 1930s, L.S. Vygotsky formulated the principle of the dynamic organization of psychological syndromes (Zinchenko & Pervichko, 2012), and therefore their multifactor development (Zeigarnik & Bratus, 1980). Following this theory, A.R. Luria and his followers formulated general methodological requirements for organizing the study of the psyche. Psychological syndromes are self-developing systems, dynamic structures possessing the qualities of self-regulation, self-organization, and self-determination. That was his main postulate. Subsequently, Zeigarnik's scientific school noted the multifactoriality of personality traits in patients with epilepsy. They concluded that the properties of the patient's character are formed *in vivo*, both in the norm and in pathology. (Zeigarnik, 1986).

Unfortunately, most practitioners only pay attention to the treatment of seizures in JME, while non-paroxysmal disorders, which are an integral part of this disease, remain insufficiently studied; thus patients do not receive adequate psychotherapeutic help. Behavioral, neuropsychological, and social problems often exceed the negative consequences of the seizures themselves. So dealing with the mental health problem in epilepsy is an important part of the strategy for patients' long-term care. Treatment of JME should aim to carry out disease-modifying psychotherapy or psycho-correction. Consequently, it requires an integrated approach and management of patients together with a psychotherapist.

Conclusion

Our findings highlight the etiological heterogeneity of cognitive disorders in JME (Shnayder, 2016).

The mental health problem in epilepsy is the important aspect of the strategy for patients' long-term care. The aim of the treatment of JME is to carry out a disease-modifying psychotherapy or psycho-correction. Consequently, it requires an integrated approach and management of patients together with a psychotherapist.

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References

- Avakyan, G.N., Blinov, D.V., Lebedeva, A.V., Burd, S.G., & Avakyan, G.G. (2017). ILAE classification of epilepsies: the 2017 revision and update. *Epilepsy and Paroxysmal Conditions*, 9(1), 6–25 [article in Russian] <https://doi.org/10.17749/2077-8333.2017.9.1.006-025>
- Braithwaite, V.A. (1987). The Scale of Emotional Arousability: bridging the gap between the neuroticism construct and its measurement. *Psychol. Med.*, 17(1), 217–25. <https://doi.org/10.1017/S0033291700013106>
- Carvalho, K.C., Uchida, C.G., Guaranha, M.S., Guilhoto, L.M., Wolf, P., & Yacubian, E.M. (2016). Cognitive performance in juvenile myoclonic epilepsy patients with specific endophenotypes. *Seizure*, 40, 33–41. <https://doi.org/10.1016/j.seizure.2016.06.002>
- Chachua, T., Goletiani, C., Maglakelidze, G., Sidyelyeva, G., Daniel, M., & Morris, E., et al. (2014). Sex-specific behavioral traits in the Brd2 mouse model of juvenile myoclonic epilepsy. *Genes Brain Behav.*, 13(7), 702–12. <https://doi.org/10.1111/gbb.12160>
- Da Silva Sousa, P., Lin, K., Garzon, E., Sakamoto, A., & Yacubian, E.M. (2005). Self-perception of factors that precipitate or inhibit seizures in juvenile myoclonic epilepsy. *Seizure*, 14(5), 340–6. <https://doi.org/10.1016/j.seizure.2005.04.007>
- De Araújo Filho, G.M., Lin, K., Lin, J., Peruchi, M.M., Caboclo, L.O., Guaranha, M.S., et al. (2009). Are personality traits of juvenile myoclonic epilepsy related to frontal lobe dysfunctions? A proton MRS study. *Epilepsia*, 50(5), 1201–9. <https://doi.org/10.1111/j.1528-1167.2009.02021.x>
- Hamed, S.A. (2009). The aspects and mechanisms of cognitive alterations in epilepsy: the role of antiepileptic medications. *CNS Neurosci Ther.*, 15(2), 134–56. <https://doi.org/10.1111/j.1755-5949.2008.00062.x>
- Holmes, G.L. & Lenck-Santini, P.P. (2006). Role of interictal epileptiform abnormalities in cognitive impairment. *Epilepsy Behav.*, 8(3), 504–15. <https://doi.org/10.1016/j.yebeh.2005.11.014>
- Iqbal, N., Caswell, H.L., Hare, D.J., Pilkington, O., Mercer, S., & Duncan, S. (2009). Neuropsychological profiles of patients with juvenile myoclonic epilepsy and their siblings: a preliminary controlled experimental video-EEG case series. *Epilepsy Behav.*, 14(3), 516–21. <https://doi.org/10.1016/j.yebeh.2008.12.025>
- Janz, D. (1989). Juvenile myoclonic epilepsy. Epilepsy with impulsive petit mal. *Cleve Clin J Med*, 56 Suppl Pt 1, S23–33; discussion S40–2.
- Kim, J.H., Lee, J.K., Koh, S.B., Lee, S.A., Lee, J.M., Kim, S.I., & Kang, J.K. (2007). Regional grey matter abnormalities in juvenile myoclonic epilepsy: a voxel-based morphometry study. *Neuroimage*, 37(4), 1132–7. <https://doi.org/10.1016/j.neuroimage.2007.06.025>
- Kim, S.H., Lim, S.C., Kim, W., Kwon, O.H., Jeon, S., Lee, J.M., & Shon, Y.M. (2015). Extrafrontal structural changes in juvenile myoclonic epilepsy: a topographic analysis of combined structural and microstructural brain imaging. *Seizure*, 30, 124–31. <https://doi.org/10.1016/j.seizure.2015.06.009>

- Krauss, G.L. (2011). Cognitive Activation of "Hyperexcitable Cortex" in JME: Can It Trigger Seizures? *Epilepsy Curr.*, 11(6), 184–5. <https://doi.org/10.5698/1535-7511-11.6.184>
- Lee, J.M., Kim, S.Y., Hwang, Y.H., Lee, H.W., Suh, C.K., & Park, S.P. (2008). Longitudinal Assessment of Cognitive Function in Patients with Juvenile Myoclonic Epilepsy. *Journal Korean Epilepsy Soc.*, 12(2), 85–91.
- Lin, J.J., Dabbs, K., Riley, J.D., Jones, J.E., Jackson, D.C., Hsu, D.A., et al. (2014). Neurodevelopment in new-onset juvenile myoclonic epilepsy over the first 2 years. *Ann Neurol.*, 76(5), 660–8. <https://doi.org/10.1002/ana.24240>
- Mantrova, I.N. (2010). *Metodicheskoye rukovodstvo po psikhofiziologicheskoy diagnostike* (Methodical guidance on psycho-physiological diagnostics), 56, 58, 62, 78–79, 123–127. [Guidance in Russian]. Moscow.
- Martínez-Domínguez, S., Labrada-Abella, J., Pedrós-Roselló, A., López-Gomáriz, E., & Tenías-Burillo, J.M. (2013). [Mental illness, personality traits and quality of life in epilepsy: control study of patients with juvenile myoclonic epilepsy and other epilepsies]. *Rev. Neurol.*, 56(12), 608–14. [Article in Spanish].
- Moskaleva, P., Shilkina, O., Artyukhov, I., Strotskaya, I., Dmitrenko, D., & Shnayder, N. (2017). Nonpsychotic psychiatric disorders in juvenile myoclonic epilepsy. *International Journal of Biomedicine*, 7(2), 85–95. [https://doi.org/10.21103/Article7\(2\)_RA1](https://doi.org/10.21103/Article7(2)_RA1)
- Motamedi, M., Nasergivehch, S., Karamghadiri, N., & Noroozian, M. (2014). Juvenile Myoclonic Epilepsy (JME): Neuropsychological Profile and Related Factors with Cognitive Dysfunction. *Iran Journal Psychiatry*, 9(1), 14–9.
- Noebels, J.L., Avoli, M., Rogawski, M.A., Olsen, R.W., & Delgado-Escueta, A.V. (2012). The next decade of research in the basic mechanisms of the epilepsies. In: Noebels, J.L., Avoli, M., Rogawski, M.A., Olsen, R.W., & Delgado-Escueta, A.V., editors. *Jasper's basic mechanisms of the epilepsies*. Oxford University Press, 3–11. <https://doi.org/10.1093/med/9780199746545.003.0001>
- O'Muircheartaigh, J., Vollmar, C., Barker, G. J., Kumari, V., Symms, M. R., & Thompson, P., et al. (2012). Abnormal thalamocortical structural and functional connectivity in juvenile myoclonic epilepsy. *Brain*, 135 (Pt 12), 3635–44. <https://doi.org/10.1093/brain/aws296>
- Proposal for revised classification of epilepsies and epileptic syndromes. Commission on Classification and Terminology of the International League Against Epilepsy. (1989). *Epilepsia*, 30(4), 389–99.
- Shilkina, O., Artyukhov, I., Moskaleva, P., Strotskaya, I., & Shnayder, N. (2017). Cognitive disorders in juvenile myoclonic epilepsy. *International Journal of Biomedicine*, 7(1), 9–14. [https://doi.org/10.21103/Article7\(1\)_RA1](https://doi.org/10.21103/Article7(1)_RA1)
- Shnayder, N.A., Shilkina, O.S., Petrov, K.V., Chernykh, I.A., & Diuzhakova, A.V. (2016). Clinical and genetic heterogeneity of juvenile myoclonic epilepsy. *Epilepsy and Paroxysmal Conditions*, 8(2), 20–36. [Article in Russian].
- Somayajula, S., Vooturi, S., & Jayalakshmi, S. (2015). Psychiatric disorders among 165 patients with juvenile myoclonic epilepsy in India and association with clinical and sociodemographic variables. *Epilepsy Behav.*, 53, 37–42. <https://doi.org/10.1016/j.yebeh.2015.09.024>
- Tae, W.S., Kim, S.H., Joo, E.Y., Han, S.J., Kim, I.Y., Kim, S.I., et al. (2008). Cortical thickness abnormality in juvenile myoclonic epilepsy. *Journal Neurol.*, 255(4), 561–6. <https://doi.org/10.1007/s00415-008-0745-6>
- Thomas, R.H., Walsh, J., Church, C., Sills, G.J., Marson, A.G., Baker, G.A., & Rees, M.I. (2014). A comprehensive neuropsychological description of cognition in drug-refractory juvenile myoclonic epilepsy. *Epilepsy Behav.*, 36, 124–9. <https://doi.org/10.1016/j.yebeh.2014.04.027>
- Valente, K.D., Rzezak, P., Moschetta, S.P., de Vincentiis, S., Coan, A.C., & Guerreiro, C.A. (2016). Delineating behavioral and cognitive phenotypes in juvenile myoclonic epilepsy:

- Are we missing the forest for the trees? *Epilepsy Behav.*, 54, 95–9. <https://doi.org/10.1016/j.yebeh.2015.10.022>
- Wandschneider, B., Thompson, P. J., Vollmar, C., & Koepp, M. J. (2012). Frontal lobe function and structure in juvenile myoclonic epilepsy: a comprehensive review of neuropsychological and imaging data. *Epilepsia*, 53(12), 2091–8. <https://doi.org/10.1111/epi.12003>
- Woermann, F.G., Free, S.L., Koepp, M.J., Sisodiya, S.M., & Duncan, J.S. (1999). Abnormal cerebral structure in juvenile myoclonic epilepsy demonstrated with voxel-based analysis of MRI. *Brain*, 122 (Pt 11), 2101–8. <https://doi.org/10.1093/brain/122.11.2101>
- Zeigarnik, B.V. & Bratus, B.S. (1980). *Ocherki po psikhologii anomalnogo razvitiya lichnosti* (Essays on the psychology of abnormal personality development). Publishing house of the MSU. [Monograph in Russian].
- Zeigarnik, B.V. (1986). (Pathopsychology). Publishing house of the MSU. [Book in Russian].
- Zinchenko, Yu.P. & Pervichko, E.I. (2012). *Postneklassicheskaya metodologiya v klinicheskoy psikhologii: nauchnaya shkola L. S. Vygotskogo A. R. Luriya* (Postnonclassical methodology in clinical psychology: LS Vygotsky's science school AR Luria). *National Psychological Journal*, (2), 32–45. [Article in Russian].

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A comparative clinical study of the effectiveness of computer cognitive training in patients with post-stroke cognitive impairments without dementia

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Introduction. A complex of computer neuropsychological programs was developed at KrasSMU, which in several pilot studies has shown effectiveness in cognitive training for patients with vascular cognitive impairments (VCI).

Objectives. The aim of the present study was to compare changes in cognitive status in those patients with post-stroke VCI who worked with neuropsychological computer programs, with those changes experienced by a group of similar patients who played entertaining computer games.

Methods. Patients in the early recovery period after a hemispheric stroke with VCI without dementia (N=26, age 40-67) were randomized into three groups. All patients underwent conventional treatment in a rehabilitation hospital. Patients in the *intervention* group had ten daily 40-minute training sessions with neuropsychological computer programs. Participants in the *active control* group played entertaining computer games, and kept an identical regimen. Patients in the *passive control* group received only conventional treatment. Cognitive, neurological, affective, and functional states were assessed before and after the training periods.

Results. Significant improvements were observed in the *intervention* group as compared to the *passive control* group on the Montreal Cognitive Assessment (MoCA, $p=0.0004$), the Clock Drawing Test (CDT, $p=0.001$), and the Frontal Assessment Battery (FAB, $p=0.01$). Differences between the groups of patients playing neuropsychological and entertaining games were statistically insignificant (Mann-Whitney U test, $p>0.05$), although in the *intervention* group there were improvements on every cognitive scale after the training period (Wilcoxon matched pairs test, $p<0.05$), while in the *active control* group, enhancements were evident only on some cognitive scales ($p<0.05$). No changes were observed in the *passive control* group.

Conclusions. Neuropsychological computer programs enhance cognitive status in patients with post-stroke VCI. It is possible that entertaining computer games can also improve cognitive functions. In all groups, no changes of functional state were observed before and after the training period.

Keywords: Cognitive training, computer cognitive training, stroke, cognitive rehabilitation, neuropsychological computer programs, vascular cognitive impairments, post-stroke cognitive impairments.

Introduction

Stroke is an important medical and social problem. Every year, approximately six million people suffer from stroke worldwide, of which 450,000 are located in Russia (Stakhovskaya, Klochikhina, Bogatyreva, & Kovalenko, 2013; Klochikhina & Stakhovskaya, 2014; Feigin, Lawes, Bennett, Barker-Collo, & Parag, 2009; Feigin et al., 2014). According to different authors, cognitive dysfunction after stroke is observed in 20 to 90% of all cases (Gottesman & Hillis, 2010); Pendlebury & Rothwell, 2009). Over the last few years, more scientists have begun studying this problem, but in clinical practice, addressing post-stroke cognitive impairments has taken a back seat to dealing with motor dysfunctions (Lees, Fearon, Harrison, Broomfield, & Quinn, 2012). Cognitive impairments decrease success in rehabilitation outcomes and disease prognosis; they cause an inability to work and to take care of one's self (Narasimhalu et al. 2011; Cumming, Brodtmann, Darby, & Bernhardt, 2014).

There are two common therapeutic methods in use: drug treatment and cognitive rehabilitation. Recently, an increasingly promising evidence base for cognitive rehabilitation after acute brain injuries has emerged.

Cognitive rehabilitation is the best available form of treatment for people who exhibit neurocognitive impairment and functional limitations after a traumatic brain injury or stroke. At present, cognitive rehabilitation is recommended as standard practice for left visual neglect, aphasia, and apraxia in patients after stroke (Cicerone et al., 2011). Also, Xu, Ren, Prakash, Vijayadas, & Kumar (2013) suggest that there is sufficient evidence to support the conclusion that cognitive therapies are effective treatments for attention-related and visual perceptual problems in post-stroke patients. There is little evidence to suggest that executive function interventions have the potential to improve aspects of executive functioning in adults with stroke (Poulin, Korner-Bitensky, & Dawson, 2013). Evaluating the efficacy of different cognitive rehabilitation methods and approaches is very difficult due to differences in patients' ages, brain injuries, and cognitive dysfunctions, as well as the difficulties of conducting randomized clinical trials in this field (Hénon et al., 2001).

Computer cognitive training is one of the directions cognitive rehabilitation has taken. Computer technologies for cognitive training have been increasingly used in clinical and scientific practice since the 1980s. Since that time, computer programs have been created for the selective training of attention, memory, visual perception, planning, and problem-solving. Each of these programs contains tasks that concentrate on one cognitive domain. Nevertheless, the majority of tasks inevitably affects all spheres of mental activity simultaneously (Grigoreva, Kovyazina, & Thostov, 2012).

One of the advantages of computer training programs is that they allow individual patient rehabilitation at home, either independently or with caregiver assistance. Secondly, there is the potential for continuous training in several cognitive domains, for automatic level control, and for scoring. When a patient is motivated by a game, he/she is more involved in the process, which ensures his/her compliance with the rehabilitation program. It should be noted that these advantages are in addition to the lower cost of this approach.

Although the effectiveness of computer-based cognitive rehabilitation has still not been thoroughly studied, some brain game programs have shown effectiveness, according to separate studies in different groups of healthy participants and patients (Sternberg et al., 2013; Hardy, Drescher, Sarkar, Kellett, & Scanlon, 2011; Finn & McDonald, 2011; Karen et al., 2013). Up until now, the generalization of these improvements from the games to activities of the patient's daily life has not been proven (Van de Ven, Murre, Veltman, & Schmand, 2016; Zucchella, Capone et al., 2014).

The Department of Neurology and Medical Rehabilitation of the Krasnoyarsk State Medical University was the first to develop a Russian computer complex of neuropsychological programs for cognitive rehabilitation. This complex has proven effective in the correction of post-stroke cognitive impairments in acute and early recovery periods in some previous studies (Prokopenko et al., 2013; Prokopenko et al., 2012). The aim of the present study is to reveal the benefits of special computer-based cognitive rehabilitation. First, a neuropsychological assessment of the post-stroke patients in the *intervention* group and control groups before and after the rehabilitation course was conducted. Then, the results of cognitive training with the authors' computer programs for post-stroke patients were compared with the cognitive status in a similar group of patients who played entertaining games, and in a control group, where participants received only conventional treatment.

Materials and Methods

Participants

This study was conducted in the Siberian Clinical Center of the Federal Medical and Biological Agency of Russia in Krasnoyarsk city. Twenty-five participants who received conventional treatment in the Neurorehabilitation Center were randomized into three groups. The intervention group consisted of ten individuals (six males and four females) median age 59.5 [57; 60]. Patients in the intervention group were treated using the authors' computer neuropsychological programs. Patients in the active control group played entertaining computer games (six participants: four males and two females, median age 58 [49; 61]). Nine individuals from the passive control group received physiotherapy only (eight males and one female, median age 62.55 [61; 65]). A simple randomization using simple random tables was performed.

Patients aged 40–67, with vascular cognitive impairments without dementia in early recovery periods of ischemic hemispheric stroke (up to six months after

stroke), were included. According to ICD-10, their clinical diagnoses were coded I63.3, I63.4, and I63.5.

Exclusion criteria were: decompensation of somatic and neurologic diseases; epilepsy; severe cognitive dysfunction; severe and moderate aphasia; and severe decrease of vision or hearing.

Diagnostic methods

In the first days after admission, the patients were examined by a neurologist in order to provide a clinical diagnosis; by a physician in order to assess concomitant somatic pathology; and by a speech therapist in order to exclude moderate and severe aphasia. Clinical diagnosis of hemispheric stroke was confirmed using neuroimaging (computer-aided tomography or magnetic resonance imaging). Electroencephalography was provided to exclude seizure patterns.

The National Institutes of Health Stroke Scale (NIHSS) was added to the neurological examination. Patients scored from one to thirteen points on the NIHSS. The neuropsychological examination consisted of a number of valid cognitive scales: the Mini Mental State Examination (MMSE), Frontal Assessment Battery (FAB), Montreal Cognitive Assessment (MoCA), Clock Drawing Test (CDT), and Shulte's test. Included were patients who scored 20–28 points on the MMSE, 5–16 points on the FAB, 17–24 on the MoCA, and 35 to 150 seconds on Shulte's test. Additional assessment of visual and spatial gnosis was made through the Clock Drawing Test. The patients scored from five to ten points.

Each patient's functional state was estimated using a modified version of the Instrumental Activity of Daily Living Scale. The Hospital Anxiety and Depression Scale (HADS) was used to evaluate affective status. Patients were considered to have subclinical anxiety or depression if they scored seven points or more. If they scored eleven points or more, they were considered as having a clinical level of depression and/or anxiety. Study participants scored 0–18 points on the anxiety subscale, and 1–13 points on the depression subscale.

An evaluation of the patients' neurological, cognitive, affective, and functional states using these scales was performed before and after the observational period (the first examination during the first/second days on admission, and the second examination on the day after the last day of training). After the treatment course, there was also an evaluation of the subjective global impressions of both the patients and clinicians, using the CGIS (Clinician's Global Impression Scale) and PGIS (Patient's Global Impression Scale).

The study protocol was approved by the Local Ethics Committee of Krasnoyarsk State Medical University. All participants signed informed consent forms.

Treatment methods

Participants in all groups had a complex course of physiotherapy and drug treatment in the Neurorehabilitation Center. Then, patients in the *intervention* group were trained using the original complex of neuropsychological programs developed at Krasnoyarsk State Medical University (KrasSMU). They had ten daily training

sessions of 30–40 minutes' duration. During the first few sessions, an instructor demonstrated how to use a computer and explained the tasks and rules for each training program. Later, participants could train independently, but they remained under the supervision of the instructor. Levels of complexity could be increased depending on patients' abilities.

Participants in the *active control* group, apart from receiving physiotherapy and drug treatment, played entertaining computer games according to an identical regimen. Entertaining arcade and arkanoid games were used. These games are quite simple, but they simultaneously stimulate attention and increase reaction time.

Patients in the *passive control* group had physiotherapy and drug treatment without any cognitive rehabilitation during a ten-day observation period.

In all groups, drug therapy included antihypertensive, disaggregant, anticoagulant, and hypolipidemic agents for secondary stroke prevention. Also, all participants, independent of the group in which they were included, were prescribed one of the following neurometabolic or antioxidant drugs: choline alfoscerate, ethylmethylhydroxypyridine succinate, pentoxiphyllinum, magnesii sulfas, cytoflavin, or piracetam. Some patients received antispastic, hypoglycemic, and other medications. Hence, every participant received an individual complex drug therapy.

Computer complex of neuropsychological correction

The KrasSMU complex of neuropsychological programs for cognitive correction is based on the classical neuropsychological approach of Alexander Luria. It consists of various computer program modules that are focused on training different cognitive functions such as memory, attention, counting etc. The software is available on CD, and patients also can avail themselves of rehabilitation on-line. Some of the neuropsychological programs used are described below.

Training of visual and spatial gnosis using the computer-based "Figure-Background" test. A visual and spatial training program was developed as a computer-based version of the "Figure-Background" test, with a feedback mode and a gradually decreasing intensity of background noise. A picture with a decreasing intensity of background noise is presented on a computer screen. There are several different pictures without a background in the top part of the screen. One of these pictures corresponds to the image presented in the task with the noise; other pictures represent various images of objects and letters.

During the training session, a patient is asked to identify the image in the picture with noise, and click on the corresponding image in the top part of the screen. There is then a gradual reduction of noise intensity, up to its complete disappearance. The patient needs to recognize the image as soon as possible. The speed of recognition is assessed on a scale of 0–10. The accuracy of performance is marked by applause or a signal "incorrect" (Figure 1).

Visual and spatial memory training using pattern position-test. The training of visual and spatial memory is aimed at getting the patient to remember the position of images, with a gradually increasing number of objects (images of books, berries, etc.) in cells of a square. After presentation of various pictures arranged in cells, the pic-

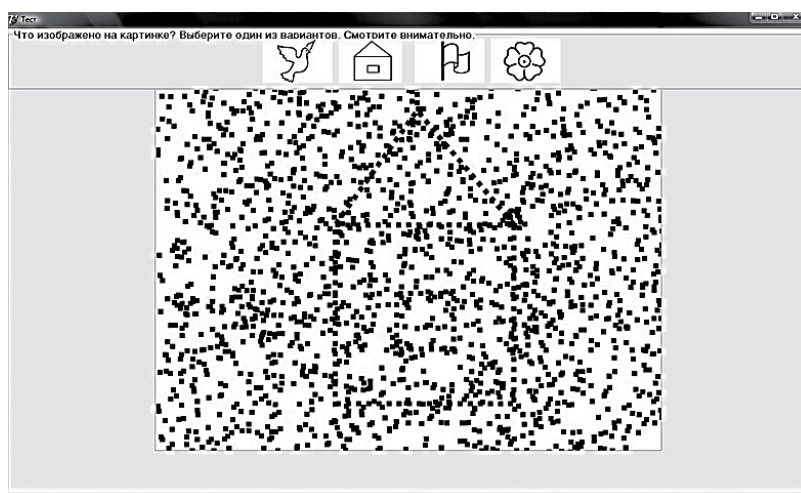


Figure 1. Computer program for training visual and spatial gnosis using background-noised images

tures are hidden, and then the patient is asked to click on the cells where pictures he or she remembers were located. After a correct performance, the number of objects for memorization is increased by one. Training continues until the patient makes two mistakes, and is followed by the appearance of information about the speed and correctness of answers, and the highest volume of information memorized on a screen (Figure 2). Then, the participant goes up to the next level, where the quantity of cells increases.

The neuropsychological program complex for cognitive rehabilitation also included a program for training visual memory, using tasks for the memorization of sequences of nonverbal patterns; a program for training spatial gnosis arranging clock hands; a program for impetuosity correction; a program for speed counting; and a program for attention training using a computer-based Shulte's tables test.

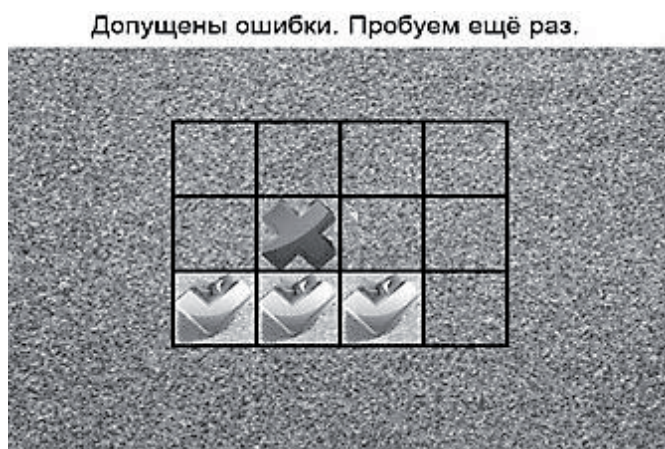


Figure 2. The program for training visual and spatial memory. Level 1

Statistical analysis

Data analysis was conducted using a software application package called “Statistica 7.” Due to the small sample sizes, parametric statistical methods could not be used. All data were described as Median and the first and the third quantiles (Me [Q1;Q3]), and the data were analyzed using nonparametric statistics. The Kruskal-Wallis test ($p>0.05$) was conducted to compare groups before the intervention. The Wilcoxon Matched Pairs Test ($p<0.05$) was used to assess changes in every group before and after the treatment. The Mann-Whitney U Test ($p<0.05$) was performed to determine the statistical significance of changes between groups after the course of treatment.

Results

Before the intervention, all groups were equivalent. There were no statistical differences between the *intervention* group and both of the control groups on neurological, cognitive, affective, and functional scales (Kruskal-Wallis, $p>0.05$). After the training period, in the *intervention* group, statistically significant improvements on every cognitive scale were found: MoCA (+27%), FAB (+18%), MMSE (+13%), clock drawing test (+27%), and Shulte’s tables (–21%) (Table 1). In the *active control* group, after the patients played entertaining games, no relevant changes on the MMSE and CDT were observed (Wilcoxon Matched Pairs Test, $p>0.05$). However, relevant improvements on the FAB (+23%), MoCA (+16%), and Shulte’s tables (–32%) were revealed (Table 2). No statistically significant changes on cognitive scales after observation period were found in the *passive control* group (Table 3).

Table 1. Differences in cognitive parameters in the intervention group (Me [Q1; Q3])

| | MMSE | FAB | MoCA | Clock drawing test | Shulte’s test | HADS A | HADS D | NIHSS | IADL |
|-------------------------------------|-----------------|-----------------|-----------------|--------------------------|------------------|--------------|--------------|---------------|-----------------|
| Intervention group before treatment | 25 [20;28] | 13.6 [12;16] | 20.6 [18;24] | 7.4 [5;9] | 76.5 [52;103] | 3.2 [1;5] | 2.3 [1;4] | 4.6 [1;10] | 16.3 [10;18] |
| Intervention group after treatment | 28.2 [26;30] | 16.1 [12;18] | 26.1 [24;28] | 9.4 [8;10] | 60.2 [48;81] | 2.5 [0;4] | 2.2 [1;4] | 3.8 [1;9] | 17.1 [10;20] |
| Changes (points) | +3.2 | +2.5 | +5.5 | +2 | –16.3 | –0.7 | –0.1 | –0.8 | +0.8 |
| Changes (percent) | +13% | +18% | +27% | +27% | –21% | –22% | –4% | –17% | +5% |
| Wilcoxon Matched Pairs Test | 0.004* | 0.003* | 0.003* | 0.004* | 0.003* | 0.013* | 1.000 | 0.013* | 0.074 |

Note. * = statistically significant, Wilcoxon Matched Pairs Test, $p<0.05$

Table 2. Differences in cognitive parameters in the active control group (Me [Q1; Q3])

| | MMSE | FAB | MoCA | Clock drawing test | Shulte's test | HADS A | HADS D | NIHSS | IADL |
|---------------------------------------|-----------------|-----------------|-----------------|--------------------------|------------------|---------------|--------------|--------------|-----------------|
| Active control group before treatment | 26.4 [24;27] | 12.1 [6;17] | 21 [19;24] | 7.7 [5;9] | 79.3 [35;150] | 7.3 [2;18] | 6 [2;8] | 4.4 [3;7] | 19.1 [15;22] |
| Active control group after treatment | 27.6 [25;30] | 14.9 [12;18] | 24.4 [23;27] | 8.3 [5;10] | 53.9 [32;75] | 4.1 [3;10] | 4.5 [1;6] | 4.4 [3;7] | 19.4 [14;22] |
| Changes (points) | +1.1 | +2.7 | +3.4 | +0.6 | -25.4 | -3.2 | -2 | 0 | +0.3 |
| Changes (percent) | +5% | +23% | +16% | +8% | -32% | -44% | -25% | 0 | +2% |
| Wilcoxon Matched Pairs Test | 0.138 | 0.018* | 0.035* | 0.612 | 0.028* | 0.093 | 0.043* | 1.000 | 1.000 |

Note. * = statistically significant, Wilcoxon Matched Pairs Test, $p < 0.05$.

Table 3. Differences in cognitive parameters in the passive control group (Me [Q1; Q3])

| | MMSE | FAB | MoCA | Clock drawing test | Shulte's test | HADS A | HADS D | NIHSS | IADL |
|--|-----------------|----------------|-----------------|--------------------------|------------------|---------------|--------------|--------------|-----------------|
| Passive control group before treatment | 25.8 [21;28] | 11.9 [5;16] | 20.2 [15;24] | 8 [5;10] | 73.7 [48;101] | 3.7 [0;10] | 3.3 [1;8] | 4.4 [1;7] | 16.8 [10;24] |
| Passive control group after treatment | 26.6 [22;30] | 13.8 [9;17] | 21.3 [14;27] | 8.1 [7;10] | 80.9 [44;141] | 3.6 [0;9] | 3 [1;7] | 3.7 [1;6] | 17.1 [10;24] |
| Changes (points) | +0.8 | +1.9 | +1.1 | +0.1 | +7.2 | -0.1 | -0.3 | -0.7 | +0.3 |
| Changes (percent) | +3% | +16% | +5% | +1% | +10% | -3% | -9% | -16% | +2% |
| Wilcoxon Matched Pairs Test | 0.176 | 0.091 | 0.214 | 1.000 | 0.813 | 0.500 | 0.401 | 0.028* | 0.480 |

Note. * = statistically significant, Wilcoxon Matched Pairs Test, $p < 0.05$.

Paired comparisons of the groups after their treatment courses showed statistically relevant differences between the *intervention* group and the *passive control* group on a few cognitive scales: FAB ($p=0.01$), MoCA ($p=0.0004$), and CDT ($p=0.001$). No significant changes were found between the group where patients played entertaining games and the group where patients did not receive cognitive training. Also, after the training period was concluded, no statistically significant changes between the *intervention* group and the *active control* group were observed (Figure 3).

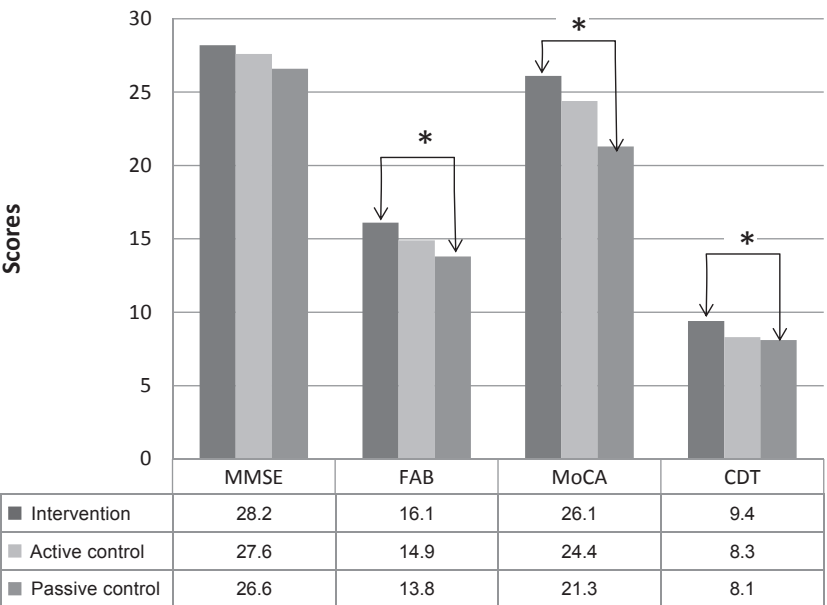


Figure 3. Comparison of cognitive scale results between all groups after the training period

Note. Changes are significant on the FAB, MoCA, CDT, between the intervention and the passive control group (Median, *=statistically significant, Mann-Whitney U Test, $p<0.05$).

No relevant changes on the anxiety subscale were found between groups after the training period. After treatment, there was no statistical difference in the neurological state between groups, according to NIHSS.

Changes on the cognitive scales did not influence patients' functional state. The IADL score increased insignificantly in every study group before and after the training, and the difference between groups was not relevant (Mann-Whitney U Test, $p>0.05$).

Neither patients nor clinicians noticed changes in the *passive control* group, according to the Global Impression scale. There were improvements on the clinicians' global impression scale in both the groups where participants received cognitive rehabilitation, as compared with the *passive control* group. However, participants who played entertaining games got more satisfaction.

Discussion

Computer cognitive training using the authors' neuropsychological computer programs once again has shown effectiveness in the correction of cognitive impairments in the early recovery period of hemispheric ischemic stroke, compared with a similar group where patients did not receive cognitive rehabilitation (Prokopenko et al, 2013; Prokopenko, et al., 2012). A few mechanisms can have an impact on cognitive improvements after cognitive computer training. The first is the activation of median deep subcortical brain structures, which are considered block one of the brain, according to Luria (1962). Nonspecific stimulation can improve involuntary memory, attention, and neurodynamical parameters. However, physiotherapy can also nonspecifically activate neurodynamic parameters.

At the same time, neuropsychological computer programs include tasks that are targeted toward training different cognitive domains, such as visual gnosis, visual spatial gnosis and memory, voluntary attention, and counting. Thus, they can also influence the blocks two and three of the brain, as identified by Luria (1962). To understand the physio-morphological changes at the base of clinical improvements, it is necessary to use additional para-clinical methods.

No statistically significant improvements were observed in the group where participants played entertaining games compared to the group where the cognitive training was not conducted. Although no relevant differences between the effectiveness of computer neuropsychological programs and entertaining computer games were found, this result indicates that it is possible to find statistically significant differences between the *intervention* group and the *active control* group if we expand the study groups. It has to be noted that using entertaining games activated patients' attention, sped up their reaction time, improved their visual and spatial orientation, and memory. It can be assumed that any nonspecific cognitive stimulation is effective for cognitive correction during the early recovery period of stroke. An estimation of the long-term effects, and a more detailed analysis of single cognitive domains after using different cognitive methods, are needed in the future studies.

Obviously, the participants who played entertaining games obtained more enjoyment from the treatment due to the more colorful and bright designs of these games. At the same time, the improvements of cognitive state in this group were insignificant compared to other groups. A possible explanation is that PGIS is a subjective scale. They enjoyed the game process; it was fun and fascinating, but not so effective objectively.

The complicated interaction between cognitive decline and depression is well known (Limampai, Wongsrithep, & Kuptniratsaikul, 2017; Hackett & Anderson, 2005). After stroke, approximately 30% of patients experience depression and 20% anxiety (Hackett, Yapa, Parag, & Anderson, 2005; Knapp et al., 2017). Individuals with post-stroke depression have a worse functional outcome, slower recovery, and increased mortality (Bartoli et al., 2013). It is also of interest whether anxiety and depression affect the effectiveness of computer cognitive training. In this study, participants differed widely in their emotional states, but it was impossible to analyze subgroups due to the small sample size. This can become the subject of a future investigation.

Improvements on cognitive scales did not influence the patients' functional states, as shown in most of the studies targeted towards the evaluation of cognitive training (Zucchella et al., 2014; Cicerone et al., 2011). This result can be explained by the short period of observation. Given the fact that all patients had physiotherapy and improved in neurological status, improvements in functional state were expected. It can be assumed that the changes in both cognitive and neurological states were not enough to influence daily living activities, and results should probably be estimated after a few sequence courses. Effectiveness can probably be increased after adapting the studies' regimen.

For future studies, it would be interesting to compare the effectiveness of the computer cognitive training with the conventional neuropsychological rehabilitation course that is usually performed by a neuropsychologist. An investigation of the neuropsychological syndromes and domains which can be restored using computer or conventional approaches, can improve routine clinical practice (Bogdanova, Yee, Ho, & Cicerone, 2016).

Conclusions

Thus we have determined that improvements in the cognitive state of patients with post-stroke cognitive impairments were more likely to occur in the group of the computer-based training with special neuropsychological programs, as compared to the conventional treatment.

We also found that the results which followed the stroke patients' playing of entertaining games were statistically insignificant, compared with those receiving only conventional treatment.

It still needs to be clarified as to whether there is a difference between the effectiveness of neuropsychological computer training and entertaining computer games. This question can probably be answered by studies which expand the size of the study groups, and which evaluate the long-term effects of the rehabilitation process.

Limitations

In this study there were several limitations: a small sample size, a short observation period, and a lack of follow-up examination.

References

- Bartoli, F., Lillia, N., Lax, A., Crocamo, C., Mantero, V., Carra, G. ..., & Clerici, M. (2013). Depression after stroke and risk of mortality: a systematic review and meta-analysis. *Stroke Res Treat*, 2013, 11 pages. <https://doi.org/10.1155/2013/862978>
- Bogdanova, Y., Yee, M.K., Ho, V., & Cicerone, K.D. (2016). Computerized Cognitive Rehabilitation of Attention and Executive Function in Acquired Brain Injury: A Systematic Review. *Journal Head Trauma Rehabil*, 31(6), 419–433. <https://doi.org/10.1097/HTR.0000000000000203>
- Cicerone, K.D., Langenbahn, D.M., Braden, C., Malec, J.F., Kalmar, K., Fraas, M., ... & Ashman, T. (2011). Evidence-based cognitive rehabilitation: Updated review of the literature from 2003 through 2008. *Archives of Physical Medicine and Rehabilitation*. <https://doi.org/10.1016/j.apmr.2010.11.015>

- Cumming, T.B., Brodtmann, A., Darby, D., & Bernhardt, J. (2014). The importance of cognition to quality of life after stroke. *Journal of Psychosomatic Research*, 77(5). <https://doi.org/10.1016/j.jpsychores.2014.08.009>
- Feigin, V.L., Forouzanfar, M.H., Krishnamurthi, R., Mensah, G.A., Connor, M., Bennett, D.A. ..., & Naghavi, M. (2014). Global and regional burden of stroke during 1990-2010: Findings from the Global Burden of Disease Study 2010. *The Lancet*, 383(9913), 245-255. [https://doi.org/10.1016/S0140-6736\(13\)61953-4](https://doi.org/10.1016/S0140-6736(13)61953-4)
- Feigin, V.L., Lawes, C.M., Bennett, D.A., Barker-Collo, S.L., & Parag, V. (2009). Worldwide stroke incidence and early case fatality reported in 56 population-based studies: a systematic review. *The Lancet Neurology*, 8(4), 355-369. [https://doi.org/10.1016/S1474-4422\(09\)70025-0](https://doi.org/10.1016/S1474-4422(09)70025-0)
- Finn, M. & McDonald, S. (2011). Computerised cognitive training for older persons with mild cognitive impairment: A pilot study using a randomised controlled trial design. *Brain Impairment*, 12(3), 187-199. <https://doi.org/10.1375/brim.12.3.187>
- Gottesman, R.F. & Hillis, A.E. (2010). Predictors and assessment of cognitive dysfunction resulting from ischaemic stroke, 9(9), 895-905. [https://doi.org/10.1016/S1474-4422\(10\)70164-2](https://doi.org/10.1016/S1474-4422(10)70164-2)
- Grigoreva, V., Kovyazina, M., & Thostov, As. (2012). *Cognitive rehabilitation patients with stroke and traumatic brain injury*. Nizhni Novgorod State Medical Academy Publishers.
- Hackett, M.L. & Anderson, C.S. (2005). Predictors of depression after stroke: A systematic review of observational studies. *Stroke*, 36(10), 2296-2301. <https://doi.org/10.1161/01.STR.0000183622.75135.a4>
- Hackett, M.L., Yapa, C., Parag, V., & Anderson, C.S. (2005). Frequency of depression after stroke: A systematic review of observational studies. *Stroke*, 36(6), 1330-1340. <https://doi.org/10.1161/01.STR.0000165928.19135.35>
- Hardy, J.L., Drescher, D., Sarkar, K., Kellett, G., & Scanlon, M. (2011). Enhancing visual attention and working memory with a web-based cognitive training program. *Mensa Research Journal*, 42(2), 13-20.
- Hénon, H., Durieu, I., Guerouaou, D., Lebert, F., Pasquier, F., & Leys, D. (2001). Poststroke dementia. Incidence and relationship to prestroke cognitive decline. <https://doi.org/10.1212/WNL.57.7.1216>
- Klochikhina, O.A. & Stakhovskaya, L.V. (2014). An analysis of epidemiological indices of stroke based on the data of a regional population register from 2009 to 2012. *Zhurnal Nevrologii I Psikhiatrii Imeni S.S. Korsakova*, 114(6), 63-69.
- Knapp, P., Campbell Burton, C., Holmes, J., Murray, J., Gillespie, D., Lightbody, C. ..., & Lewis, S. (2017). Interventions for treating anxiety after stroke (Review). *Cochrane Database of Systematic Reviews*, (5). <https://doi.org/10.1002/14651858.CD008860.pub3>
- Lees, R., Fearon, P., Harrison, J. K., Broomfield, N. M., & Quinn, T. J. (2012). Cognitive and mood assessment in stroke research: Focused review of contemporary studies. *Stroke*, 43(6), 1678-1680. <https://doi.org/10.1161/STROKEAHA.112.653303>
- Limampai, P., Wongsrithep, W., & Kuptniratsaikul, V. (2017). Depression after stroke at 12-month follow-up: A multicenter study. *International Journal of Neuroscience*, 7454(January), 1-20. <https://doi.org/10.1080/00207454.2016.1277344>
- Luria, A.R. (1962). *Higher cortical functions in man and their disturbances in local brain lesions*. Moscow University Press. <https://doi.org/10.1007/978-1-4615-8579-4>
- Miller, K.J., Dye, R., Kim, J., Jennings, J., O'Toole, E., Wong, J., & Siddarth, P. (2013). Effect of a Computerized Brain Exercise Program on Cognitive Performance in Older Adults. 21:7, *Am J Geriatr Psychiatry*, 21(7), 655-663.
- Narasimhalu, K., Ang, S., De Silva, D.A., Wong, M.C., Chang, H.M., Chia, K.S. ..., Chen, C.P. (2011). The prognostic effects of post-stroke cognitive impairment on dementia and do-

- main-specific cognitive impairments in nondisabled ischemic stroke patients. *Stroke*, 42(4), 883–888. <https://doi.org/10.1161/STROKEAHA.110.594671>
- Pendlebury, S.T. & Rothwell, P.M. (2009). Prevalence, incidence, and factors associated with pre-stroke and post-stroke dementia: a systematic review and meta-analysis. *The Lancet Neurology*, 8(11), 1006–1018. [https://doi.org/10.1016/S1474-4422\(09\)70236-4](https://doi.org/10.1016/S1474-4422(09)70236-4)
- Poulin, V., Korner-Bitensky, N., & Dawson, D.R. (2013). Stroke-specific executive function assessment: A literature review of performance-based tools. *Australian Occupational Therapy Journal*, 60(1), 3–19. <https://doi.org/10.1111/1440-1630.12024>
- Prokopenko, S.V., Mozheyko, E.Y., Levin, O.S., Koryagina, T.D., Chernykh, T.V., & Berezovskaya, M.A. (2012). Cognitive disorders and its correction in the acute period of ischemic stroke. *Zhurnal Nevrologii I Psikiatrii Im. S.S. Korsakova*, 8(2), 35–39.
- Prokopenko, S.V., Mozheyko, E.Y., Petrova, M.M., Koryagina, T.D., Kaskaeva, D.S., Chernykh, T.V. ..., & Bezdenezhniy, A.F. (2013). Correction of post-stroke cognitive impairments using computer programs. *Journal of the Neurological Sciences*, 325(1–2), 148–153. <https://doi.org/10.1016/j.jns.2012.12.024>
- Stakhovskaya, L.V., Klochikhina, O.A., Bogatyreva, M.D., & Kovalenko, V.V. (2013). Epidemiology of stroke in the Russian Federation: results of territory's population registry (2009–2010). *Zhurnal Nevrologii I Psikiatrii Imeni S.S. Korsakova*, 5, 4–10.
- Sternberg, D.A., Ballard, K., Hardy, J.L., Katz, B., Doraiswamy, P.M., & Scanlon, M. (2013). The largest human cognitive performance dataset reveals insights into the effects of lifestyle factors and aging. *Frontiers in Human Neuroscience*, 7(June), 1–10. <https://doi.org/10.3389/fnhum.2013.00292>
- Van de Ven, R.M., Murre, J.M., Veltman, D.J., & Schmand, B.A. (2016). Computer-Based Cognitive Training for Executive Functions after Stroke : A Systematic Review. *Frontiers in Human Neuroscience*, 10(April), Article 150. <https://doi.org/10.3389/fnhum.2016.00150>
- Xu, X.-D., Ren, H.-Y., Prakash, R., Vijayadas, & Kumar, R. (2013). Outcomes of neuropsychological interventions of stroke. *Annals of Indian Academy of Neurology*, 16(3), 319–28. <https://doi.org/10.4103/0972-2327.116909>
- Zucchella, C., Capone, A., Codella, V., Vecchione, C., Buccino, G., Sandrini, G. ..., & Bartolo, M. (2014). Assessing and restoring cognitive functions early after stroke. *Functional Neurology*, 29(4), 255–262. <https://doi.org/10.11138/FNeur/2014.29.4.255>

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The correlation between intelligence, creativity and the parameters of sensorimotor integration in children of different ages

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Introduction. Analysis of the literature suggests that the particular nature of the interplay between a person's creativity and intelligence is determined not only by the conditions in which a person develops and their personality traits, but also their age.

Objective. The purpose of this study was to compare the interaction between the levels of creativity and intelligence of 7 to 8 year-old children and 12 to 13 year-old teenagers, by studying how 7–8 year-old children and young teenagers (12–13 years old) with different levels of intelligence and creativity assimilate stochastic signals.

Design. A total of 160 children took part in the study, 80 first- and second-graders who were 7–8 years old (37 boys and 43 girls), and 80 fifth-graders, aged 12–13 (40 boys and 40 girls). We used the following procedures: Raven's Progressive Matrices; a battery of creative thinking tests, amounting to a modification of the Guilford and Torrance's tests in a Russian adaptation created by E. Tunik; and the computer reflexometric method.

Results. Our findings showed that the relationship between the level of intelligence and the level of creativity is different in the two age groups. With 7–8 year-olds, the two parameters are independent of each other, whereas with 12–13 year-olds, there is a weak but significant link between them. With the 7–8 year-old children, the level of creativity predetermines the child's ability to detect the structure of a sensory stream that is organized in a complex way. At the ages of 12–13, neither the level of creativity nor the level of intelligence is correlated with the parameters of sensorimotor integration, but the two parameters are interconnected.

Keywords: creativity, intelligence, children, teenagers, reaction time, simple and complex sensorimotor reactions

Introduction

The correlation between intelligence and creativity is fraught with all sorts of complexities. First of all, there are no generally accepted definitions for either of these concepts, which is why the result of any study, to a considerable extent, depends on the approaches employed by the authors. Even so, the existence of commonly used methods for evaluating each of these parameters makes it possible to compare the psychometric data, and make some predictions within the context of the ideas central to the tests that are used (Nikolaeva, 1998).

One of the clearest examples of why it is impossible to predict a person's level of creativity using tests designed to assess intelligence is a study conducted by L. Terman (1925). He screened more than 150,000 schoolchildren and then selected out 1,500 of them who had an IQ (according to the Stanford-Binet test) of more than 136. This longitudinal study of the children's achievements continued for many years. Almost all of the children from the sample group with a high order of intellect went on to attain elevated social status; two-thirds of them graduated from universities; and the incomes in this group were four times higher than the national average. The sole Nobel laureate in the first screening, however, came up just shy of the 136 mark (he scored 132), and did not make it into the sample group.

The results of further studies on the connection between creativity and intelligence have been extremely contradictory. On the one hand, there are findings that show a significant correlation between these two parameters (Hennessey, Amabile, 2010); on the other, there is data that shows such a link to be insignificant. There is an opinion that any and all combinations of intelligence and creativity are possible (Deary, 2012), which is why there are individuals with high levels of both parameters and low test scores, as well as people with a high level of one parameter and a low level of the other.

It can be assumed that the particular nature of the interplay between creativity and intelligence is determined not only by the conditions in which a person develops and their personality traits (Haier, 2009), but also by their age.

The right hemisphere of the brain, which is usually pointed to as the psychophysiological basis of creativity (Goldberg, Perfetti, & Schneider, 2006), matures later than the frontal regions of the cerebral hemisphere, which are responsible for decision-making (Byrge, Sporns, & Smith, 2014). Thus, an increase in the levels of creativity and intelligence in an individual's ontogeny can happen at different times, a disparity which can also be reflected in the correlation between these parameters for any particular test subject.

One longitudinal study with a complex design showed intricate alterations in the cerebral cortex at different ages. Three hundred and seven children between the ages of 7 and 19 were examined one to three times on an fMTR scanner at two-year intervals. Their general intelligence and the cortical thickness of their brains were compared (Shaw et al., 2006). The children were divided into three groups: those with superior intelligence, those with high intelligence, and those with average intelligence. It turned out that the group with a superior level of intelligence differed from the other two groups in respect to the changes in their cortical thickness at different ages: the difference was minimal up to the age of 7, when it sharply increased, becoming the most sizeable at around the age of 12. Then it returned to

average size at the age of 19. Thus, significant changes occurred between the ages of 7 and 12.

Consequently, when analyzing the relationship between intelligence and creativity, consideration must be given to the nature of the processes underlying the maturation of the cerebral structures.

Practically all of the data indicates that there is no single region of the brain responsible for the level of a person's intelligence. Neural networks distributed throughout the parietal and frontal regions of the brain account for the quality of intelligence (Haier, 2009). Such an explanation is called the parieto-frontal integration theory of intelligence. During the process of thinking, the brain uses complex aural and visual cues simultaneously. When information is being processed, in the early stages the occipital and the temporal lobes are involved. Visual information is also processed in the extrastriate cortex (areas 18 and 19, according to K. Brodmann) and the fusiform gyrus (Brodmann area 37). These regions are responsible for the recognition and processing of visual information. Area 22, which handles verbal information and is related to Wernicke's area, also participates in the processing.

This sensory information then goes to the parietal cortex, first to the supramarginal gyrus (area 40), then the lower parietal (area 7), and the angular gyrus (area 39), where abstract information is processed.

The parietal cortex cooperates with the frontal region (areas 6, 9, 10, and 45–47), where possible solutions to problems are reviewed. If a solution arises, neural networks in the dorsal anterior cingulate cortex (area 32) are activated; this leads to the suppression of other possible solutions and provides support for the one that has been chosen. This process hinges on how accurately information is transferred from the dorsal to the frontal regions of the brain.

One means of transfer might be sensorimotor integration (Fotowat & Gabbiani, 2011), which is essentially the interplay between sensory input and motor output. It should be noted that the activity of the sensory neurons presupposes preparation for the ensuing motor act, and feedback from the act, once it has been carried out, leads to its being elaborated in accordance with the context (Anochin, 1975).

In the event that there is uncertainty about the goal, the brain immediately plans a multitude of possible acts, adjusting itself to the constantly changing situation (Gallivan et al., 2016). Sensorimotor integration underlies not only intellectual activity but also many other mental processes, reflecting the integrative functions of the brain when cognitive processes are being carried out (Deary & Der, 2005; Haier, 2009). There is evidence that the level of intellectual activity is dependent on the condition of the neuronal network (Martindale & Hines, 1975), which perhaps, in turn, is explained both by genetic factors and the context in which particular events take place (Lyons et al., 2009).

The speed of the brain's processes has been associated with the level of intelligence for a long time (Deary, 2012) whereas brain plasticity and a variety of mutual interactions have been linked with creativity (Hennessey & Amabile, 2007). A meta-analysis of 172 studies, in which a total of 50,000 test subjects participated, revealed that the coefficient of correlation between the two parameters is 0.31 (Sheppard, 2008).

Therefore, an individual's reaction time correlates significantly with his/her psychometric intelligence, although there is as yet no description of the mechanism behind such a connection.

According to such an approach, the speed of sensorimotor integration should correlate to a greater extent with the parameters of intelligence than with those of creativity. But it is possible that a child's intelligence depends on the speed of the sensorimotor reactions only during the early stages of their life. The older a person is, the greater the role played by experience and decision-making (Santos & Rosati, 2015), which suggests that the connection between intelligence and the parameters of sensorimotor integration is rather complex.

PET scans show that the people who receive the highest scores on the Raven's test expend the least amount of energy (Haier, 2009). The authors of this study concluded that intelligence is connected with more efficient brain activity. This notion has been confirmed many times ever since (Neubauer & Fink, 2009).

If a child's level of intelligence can depend upon the speed of their reactions, then it is entirely possible that his or her creativity might be determined by his/her sensitivity (not necessarily conscious) to the structure of the sensory flow, making it possible to predict its changes and trends. This ability, in turn, might depend on the condition of the neuronal circuits in the child's brain at a certain stage of the ontogeny.

It is now known that the brain is constantly predicting the future, orienting itself on the rather indeterminate, stochastic flow of signals from the external environment. A stochastic flow is a stream of signals that is subject to random processes. It can be assumed that by changing the structure of the flow in an experiment, it will be possible to determine the region of a child's neuronal circuits that are the most sensitive.

With this in mind, we set as our objective the study of how 7–8 year-old children and young teenagers (12–13 years old) with different levels of intelligence and creativity assimilate stochastic signals. We chose these particular ages based on data that shows this (ages 7–13) to be precisely the age range in which the essential restructuring takes place in children that will determine the development of their intelligence and creativity.

Method

A total of 160 children took part in the study, 80 first- and second-graders who were 7–8 years old (37 boys and 43 girls), and 80 fifth-graders, aged 12–13 (40 boys and 40 girls).

In order to achieve our goals, we used the following procedures.

Raven's Progressive Matrices (Raven, Raven & Court, 2003).

For the 7 yearsold children we used the colored version.

The stimulus material was divided into three sets (A, AB, and B)

Each task is basically a rectangular-shaped matrix containing different figures and sets of figures that are composed so that they logically form a whole; the elements are arranged according to a consistent pattern. Each set begins with a relatively easy problem, and then the tasks become gradually more involved. Such a progression

can also be observed from one set to the next. All three of the Raven's sets are organized in accordance with the following principles: set A is based on the principle of a correlation of matrices; set AB, on the principle of analogy between pairs of figures; and set B, on the principle of progressive changes in the figures of a matrix.

Set A calls for analyzing the pattern in an image, recognizing the connection between elements in the pattern, and, based on this, identifying a missing element.

Set AB requires examining disconnected elements and establishing analogies.

Set B necessitates understanding the logical principles behind the changes in position of figures from one space to another.

Administering the test involved the following procedure: the experimenter showed a child a card on which a "carpet" and six "patches" were depicted. In order to "mend the carpet," the child had to scrutinize its pattern and the pattern of all the "patches," and then choose the one that fits the pattern of the "carpet." The child designated the number of the missing element in the picture, and it was written down in the protocol.

When processing the results, we tabulated the scores in percentages, and interpreted them in accordance with how frequently a particular score was attained in a given age category.

A battery of creative thinking tests, amounting to a modification of Guilford and Torrance's tests, in a Russian adaptation created by Tunik (2002)

The stimulus material included seven subtests: *Use of Objects, Consequences, Words and Sentences, Word Associations, Image Construction, Sketches, and Hidden Forms*.

It took 40 minutes to administer these tests, which are intended for an age group of between 5 and 15. For children from 5 to 8 years old, they are conducted one on one. With 9- to 15-year-olds, they can be done either in a group or individually.

It should be noted that Subtest 3 had two versions — *Words and Sentences*. The first is intended for children from 5 to 8 years old, and the second, for those between the ages of 9 and 15.

The first through fourth subtests are designed to assess verbal creativity, while the fifth, sixth, and seventh reflect the test subject's graphic creativity.

Processing of the tests is connected with the parameters established by Guilford in his studies, to wit:

- 1) *Fluency (facility, productivity)*: This factor characterizes how effective a person's creative thinking is, and it is determined by the total number of answers.
- 2) *Flexibility*: This factor indicates how flexible a child's creative thinking is, and shows how good the child is at switching his/her attention quickly from one thing to another. It is determined by the number of categories (groups) in the answers given.
- 3) *Originality*: This factor shows how distinctive and unique the child's creative thinking is, and how unusual his/her approach to a problem is. It is established by assessing how divergent the answers are from those of other test subjects, how unusual the terminology is, and how original the structure of the answers.

- 4) *Elaboration*: This factor reflects how orderly and consistent a person's creative thinking is, and how appropriate and relevant their answers are.

For each factor, a number of points is calculated, according to formulas which differ for each subtest.

The computer reflexometric method (Nikolaeva & Vergunov, 2013)

This method consisted of three stages, each of which contained a sequence of 64 visual and acoustic stimuli (signals). The visual stimuli were represented by red, blue and green circles, the colors being of equal intensity. For the acoustic stimulus, a sound was emitted at a frequency of approximately 900hz, a volume level of 60 decibels, and a duration of 100 msec. During each stage, each of the stimuli was presented 16 times.

The first stage called for simple sensorimotor reactions, in which the structure of the inter-stimulus intervals was organized in a fractal manner. The second stage involved simple sensorimotor reactions, with the signals having a bi-dimensional fractal structure (the stream of the groups being organized in a fractal way, and within each group the signals were set up in a random fashion). The third stage required complex sensorimotor reactions, and, as in the first stage, the structure of the inter-stimulus intervals was organized in a fractal manner, but here the test subject was not allowed to react to the red circles.

In all three stages, the fractality of the time lapses, after which the stimuli are presented, was computer-generated, so that at each stage, the way in which the signals were presented was determined by a specific algorithm.

Fractal sequences are successions of stimuli, and the variance in the time intervals between their presentations has fractal properties of the same type. In our case, the fractal properties were evaluated with recourse to the Hurst exponent (H), and they were of the following types:

$0 < H < 0.5$: As a rule, high values are followed by low values (or low values by high values); the closer the Hurst component is to 0, the more pronounced this pattern is; at a value of 0, there are no fractal properties (the fractal dimension coincides with the topological dimension);

$H = 0.5$: "white" noise, with random alternation of high and low values; as a practical matter, this range is from 0.45 to 0.55;

$0.5 < H < 1.0$: As a rule, high values are followed by high values, and low values by low values; the closer the Hurst component is to 1, the more pronounced this pattern is; at a value of 1, there are no fractal properties (the fractal dimension coincides with the topological dimension);

$H > 1$: various noises, including "pink" noise (vibrating, flicker noise, with a spectral density of $1/f$) and Brownian (red and "brown" with a spectral density of $1/f^2$).

In a simple sensorimotor reaction, the correlation dimensionality is 2.25 (three orthogonal exponents are needed to describe a model of a time series), and the Hurst component is equal to 0.75. When calculated according to a formula with cumulative amplitude, the Hurst component is 0.66. Recursive sequences are in evidence, and they are two stimuli long. They amount to 0.2 percent of all possible sequences. (The presence of such sequences indicates that there is no physical sense

in assessing the fractal properties of sequences composed of two stimuli.) A direct calculation of sequences with between 3 to 64 stimuli gives a Hurst component equal to 0.86 (the variation from 0.75 might be due to the “rejection” of the Hurst component values for instances of two stimuli).

In the stage calling for complex sensorimotor reactions, red stimuli play a special role: there is to be no reaction to them. Moreover, an accidental break in the sequencing of the stimuli that are supposed to be reacted to, by the emission of one or more stimuli that are *not* supposed to be reacted to, causes both streams of stimuli—the one that calls for a reaction and the one that doesn’t—to degenerate into noise. In other words, there are no consistent patterns in either stream of stimuli.

The second stage involves simple sensorimotor reactions, and the signal flow has a binary fractal structure. The correlation dimensionality is 1.57 (the fractal structure is two-dimensional, i.e., there are more recurrent components than in the stage calling for complex sensorimotor reactions), and the Hurst component for the dimensionality is equal to 0.43. The Hurst component, when calculated according to a formula with cumulative amplitude, is 0.50. Recursive sequences are in evidence, and they are two stimuli long. They amount to 0.5 percent of all possible sequences. A direct calculation of sequences with from 3 to 64 stimuli gives a Hurst component equal to 0.55.

Thus, although the sequences in this stage are not as chaotic as in the first stage, the succession of stimuli in its time flow should be perceived by the test subject as random (random events are a part of white noise; 0.55 is the upper limit of the range for white noise, and 0.43 is very close to its lower limit). As a result, test subjects perceive this sequence of simple sensorimotor reactions, with its signal flow structured in a binary way, as a sequence of stimuli which, over time, has a distinct succession of small groups of stimuli (higher-higher and lower-lower), while large groups of stimuli have the opposite tendency (higher-lower and lower-higher).

The *testing procedure* was as follows: A lap-top computer was put on the table in front of the child, who was told that he or she had to turn off the colored circles and signals on the monitor screen as quickly as possible by hitting the space bar. In the last stage, which evaluated inhibitory processes, the child had to press down on the bar for all stimuli except for the red circles.

Interpretation of the data involved the following parameters:

- the mean reaction time for all stimuli, taking into account the reaction symbol;
- the mean reaction time without regard to the reaction symbol $|dt|$;
- the mean reaction time for acoustic stimuli, taking into account the reaction symbol dt -sound;
- the mean reaction time for visual stimuli, taking into account the reaction symbol dt -color;
- the number of motor reactions in advance of the stimuli (false starts);
- the number of stimuli that were missed;
- in the third stage, the number of reactions to the red circles (“errors”) was tabulated.

Accuracy can indicate a test subject's sensorimotor integration. In this case, it can be demonstrated by first, little variation in the response times; i.e. stability, and, second, coordination between the sensory stimuli as they are presented, and the responses to them, i.e. proper timing. Therefore, in order to assess the +6 accuracy of the sensorimotor reactions as a statistical measure of the sensorimotor reactions over time to stimuli of varying modalities, the accuracy value K was calculated according to this formula: $K = dt / |dt|$

For statistical processing of the data, SPSS Statistics 21 was used.

Results

Comparison of the mean parameters for the levels of intelligence and creativity did not bring to light any distinctions between the children of the two age groups (see Table 1).

Table 1. Means and standard deviations for the creativity, intelligence and reflexometry parameters of children and teenagers

| Parameters | Children of 7–8 years-old | Teenagers of 12–13 years-old |
|--|------------------------------|---------------------------------|
| Nonverbal intelligence (%) | 76.55±13.20 | 74.51±12.41 |
| Verbal creativity (scores) | 70.18±23.79 | 64.21±21.14 |
| Pictures creativity (scores) | 81.70±20.31 | 95.22 ±24.53 |
| The time of the simple sensorimotor reaction (mc) | 303.96±71.93 | 291.54±58.64 |
| Coefficient of the quality of the simple sensorimotor reaction | 0.51±0.35 | 0.78±0.18* |
| Number of false starts in the simple sensorimotor reaction | 16.55±9.75 | 7.88±6.72* |
| Number of false starts in the complex sensorimotor reaction | 7.67±4.10 | 4.82±3.01* |

Note. *=differences for $p \leq 0.05$ (Student's criterion) between children and teenagers

The older children, however, were more proficient at carrying out the tasks, whether they called for simple or complex sensorimotor reactions. They had a higher quality coefficient for the simple sensorimotor reactions and fewer false starts.

A regression analysis revealed that, in terms of the groups of test subjects, the independent variable of intelligence had only a slight impact on the dependent variable of creativity ($R^2=0.070$, $\beta=0.265$, and $p=0.049$). Since we used a linear regression analysis, R^2 was a percentage of the explained variation of the dependent variable, due to a change in the independent variable (7%); p =the significance level; and β =the regression coefficient.

Overall, and on a group basis, however, neither of these parameters was connected in any way with sensorimotor integration. For this reason, further statistical analysis was conducted separately for each of the test groups.

Using regression analysis, the data that was obtained on the 7–8 year-olds was examined first. For this age range, no differences were found between the boys and the girls in terms of intelligence.

At the same time, the level of intelligence for the 7–8 year-olds was directly connected with the response rate for the simple sensorimotor reactions (See Table 2).

Table 2. Regression analysis parameters showing the influence on the dependent variable *Level of Intelligence* for children of 7-8 years-old

| Independent variables | R ² | β | P |
|---|----------------|--------|-------|
| Reaction time for simple sensorimotor reactions | 0.110 | -0.332 | 0.042 |
| Reaction time to red circle for simple sensorimotor reactions | 0.136 | -0.369 | 0.023 |
| Reaction time to green circle for simple sensorimotor reactions | 0.160 | -0.400 | 0.013 |
| Reaction time to blue circle for simple sensorimotor reaction | 0.109 | -0.330 | 0.043 |
| Reaction time to a sound for simple sensorimotor reaction | 0.118 | -0.133 | 0.035 |

All of the speed parameters for the simple sensorimotor reactions had an effect on the dependent variable “level of intelligence”: see the independent variable “reaction time for the simple sensorimotor reactions” (where $R^2=0.110$, $\beta=0.332$, and $p=0.042$). The reaction time was the time taken in absolute magnitude, ignoring the sign. Since the children could hit the space bar before the circles appeared, the reaction time could even be negative.

Accordingly, the independent variables “reaction time to the red circles for simple sensorimotor reactions” (where $R^2=0.136$, $\beta=-0.369$, and $p=0.023$); “reaction time to the green circles for simple sensorimotor reactions” (where $R^2=0.160$, $\beta=-0.400$, and $p=0.013$); “reaction time to the blue circles for simple sensorimotor reactions” (where $R^2=0.109$, $\beta=0.330$, and $p=0.043$); and “reaction time to sound for simple sensorimotor reactions” (where $R^2=0.118$, $\beta=0.343$, and $p=0.035$) all had an effect on the dependent variable “level of intelligence.”

For the 7 to 8 year-old children, there was no significant correlation between the levels of intelligence and creativity.

A radically different situation was observed with the young teenagers (the 12–13 year-olds), for whom there was a link between the level of intelligence and the level of creativity (where $R^2=0.074$, $\beta=0.272$, and $p=0.043$). On the other hand, neither of these parameters had any connection with the parameters of sensorimotor integration.

While the intelligence of the 7–8 year-old children intelligence was correlated with practically all of the parameters of the simple sensorimotor reactions, with the young teenagers there were no such connections. It should be emphasized that in neither group was there any connection of intelligence with the complex sensorimotor reactions, which, for children in these age groups, require great exertion and were poorly performed by all children.

Our findings demonstrate that creativity is connected with intelligence only in the 12–13 year-old age range (See Table 3). Before that age, such a close correlation between the two parameters is not observed. It can be hypothesized that the change in this situation with the 12–13 year-olds has something to do with a change in the connections between the neurons caused by the hormonal changes that begin during early adolescence.

Table 3. Regression analysis parameters showing the influence on the dependent variable *Level of Intelligence* for teenagers 12–13 years old

| Independent variable | R ² | β | P |
|----------------------|----------------|---------|-------|
| Creativity | 0.074 | 0.272 | 0.043 |

The regression analysis showed that with the 7 to 8 year-old children, creativity is connected with the parameters of sensorimotor integration, not with the simple sensorimotor reactions, as was found with respect to intelligence, but in the stage where the signal flow has a bi-dimensional structure. Creative children sense the structure of the large blocks inside of which signals are presented in a random manner, and this allows them to react more effectively to the signals during this stage.

Table 4. Regression analysis parameters showing the influence on the dependent variable *creativity* for children 7–8 years old

| Independent variable | R ² | β | P |
|---|----------------|---------|-------|
| Sex | 0.100 | –0.317 | 0.050 |
| Reaction time to red circle for series with bi-dimensionally structured signal flow | 0.149 | –0.375 | 0.017 |
| Reaction time to green circle for series with bi-dimensionally structured signal flow | 0.106 | –0.326 | 0.046 |
| Reaction time to blue circle for series with bi-dimensionally structured signal flow | 0.137 | –0.369 | 0.022 |
| Reaction time for complex sensorimotor reaction | 0.131 | –0.362 | 0.023 |

Accordingly, the independent variable “reaction time to the red circles in the series with the bi-dimensionally structured signal flow” (where $R^2=0.149$, $\beta=-0.375$, and $p=0.017$); “reaction time to the green circles in the series with the bi-dimensionally structured signal flow” (where $R^2=0.106$, $\beta=-0.326$, and $p=0.046$); “reaction time to the blue circles in the series with the bi-dimensionally structured signal flow” (where $R^2=0.137$, $\beta=-0.369$, and $p=0.022$); and “reaction time for the complex sensorimotor reactions” (where $R^2=0.131$, $\beta=-0.362$, and $p=0.023$) all had an effect on the dependent variable “level of creativity.”

No connection was found between the parameters for creativity and sensorimotor integration for the young teenagers. The only connection, described earlier, was between the level of intelligence, assessed according to the Raven's test, and the level of creativity.

The next step was to conduct a factor analysis, starting with the findings obtained for the 7 to 8 year-old children. The Kaiser-Meyer-Olkin measure in this group was equal to 0.555, and the explained variation was 70.6 %. A five-factor solution was obtained. The first factor (18%) included the level of intelligence (0.538). The second factor (14.8%) included different parameters of the sensorimotor integration. The third factor (12.8%) was comprised of several parameters: creativity (-0.639), the reaction time (0.436), and the quality of the reaction in the stage with the complex fractal signal flow. Consequently, the higher the level of creativity in this age range, the shorter the reaction time and the better the performance. More creative children discern the structure of a sensory stream composed of the large blocks inside of which signals are presented in a random manner.

Another factor analysis was then conducted (the Kaiser-Meyer-Olkin measure was equal to 0.548, and the explained variation was 68.5%), and a three-factor solution was obtained. The first factor (28.5% of explained variation) included the level of creativity (0.641).

The second factor included the absolute reaction time (0.875) and the quality coefficient (-0.846) at the stage with the simple sensorimotor reactions, and with the signals having a bi-dimensional fractal structure.

Thus, our findings showed that the relationship between the level of intelligence and the level of creativity is different in the two age groups. With the 7 to 8 year-olds, they are independent of each other, whereas with the 12 to 13 year-olds, there is a weak but significant link between them.

The level of intelligence is connected with the speed of the reaction time for the sensorimotor integration only with the 7 to 8 year-olds. Later on (at the ages of 12–13), intelligence does not depend on the speed of the reaction to sensory stimuli.

With the 7 to 8 year-old children, the level of creativity predetermines the ability to detect the structure of a sensory stream that is organized in a complex way.

At the ages of 12–13, neither the level of creativity nor the level of intelligence is connected with the parameters of sensorimotor integration, but they themselves are interconnected. We can hypothesize that the correlation between creativity and intelligence changes as children grow older, in the same way that the relationship between thinking and speech changes up to the age of three. Prior to that age, they develop separately, and then they begin to influence each other, and each of them begins to develop more intensively, which fundamentally alters the cognitive capabilities of the child.

In exactly the same way, intelligence and creativity develop in children in relatively independent fashions, although depending in different ways on the parameters of sensorimotor integration: intelligence depends on its speed, and creativity is based on the ability to detect the structure of a sensory stream and to predict it. The changes connected with the maturing of the brain's structure, described earlier, lead to the integration of the ability to predict the structure of a signal flow and the ability to solve problems, which prepares a child who is entering puberty to solve problems at a more complex level and to adapt to adult life. This hypothesis needs to be proven, but it also suggests a line of further research.

Conclusions

Our study found that the level of intelligence for 7 to 8 year-olds was directly connected with their response rate for simple sensorimotor reactions; the better the quality of sensorimotor reactions, the higher the level of intelligence. But for these children, there was no significant correlation between the levels of intelligence and creativity.

A radically different situation was observed with young teenagers (the 12-13 year-olds). The study showed that there is a link between the level of intelligence and the level of creativity. On the other hand, neither of these parameters had any connection with the parameters of sensorimotor integration.

It can be hypothesized that the change in this situation with the 12-13 year-olds has something to do with a change in the connections between the neurons caused by the hormonal changes that begin during early adolescence.

Creative children sense the structure of the large blocks inside of which signals are presented in a random manner, and this allows them to react more effectively to the signals during this stage.

Thus, our findings show that the relationship between the level of intelligence and the level of creativity is different in the two age groups. With the 7 to 8 year-olds, they are independent of each other, whereas with the 12 to 13 year-olds, there is a weak but significant link between them.

Limitations

We have assumed that the correlation between creativity and intelligence changes as children grow older, in the same way that the relationship between thinking and speech changes up to the age of three. We think that the changes connected with the maturing of the brain's structure lead to the integration of the ability to adapt to adult life. But our data does not allow us to prove this assumption. Research based on EEG data and visualization is needed to substantiate our hypothesis about how this maturation process might work both for creativity and intelligence.

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References

- Anochin, P.K. (1975). *Essays on physiology of functional systems* (17–62). M: Mir. [Russian].
- Byrge, L., Sporns, O., & Smith, L.B. (2014). Developmental process emerges from extended brain-body-behavior networks. *Trends Cogn. Sci.*, 18(8), 395–403. <https://doi.org/10.1016/j.tics.2014.04.010>
- Deary, I.J. & Der, G. (2005). Reaction time explains IQ's association with death. *Psychol. Sci.*, 16, 64–69. <https://doi.org/10.1111/j.0956-7976.2005.00781.x>
- Deary, I.J. (2012). Intelligence. *Annu. Rev. Psychol.*, 63, 453–482. <https://doi.org/10.1146/annurev-psych-120710-100353>
- Fotowat, H. & Gabbiani, F. (2011) Collision Detection as a Model for Sensory-Motor Integration. *Annu. Rev. Neurosci.*, 34, 1–19. <https://doi.org/10.1146/annurev-neuro-061010-113632>

- Gallivan, J.P., Logan, L., Wolpert, D.M., & Flanagan, J.R. (2016). Parallel specification of competing sensorimotor control policies for alternative action options. *Nature*, 11 January. <https://doi.org/10.1038/nn.4214>
- Goldberg, R.F., Perfetti, C.A., & Schneider, W. (2006). Perceptual knowledge retrieval activates sensory brain regions. *J. Neurosci.*, 26, 4917–4921. <https://doi.org/10.1523/JNEUROSCI.5389-05.2006>
- Haier, R.J. (2009). Neuro-intelligence, neuro-metrics and the next phase of brain imaging studies. *Intelligence*, 37, 121–123. <https://doi.org/10.1016/j.intell.2008.12.006>
- Hennessey, B.A. & Amabile, T.M. (2010). Creativity. *Annu. Rev. Psychol.*, 61, 569–598. <https://doi.org/10.1146/annurev.psych.093008.100416>
- Lyons, M.J., York, T.P., Franz, C.E., Grant, M.D., Eaves, L.J., et al. (2009). Genes determine stability and the environment determines change in cognitive ability during 35 years of adulthood. *Psychol. Sci.*, 20, 1146–1152. <https://doi.org/10.1111/j.1467-9280.2009.02425.x>
- Martindale, C. & Hines, D. (1975). Creativity and cortical activation during creative, intellectual and EEG feedback tasks. *Biological Psychology*, 3(2), 91–100. [https://doi.org/10.1016/0301-0511\(75\)90011-3](https://doi.org/10.1016/0301-0511(75)90011-3)
- Neubauer, A.C. & Fink, A. (2009). Intelligence and neural efficiency. *Neurosci. Biobehav. Rev.*, 33, 1004–1023. <https://doi.org/10.1016/j.neubiorev.2009.04.001>
- Nikolaeva, E.I. (1998). Intellectual peculiarities of boys and girls with different laterality indices. *Int. J. Psychophysiol.*, 30 (1–2), 21. [https://doi.org/10.1016/S0167-8760\(98\)90573-6](https://doi.org/10.1016/S0167-8760(98)90573-6)
- Nikolaeva, E.I. & Borisenkova, E.Yu. (2009). Severity of lateral signs in preschoolers with different levels of intelligence. *Psychological journal*, 30(4), 47–55.
- Nikolaeva, E.I. & Vergunov, E.G. (2013). Forecast psychophysiological “cost” of the effectiveness of the learning process in high school. *Psychology of education in multicultural space*, 1 (21), 47–52.
- Raven, J., Raven, J.C., & Court, J.H. (2003). *Manual for Raven's Progressive Matrices and Vocabulary Scales*. San Antonio, TX: Harcourt Assessment.
- Santos, L.R. & Rosati, A.G. (2015). The Evolutionary Roots of Human Decision Making. *Annu. Rev. Psychol.*, 66, 321–347. <https://doi.org/10.1146/annurev-psych-010814-015310>
- Shaw, P., Greenstein, D., Lerch, J., Clasen, L., Lenroot, R. et al. (2006). Intellectual ability and cortical development in children and adolescents. *Nature*, 440, 676–679. <https://doi.org/10.1038/nature04513>
- Sheppard, L.D. (2008). Intelligence and information processing: a review of 50 years of research. *Personal. Individ. Differ.* 2008. V. 44, 533–549. <https://doi.org/10.1016/j.paid.2007.09.015>
- Terman, L.M. (1925). Genetic studies of genius: Vol. 1. Mental and physical traits of a thousand gifted children. *Stanford, CA: Stanford University Press*.
- Torrance, E.P. (1968). A longitudinal examination of the fourth grade slump in creativity. *Gifted Child Quarterly*, 12, 195–199. <https://doi.org/10.1177/001698626801200401>
- Tunik, E.E. (2002). Diagnostics of creative thinking. Creative tests. *SPb.: Didactics Plus*.

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Luria's syndrome analysis for neuropsychological assessment and rehabilitation

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Introduction. Neuropsychology, as a science, studies various possible relationships between psychological processes and the brain in cases of both normality and diverse pathologies. Such relationships might be established and understood in different manners.

Background. A.R. Luria proposed a unique and specific approach by identifying different brain units. His conception is not completely understood, and is even less used in diagnosis and rehabilitation today. His conception of the systemic and dynamic representation of human actions in functional brain systems is the background for our study. Psychological conceptions of the stage-by-stage formation and orientation for action, and their use in rehabilitation, are taken into account.

Objective. The objective of our report is to share our application of Luria's methodology of syndrome analysis through the presentation of the results of assessment and rehabilitation.

Design. Our study presents a unique case, along with data on the person's assessment and rehabilitation, specifically, a qualitative assessment of an adolescent patient with severe brain injury.

Results. The assessment identified severe problems in the patient's programming and self-control functions, together with spatial disorganization. The process of neuropsychological rehabilitation, as applied in two stages, showed positive effects on the activity and personality of the patient. Goals, stages, and examples of formation of actions in rehabilitation, with their results, are described.

Conclusion. We conclude that the systemic and dynamic approach in neuropsychology might be applied to assessment and rehabilitation. We discuss the necessity of establishing bridges between the psychological theory of actions (rather than functions) and the systemic representation of actions by functional brain systems.

Keywords: neuropsychological rehabilitation, concepts of neuropsychology, functional diagnosis, qualitative neuropsychology, brain injury rehabilitation.

Introduction

Luria's neuropsychological theory is well known within the scientific community. A huge number of citations of his work can be found in publications on neuropsychology. At the same time, his theoretical conception isn't completely understood,

and is even less used in the practice of diagnosis and rehabilitation today. The citations are frequently related only to his concept of three functional brain units, which he described as follows. The first unit is related to subcortical systems of general brain activation; the second to the posterior cortex responsible for perception and memory; and the third unit is responsible for programming and control, which is called “executive functions” in modern literature (although this term was introduced by Lezak (1982) and never used by Luria himself). Luria’s other important concepts — such as functional systems, neuropsychological factors, and neuropsychological syndromes — are frequently missing in Western literature. Such omissions, in our opinion, change the whole sense of Luria’s conception of brain functioning and the complex representation of cultural psychological processes in central nervous system.

It is necessary to remember that A.R. Luria’s neuropsychological theory didn’t appear in a vacuum. In our opinion, historical and cultural neuropsychology was created as a branch of the general conception of historical and cultural psychology founded by L.S. Vigotsky (Akhutina, 2016; Solovieva & Quintanar, 2017; Toomela, 2014). Luria himself stressed the relationship of all his work to the theory of Vigotsky (Akhutina, 2003).

According to Luria’s theory, higher psychological processes can’t be actually “localized” in the brain in the sense of rigid and unique connections between mental processes and specific brain zones. First of all, psychological processes should be understood as cultural by nature, originating in the activities of communication, learning, play, and so on. During the first stage of development, such psychological processes are shared between different participants, typically between adult and child, and are inter-psychological. Later on, depending on individual development and passing through a number of stages, these psychological processes become independent self-regulated activities and intra-psychological processes. The duration of the whole process might differ depending on different social, historical and cultural contexts; the functional stage of the individual’s central nervous system; previous development; educational level; and other aspects.

For example, take the writing process, which is used by Luria and his followers on many occasions (Luria, 1975; Akhutina, 2001, 2004, 2016 a). The same psychological processes, such as writing, may have different brain representations depending upon the grade of acquisition of this activity — i.e., when it is learned at school. Writing is represented as a complex functional system when it is first learned at school. The same process becomes more automatic and reduced in the structure of its components by the time the pupil finishes school. Different components or neuropsychological factors must be taken into account within the analysis in the process of writing, such as regulation and control, spatial synthesis, and so on.

The use of external tools might also be mentioned as an important factor in the dynamics of brain organization (Kotik-Friedgut & Solovey, 2003). Some systems of writing might depend mostly on spatial and visual processes, and less on kinesthetic and phonemic discrimination. Cultural features, bilingualism, or knowledge of diverse languages are important conditions for shaping the functional system of writing (Kotik-Friedgut, 2006). Nevertheless, the majority of publications never takes into account the functional or cultural context of the acquisition of the writ-

ing skill, and presents it as a unique function of the brain's organization. The same situation occurs with reading (Solovieva & Quintanar, 2014) and other abilities, such as drawing (Solovieva & Quintanar, 2017a).

From this point of view, the task of neuropsychology isn't to describe the precise localization of one or another function in the brain, but to study different kinds of psychological processes in the brain, in light of the cultural and social differences of the subjects and patients with brain damage. On the one hand, the general theory of the cultural and historical origin of psychological processes helps us to understand the specific difficulties of patients with brain damage at different ages and stages of psychological development. On the other hand, neuropsychological assessment and rehabilitation help us to understand complex functional changes in the representation of psychological activities in the human brain.

One of the important objectives of neuropsychological assessment in cases of brain injury is to discover the specific neuropsychological syndromes involved. Luria himself has described the classification of different types of aphasia in adult patients with acquired brain injury (Luria, 1947; Tsvetkova, 2016 a, b; Ardila, 2010; Akhutina, 2016 b). Yet, it is necessary to recognize that cases of acquired brain damage in adults don't represent all the possibilities for applying syndrome analysis in cases of brain damage or developmental disabilities and dysfunctions. The aim of our present article is to show the usefulness of the methodology of Luria's syndrome analysis in one case of acquired brain damage in an adolescent patient. This case is interesting because it shows new methodological possibilities for using syndrome analysis for assessment and rehabilitation. This is also interesting because we present the case of an adolescent whose psychological age differs from that of primary school children and whose treatment diverges from traditional work with adult patients with brain damage.

The concept of psychological age, proposed by Vigotsky (1984) and developed by Leontiev (2009) and Elkonin (1995), with the inclusion of the activity conception, shows its importance for neuropsychological assessment and rehabilitation in this case. Consideration of a person's dominant activity at a certain age serves as the basis for creating a program for the patient's rehabilitation and development. The objective of our report is to share the experience of applying Luria's methodology of syndrome analysis, and to show how the procedures of systemic functional diagnosis must lead to systemic procedures in rehabilitation.

Before starting our concrete presentation of this case, however, we would like to explain precisely how we understand the method of syndrome analysis proposed by A.R. Luria (1947, 1982).

Syndrome analysis

Among the new specific terms and concepts proposed by Luria, perhaps the most complex is the concept of the neuropsychological syndrome. We would like to emphasize again that this concept is practically never mentioned in publications, unlike Luria's concept of three functional units of the brain.

On the majority of occasions, neuropsychologists provide assessments of isolated brain functions with the aid of psychometric procedures. Their diagnosis refers to such terms as attention or memory disorders, dyslexia, and so on. All these terms are really far distant from the conception of systemic and dynamic represen-

tation of human actions in functional brain systems. Equally bad or worse is the situation where rehabilitation is directed toward isolated therapies, such as conductive exercises for isolated functions.

Traditionally, a clinical syndrome is understood as a combination of symptoms or signs, which can be detected in patients. Within cases of learning disabilities, syndromes are connected to one or another function which has been damaged in the patient. The damage to a function is determined by the presence of symptoms or difficulties in that function. For instance, symptoms of lack of attention, difficulties with concentration, and distribution of attention, are all labelled under the syndrome of “attention deficit disorder.”

Such a practice eliminates the distinction between “symptoms” and “syndromes.” As we will see, symptoms of lack of concentration and distribution of attention lead to a diagnosis of the syndrome of “attention deficit.” At the same time, it is obvious that symptoms of difficulties with attention might be related to entirely different causes or reasons. For example, lack of motivation might be a cause for absence of attention. Lack of understanding might be another cause. The absence of or difficulties with attention might be caused by a diversity of reasons.

The situation becomes more complex if we take into account the level of the functional state of the central nervous system, instead of considering it on only one level. It is well known that, from the point of view of brain mechanisms, a variety of causes, expressed at different levels, might lead to difficulties with attention (Solovieva & Cols., 2016; Machinskaya & Cols., 2014, 2016). For example, organic or functional difficulties with the third, first, or both the first and third brain units can cause difficulties with attention (and not only attention). In one recent publication, we presented the case of a child with symptoms of attention deficit disorder, who had positive functioning of all brain units but a low level of psychological preparation for school learning and negative aspects of social situation of development (Solovieva & Cols., 2017). Yet, classification of learning disabilities continues to talk about the syndrome of attention deficit disorder and the impossibility of differentiating between “symptoms” and “syndromes.”

The traditional approach is to try to identify isolated processes, for example, problems with particular brain structures or brain systems. From this standpoint, attention, memory, or thinking may present negative symptoms (difficulties or absence) related directly to the same brain structures. Usually, when one is speaking about syndromes, isolated functions are taken as the basic level and unit of analysis. Such functions usually are: memory, attention, executive functions, thinking, perception, and language. The symptoms and syndromes of the difficulties refer simultaneously to the same functions, and are reflected in the present official classifications (DSM-V, 2014).

An alternative approach would be to identify a new level of analysis of the difficulties: the psychophysiological or neuropsychological level (Luria, 1947). This level is not related to processes or functions, but to functional brain mechanisms, which appear as the combination of primary structures and cultural human activity. An example of such mechanisms might be the general level of cortical activation, of spatial integration, or of programming and control.

The same mechanism usually belongs to different functional systems. For instance, the mechanisms of programming and control take part in solving math-

ematical problems and in the writing process. While assessing a patient's difficulties, we wouldn't speak of attention problems, or difficulties with writing or with mathematics, but of the syndrome of difficulties of programming and control as the unique cause of the patient's difficulties. All cultural actions within the learning process or intellectual activity will suffer as the consequence of insufficient programming and control. Any action which doesn't require programming and control — for instance, automatic and memorized information such as direct counting from 1 to 10 — will be intact in the patient's functioning.

We propose to follow Luria's theory by using functional brain mechanisms as an essential level of neuropsychological analysis, and as the basis for finding neuropsychological syndromes for assessment and rehabilitation (Akhutina & Pilayeva, 2012; Mikadze, 2008; Glozman, 2013; Glozman, & Potanina, 2004; Solovieva & Quintanar, 2015, 2016).

It is important to stress that the determination of a patient's weak factor is not sufficient to determine his/her whole syndrome; a different level of analysis is necessary. As in Luria's proposal for classification of aphasia, different levels for analysis of neuropsychological syndromes were established (Luria, 1947, 1970, 1973). These levels are: 1) the level of the central nervous system; 2) the level of neuropsychological factor or mechanism; 3) the level of intellectual activity of the patient; and 4) the level of verbal activity.

Using these levels, a scheme for qualitative analysis of a syndrome, instead of a psychometric or isolated method of assessment of cognitive functions (Wechsler, 1987), might be proposed. The first level, the level of the central nervous system, should be confirmed by specific techniques such as neurological, neuropsychological, or electrophysiological testing. The second level in this schema is the most important for establishing a neuropsychological syndrome. This is the level of psychophysiological mechanisms as a neuropsychological factor, which has to be evaluated functionally during the assessment process. Another level of analysis is the level of the patient's practical and intellectual activity at his/her corresponding psychological age.

An analysis of psychological age is essential for planning a program for rehabilitation. This age level may include actions of school learning or symbolic actions at preschool age (Solovieva & Quintanar, 2015). The fourth level, the level of verbal activity, is also important and interesting for syndrome analysis and proposing further neuropsychological rehabilitation. At this level, the neuropsychologist can characterize the patient's verbal activity, oral and written comprehension, and production, according to the central neuropsychological factor established at the second level.

The levels of analysis within the system of neuropsychological syndrome are:

- 1) Which neuroanatomical structure of the central nervous system is involved.
- 2) Deficient neuropsychological factor/ factors.
- 3) Practical and intellectual actions corresponding to the psychological age and personality of the patient.
- 4) Oral and written comprehension and production, disturbed as the consequence of the weak neuropsychological factor.

Each level should be characterized according to each child's positive and negative aspects of development and learning. Such levels could be studied in an interdisciplinary manner, including by specialists in neuroimaging or electrophysiology (Solovieva et al. 2013; Machinskaya, Sokolova & Krupskaya, 2007; Solovieva & Cols., 2016). We understand that the logic of syndromic analysis is rare in neuropsychological practice, and that the use of the psychometric perspective is much more popular. Future studies would allow us to identify other syndromes precisely, and to improve the whole qualitative methodology. Such a methodology differs essentially from the quantitative approach, and could not be easily applied for statistical analysis of data, or for psychometric assessment of large populations (Plaisted et al., 1983; Teeter, 1986; Roselli et al. 2004, 2010).

It is obvious that our approach to syndrome analyses requires specific instruments for assessment. All protocols and instruments for qualitative analysis should be specifically tailored for each different language and psychological age.

The usefulness of a qualitative approach consists in the possibility of clinical-personified assessment of unique cases, which is very helpful for proposing strategies of correction and development. It is also useful for establishing a clear relationship between the levels of the patient's nervous system, neuropsychological syndrome, psychological activity, and personality. The important advantages of such a complex integrative approach to clinical cases with development and learning disabilities is that it integrates information on different levels of analysis: i.e., the brain neural structures involved in brain damage, the brain functional mechanisms as neuropsychological factors, and the activity and personality of each specific patient.

The Clinical Case

This study concerned the case of an adolescent patient with traumatic brain injury. The participant was 12 years old at the moment of the accident. The boy was run over by a bus on the street. He was admitted to the hospital presenting a loss of consciousness, multiple bone fractures, and optic nerve detachment. This situation led to vision loss in the left eye.

The computed tomography (CT) scans (see Figure 1) showed severe cerebral edema, frontal hemorrhagic contusion, intravenous hemorrhage, left lamellar epidural subdural hematoma, and a left papillary laminar fracture, as well as fractures of the homolateral maxillary at the lateral wall level, left maxillary, sphenoidal ethmoidal homosinus, and left orbital floor.

The patient remained in an induced coma for 18 days and remained in the hospital as an inpatient for two months. After the event, the patient was not able to talk properly or walk independently. Severe problems with spatial orientation were evident. The patient received motor and language therapy for four months. During this period of time, the patient suffered from an anxiety crisis, and presented constant changes of mood, impulsivity, and irritability. These symptoms were controlled with psychiatric medical treatment.

One year after the traumatic brain injury, the patient attended the Neuropsychological Service at the University Hospital provided by the Master Program in Neuropsychological Diagnosis and Rehabilitation of the Faculty of Psychology of

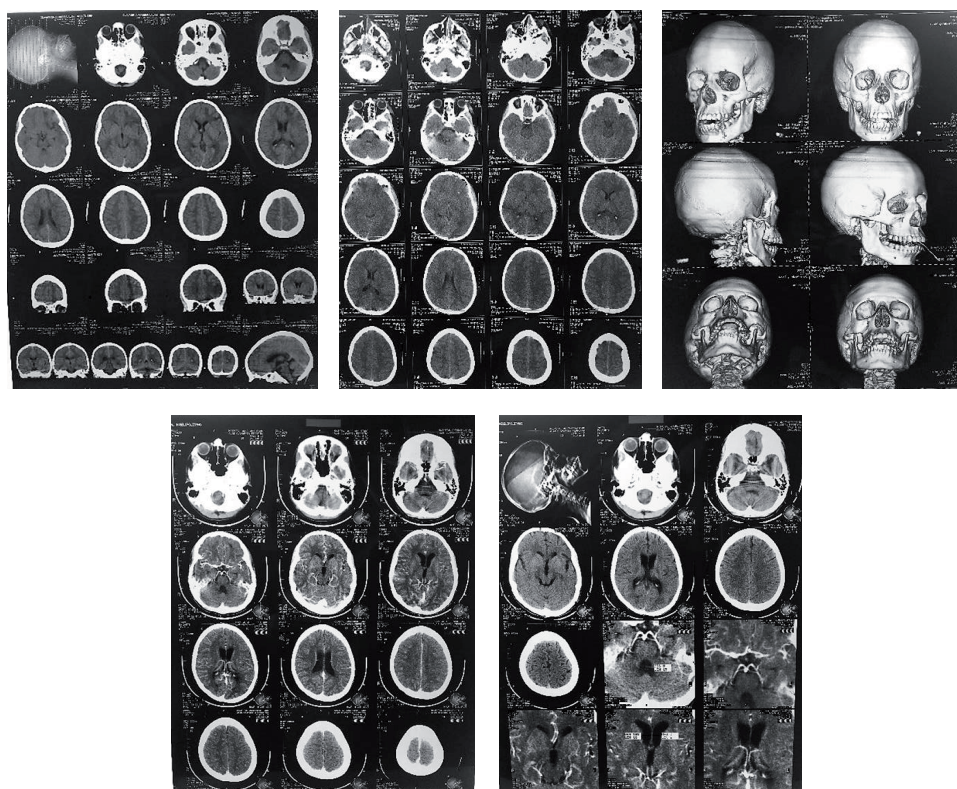


Figure 1. CT scan 3 months after the accident

Puebla Autonomous University. He could hardly be involved in the learning process, and personal problems with communication with family and friends persisted. The patient had difficulties with concentration of attention, self-regulation, planning, mental flexibility, abstraction, visual-spatial ability, and language production and comprehension.

Method

Neuropsychological assessment proceeded for four individual sessions. After that, a program for neuropsychological rehabilitation was designed and applied in 70 individual sessions over two periods of four months, with a six-month interval in-between. Later on, final neuropsychological assessment was provided. Qualitative analyses of the mistakes and achievements were carried out in light of the findings of syndrome analysis.

The following instruments and protocols for qualitative assessment were used:

- Brief neuropsychological assessment for adults (Quintana & Solovieva, 2013).
- Assessment of school success (Solovieva & Quintanar, 2012).
- Neuropsychological assessment of spatial integration (Solovieva & Quintanar, 2012).

- Neuropsychological assessment of voluntary activity (Quintanar & Solovieva, 2010).
- Neuropsychological assessment of verbal activity (Quintanar & Solovieva, 2010).
- Clinical assessment with the Aphasia Puebla-Sevilla test. (Quintanar, Solovieva & León-Carrión, 2013).
- Assessment of intellectual activity (Solovieva, 2014).

All these instruments were created on the basis of A.R. Luria's neuropsychological theory, particular features of the Spanish language, and the concept of the zone of proximal development (Vigotsky, 1984). In the case of neuropsychological assessment, this latter concept refers to allowing flexibility in the order and procedure of implementing assessment tasks; the ability to repeat tasks; and external help from the psychologist, through wide-ranging verbal and non-verbal communication with the patient. These features of assessment are never considered during the computerized or psychometrical procedure, which is especially relevant considering the psychological age of the patients. In our case, the psychological age was that of a teenager, a time when the patient was especially affected by, and sensitive to, any kind of negative attitude toward his difficulties or disabilities.

Qualitative assessment revealed that the patient had severe difficulties with two functional brain mechanisms: programming and control, and spatial integration. The specific and typical mistakes noticed in all tasks and interaction during assessment were the following: verbal and mental perseverations; inversions; misunderstanding of complex grammatical structures; the inability to organize written sentences and texts; the inability to understand texts; and the inability to follow rules and order in all kinds of complex intellectual tasks.

An EEG was also applied with posterior qualitative analysis of the data (Machinskaya & Cols, 2014, 2016). The results of the EEG analysis showed the presence of local pathological patterns in both the anterior frontal and posterior (TPO) zones of complex information integration (frontal and posterior zones).

After assessment, the program for neuropsychological rehabilitation was created and applied in the two periods during one year, with the six months interval in-between.

Program of rehabilitation

Both periods of rehabilitation consisted of 35 individual sessions carried out two times per week, for a total of 70 sessions. The duration of each session was between 60 and 90 minutes, depending on the condition of the patient and other external considerations.

The program was designed according to the theoretical principles of activity theory (Leontiev, 1960, 2003; Asmolov, 2000) and the psychological concept of orientation (Galperin, 1998). This theory, applied to neuropsychological rehabilitation, opens up the broad potential for creative design of the tasks during the various stages of the program; planning of the sequence of the stages of the program with corresponding goals; and flexible and creative implementation of the tasks with constant emotional and intellectual interaction between the psychologist and the patient. The tasks took into consideration the fact that combining of learning activity with personal communication with adults and classmates is the predominant

activity at an adolescent age. Self-regulation, self-verification, and self-emotional criticism were the criteria for marking the patient's progress.

The achievements made in each session were evaluated continuously, allowing the restructuring of the program if necessary; all necessary changes and modifications were applied throughout our work. All tasks were structured with a degree of increasing complexity, following the stages for formation of intellectual actions proposed by Galperin (1992), and used in our previous studies related to development and correction in cases of adolescent patients (Solovieva, Bonilla & Quintanar, 2006, 2012). The stages used in our program were the stages of materialized, perceptive, and verbal actions.

The main goal of our program of neuropsychological rehabilitation was to re-establish two of the brain mechanisms involved: self-control and self-regulation of the voluntary action during complex intellectual activity, and integration of spatial information at different levels (materialized symbolic, perceptive, and verbal).

Period 1

The first period of rehabilitation was dedicated to introducing the strategies for regulation and control in practical day-to-day tasks and intellectual actions. External control provided by the psychologist during joint actions directed to concrete interesting goals was guaranteed. Spatial integration was also included as a component of the rehabilitative tasks. The stages of actions during this first part of neuropsychological rehabilitation were: materialized actions, perceptive actions, and verbal actions.

As an example of the tasks used on materialized, perceptive, and verbal level, the work with geographic maps might be mentioned. Our previous experience had shown that geographic maps and schemas are very useful for reflexive understanding of spatially meaningful information (Rodríguez et al., 2011).

In order to improve his ability for spatial representation, the patient was asked to locate continents, countries, oceans, and cities on maps. At the materialized stage, the patient had to show the direction and location of a geographic object (a city or a country, and so on) with the aid of external means: a plastic arrow or compass. The patient had to verbalize whether the city was above, below, to the left, or to the right in relation to another geographic object. At the perceptive stage, the patient had to paint with a chosen color the direction from one geographic point to another. A specific "orientation card" was used to facilitate the connection between the verbal expressions of "left=west"; "right=east"; "below=south"; "above=north."

At the level of verbal actions, the patient had to identify the relationship of one geographic point to another one using both kinds of verbal expressions: spatial prepositions with geographic terms. The patient was asked to write down these expressions as sentences describing the geographic relations. Different kinds of maps of cities, countries, continents, and the world were used during the sessions. Different routes were used to reach a point on the map. Localization of the geographic objects in a coordinate system was introduced and used.

Other activities used during rehabilitation for this purpose were the drawing of schematic symbolic models following the coordinate system, and the prediction of the position of colored circles after rotating the circle. The patient was asked to move a circle containing a sequence of colors at the materialized stage; to draw the corre-



Figure 2. The model of a circle for training in rotation

and internal (mental) rotation. These levels of the tasks correspond to the proposed levels of formation of action in activity theory, and the conception of the formation of action by stages adapted for interactive tasks (Galperin, 1998; Solovieva, 2014).

In these examples, we can see that the Figures 2 and 3 show circles with a given color pattern. The patient has to move, to imagine, and to express orally the next position of each color from another perspective (back, forward, left, right) during rotation.

The tasks of identifying different features, the classification of objects according to spatial features, and the building of models with blocks with no obvious division between elements were also used. Similar tasks were proposed by A.R. Luria for developing creativity through constructive tasks as a kind of advanced intellectual action for work with pre-school children (Luria in Solovieva & Quintanar, 2013).



Figure 3. The model of complex circle for training of rotation

sponding colors at the perceptive stage, and to say and write down the change at the verbal stage (see Figure 2). The perceptive stage required drawing of positions of colors according to mental rotation. The verbal stage implied oral explanation of the positions of the colors, and writing it down with appropriate sentences.

Figure 2 shows an example of a pattern used during the rehabilitation. In this task, the patient had to identify the order of the colors and to reproduce them in an empty circle. At first, simple models were used; more colors and more complex shapes were used later on.

Figure 3 shows a more complex example for the training of materialized, perceptive,

and internal (mental) rotation. These levels of the tasks correspond to the proposed levels of formation of action in activity theory, and the conception of the formation of action by stages adapted for interactive tasks (Galperin, 1998; Solovieva, 2014).

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Period 2

The second period of rehabilitation was dedicated to re-establishing the patient's self-regulation and control in more complex intellectual tasks. Spatial integration was included in the verbal actions of producing sentences and texts, including the development of a plan for each text.

Each activity was guided by the psychologist, who provided external "orientation cards" to enhance self-organization, planning, and structure (Talizina, 2009). Each card contained the steps to be followed in order to solve each task. At first, the cards included detailed steps. Next, the cards indicated only general key steps for the tasks. After some sessions, when the patient could remember the content of the cards, he was

asked to perform the task without any card and only mention the steps out loud. Similar groups of tasks with different variants were used in order to guarantee the best level of generalization and independent self-regulation on a verbal level (Talizina, 2008).

The goal of each activity was established at the beginning of the task, and the patient was encouraged to verify and correct his own work. The types of activities proposed for this purpose were mainly mathematical, according to the patient's needs. Talizina's (2001) methodology for "training of mathematical skills" was followed, with some modifications in light of the needs and motivations of our patient. The purpose of these tasks was the development of basic mathematical concepts, and to guarantee the reflexive understanding of the procedure for solving arithmetic problems independently.

The following steps for solving the problems were offered to the patient:

1. Analyze the problem by identifying important data with different colors, according to your choice.
2. Find the final question and missing information.
3. Establish the significant relationships between the elements of the problem.
4. Explain in your own words the content of the problem.
5. Write down the steps for solving the problem with symbols or a diagram.
5. Solve the problem by steps according to the diagram.
6. Write down the result.
7. Compare the result to the original posing of the problem.

The content of the "orientation card" was applied to the process of problem solving. All tasks were performed as joint activities between the psychologist and the patient, so that the patient was never left alone with his difficulties or hesitations. The adult provided all necessary help at all moments, both in understanding the content of the "orientation card," and the content of each problem to be solved during the process of rehabilitation. The tasks were presented with the help of external symbols at the first stage, with the help of perceptive symbols at the second stage, and only at the level of written and oral language at the third stage.

The tasks for abstract thinking, inference, and judgment

The complex tasks involved analysis of the content of artistic paintings and literary texts. "Orientation cards" were also used for these tasks in order to provide the steps needed for perceptive and verbal analysis of the content of visual and verbal narrative information.

In the case of the analysis of the artistic paintings, a list of questions was presented to the patient such as:

1. What are the interesting and important elements you find in the painting?
2. Where are these elements located and in what relation one to another?
3. Who (what) is the main character (feature) in the picture?
4. Which elements are relevant (irrelevant) in this painting?
5. What can you say about the natural elements (historical events)?
6. What can you say about the emotions expressed by the characters?
7. What is happening in the picture?

After such a detailed analysis, guided by the psychologist, the written description and a title for the painting were elaborated. The patient was always asked his opinion about the content and the title, so that he could make any necessary correction or improvement of his answers at all times, and even in later sessions.

In the analysis of the content of literary text, similar “orientation cards” were provided and used constantly. The patient was asked to read each paragraph of the text carefully, underline unknown words, and clarify their meanings in the dictionary. The patient had to write down a sentence for the content of each part of the text, including the main idea for each paragraph. The patient was asked to make inferences and hypotheses during the reading of each part of the text, to relate one part to another, and to verify his ideas as he progressed with the reading of the text. The patient was asked to identify relevant elements of the text, and to state his personal judgment about the characters, emotions, situations, and events of the story.

Different kinds of narrative and artistic texts were used in the rehabilitation. The patient himself took an active part in selection of the texts.

Complex grammatical structures

As the patient had severe problems with understanding complex grammatical structures of oral and written speech, specific tasks were designed to improve his written and oral language abilities. Among such tasks were the following: classification and comparison of grammatical categories of words by their semantic, morphological, and grammatical features; identification of root words and the exploration of their grammatical meaning while adding or subtracting suffixes and prefixes to nouns; transforming words from nouns to verbs or adjectives; solving word analogies; and analyzing sentences according to the syntactic functions of the words in the sentences (Solovieva, 2016). Creation of own variants of categories of words with posterior inclusion in sentences with different syntactical functions were used. “Orientation cards” with the essential features of each term and its grammatical or syntactic category were always included.

Results

Neuropsychological assessment was carried out after both the first and the second periods of rehabilitation. Important positive changes were observed at the end of each period of rehabilitation. Some

examples of the fulfillment of the tasks of neuropsychological assessment before rehabilitation, and after the first and second period of rehabilitation, are presented below. The tasks permitted us to identify mistakes of simplification of the elements and problems with the patient’s spatial integration in our initial assessment, and also after the first period of rehabilitation. Positive changes and the disappearance of



Figure 4. The copy of a house during initial assessment

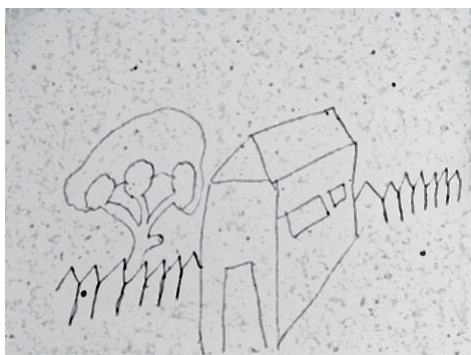


Figure 5. The copy of the house after the first period of rehabilitation



Figure 6. The copy of the house after the second period of rehabilitation

mistakes may be noticed in the fulfilment of the tasks after the second period of rehabilitation.

Figure 4 shows examples of the fulfillment of the task of copying the drawing of a house during the initial assessment, and after the first period of rehabilitation. Figure 5 presents the same task, while Figure 6 shows positive changes in the patient's copying after the second period of rehabilitation.

As a result of the first period of rehabilitation, the patient became able to fulfill tasks of regulation and control in activities such as playing table games and solving simple problems. The patient could understand and independently compose sentences describing spatial relations. At the same time, specific difficulties with construction and productions of written texts, solution of mathematical problems, and self-organization persisted.

After the second period of rehabilitation, the patient was able to organize his own complex verbal written expression. Such ability is essential for learning in general. Figure 7 presents an example of independent writing by the patient as the

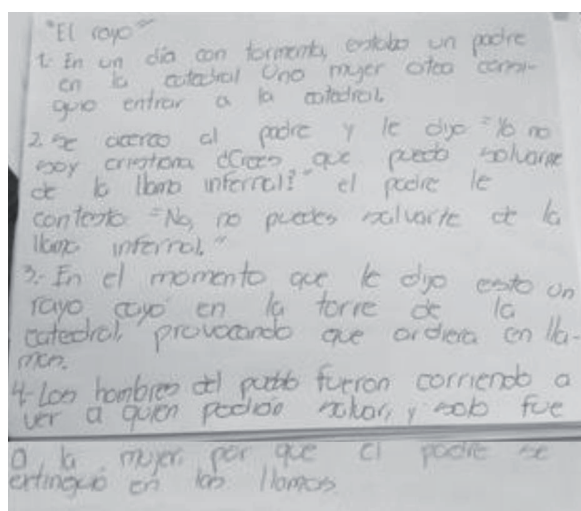


Figure 7. Independent writing at the end of the second period of rehabilitation

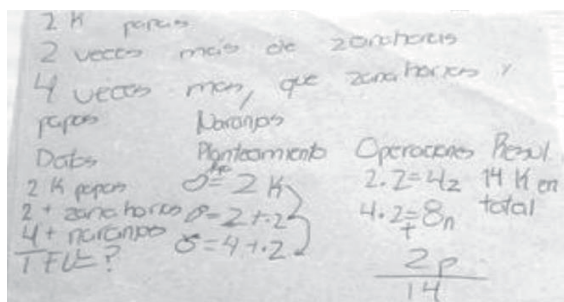


Figure 8. Solution of the problem after the second period of rehabilitation

result of the work on this stage. It is possible to note the adequate organization of ideas and of space in the text, written independently by the patient, in which he describes what he did during his vacations (the text is in Spanish).

The patient also became able to create and to solve mathematical problems independently after the second period of rehabilitation. Figure 8 shows an example of problem-solving by the patient according to an external symbolic scheme for reaching the solution. Such problems weren't accessible to the patient during initial assessment.

The results show how the process of rehabilitation allowed the patient to achieve positive reintegration into school activities and communication with his family and friends. The patient became able to complete individual tasks at home; he became more responsible and motivated in all kinds of practical and intellectual activities in his life. Negative emotions disappeared. The patient became reflective, self-critical, and involved in his own achievements and difficulties. Impulsive behavior disappeared. His parents have described positive changes in their day-to-day communication with him.

Discussion

The results of this study permit us to confirm the usefulness of Luria's proposal of the concept and method of the neuropsychological syndrome for assessment and rehabilitation. The concept of the neuropsychological syndrome is useful both for assessment in cases of acquired brain injury, and for the creation and implementation of a program for rehabilitation. Implementation of this methodology was possible and useful for a patient of the psychological age of adolescence.

The patient's neuropsychological syndrome identified in our study, according to established levels of analyses, was as follows:

- 1) Damage to the neuroanatomical structure of central nervous system of an adolescent with brain lesions in both the left anterior and posterior cortical regions;
- 2) Weak neuropsychological mechanisms: regulation and control, and spatial integration;
- 3) Practical and intellectual actions corresponding to the psychological age and personality of the patient: all types of secondary school intellectual ac-

tions, which include active self-regulation and spatial integration (specifically difficulties with written production and problem solving);

- 4) Complex verbal actions disturbed as the consequence of the weak neuropsychological factor: difficulties in understanding and self-expression in oral and written sentences and texts with complex grammatical and syntactical structures.

It is possible to note how the same neuropsychological factors (mechanisms) take part in a variety of the difficulties presented by the patient. There is no need for a separate assessment of language, memory, attention, reading, writing, or executive functions in our patient. We believe that neuropsychological factors of regulation and control and spatial integration, applied to psychological age of an adolescent, are quite enough to understand the neuropsychological syndrome of our patient, and to provide a useful program for rehabilitation. We insist that such an approach is close to the one expressed in all known publications of Luria, and in his famous short novels dedicated to the history of only one patient (Luria, 1987).

One particularly interesting feature of this patient's syndrome was the presence of two central neuropsychological factors: difficulties with regulation of control and with spatial integration. The first difficulty was the consequence of the brain lesion in anterior brain region, while the second one was related to posterior brain region. Both lesions were located in cortical areas of the left hemisphere. Classical cases of patients with aphasia or patients with frontal syndrome presented in Luria's publications were adults with local brain damage, or a series of ischemic events with unique neuropsychological factors identified as the psychophysiological reason for the difficulties (Luria, 1947). Our study presents the case of combined neuropsychological factors in an adolescent patient with acquired brain damage.

At the same time, it is necessary to remember that Luria's theory didn't appear in a vacuum. His theory is a logical continuation of Vigotsky's conception of the zone of proximate development as a cultural development shared between an adult and a child. In our case, the zone of proximate development was provided by the psychologist in goal-directed tasks at different levels of actions. All actions were significant and motivated actions for the age of adolescence.

We want to stress here that creation of such tasks would be impossible without the continuation of the great ideas of Vigotsky in the works of representatives of his activity theory (Leontiev, 1975; Galperin, Zaporozhets, Elkonin, 1987; Talizina, Solovieva & Quintanar, 2010). The central concepts of this theory, such as identifying the central dominant activity of each psychological age, the role of the activity of verbal and non-verbal communication, and the formation of intellectual actions by steps and external-internal orientation, were created during the same historical period as the main concepts of Luria's neuropsychological theory. We believe that modern conceptualization of these ideas should be one of the important tasks for neuropsychologists and psychologists in general.

We dedicate our work to the memory of A.R. Luria and P.Ya. Galperin, who constantly guide us in our work with patients of different ages in Latin America, on the 115th anniversary of their births.

Conclusions

1. Luria's syndrome analysis is a qualitative neuropsychological method, and should be understood as the basis for assessment and rehabilitation.
2. Syndrome analysis is useful for extra space work with adolescent patients with acquired brain injury.
3. Formation of joint cultural activity as the origin of psychological development and also of neuropsychological rehabilitation in cases of brain injury. Specific stages and goals should be considered for the elaboration of concrete programs.
4. Subject-object (subject) participation in motivated activity according to psychological age should be taken into account while working with adolescents with brain injury.

References

- Akhutina, T.V. (2001) Neuropsychological approximation to diagnosis and correction of learning difficulties in acquisition of writing. In: M.G. Chrakovskaya (Ed.) *Modern approach to diagnosis and correction of speech disorders*. San Petersburg, University of San Petersburg., 195–213.
- Akhutina, T.V. (2003). L.S. Vygotsky & A.R. Luria: Foundations of neuropsychology. *Journal of Russian and East European Psychology* DOI: 10.2753/RPO1061-0405370213, 41(3–4), 159–190. <https://doi.org/10.2753/RPO1061-0405370213>
- Akhutina, T.V. (2004). Writing: Assessment and remediation. In T.V. Akhutina, J.M. Glozman, L.I. Moskovich, & D. Robbins (Eds.), *A.R. Luria and Contemporary Psychology: Festschrift celebrating the centennial of his birth*. New York: Nova Science Publishers: 125–144.
- Akhutina, T.V. & Pilayeva, N.M. (2012). *Overcoming learning disabilities. A Vigotskian-Lurian neuropsychological approach*. Cambridge, Cambridge University Press. DOI: 10.1017/S0956796812000081
- Akhutina, T.V. (2016). Luria's classification of aphasia and its theoretical basis. *Aphasiology*, 30(8), 878–897. <https://doi.org/10.1080/02687038.2015.1070950>
- Akhutina, T.V. (2016). Development of the Russian neuropsychological school according to the literature and archival sources. History of clinical and fundamental neurophysiology in Russia: Contribution to European neuroscience. *Abstracts of International Seminar FENS*, 93–95. M.: MSMSU.
- American Psychiatric Association. (2014). *Guía de consulta de los criterios diagnósticos del DSM-5**: Spanish Edition of the Desk Reference to the Diagnostic Criteria From DSM-5*. American Psychiatric Pub.
- Ardila, A. (2010). A proposed reinterpretation and reclassification of aphasia syndromes. *Aphasiology*, 24, 363–394. <https://doi.org/10.1080/02687030600741667>
- Asmolv, A.G. (2000). *Del otro lado de la conciencia: problemas metodológicos de la psicología no clásica*. Moscú: Sentido.
- Elkonin, D.B. (1995). *Desarrollo psicológico en las edades infantiles*. Moscú: Academia de Ciencias Pedagógicas y Sociales.
- Galperin, P.Ya. (1992). Stage-by-stage formation as a method of psychological investigation. *Journal of Russian and East European Psychology*. <https://doi.org/10.2753/RPO1061-0405370213>
- Galperin, P.Ya., Zaporozhets, D., & Elkonin, D. (1987). Problems of the formation of knowledge and abilities in schoolchildren and new methods of teaching in school. In V.V. Davidov,

- & A. Márkova (Eds.) *The evolutionary and pedagogical psychology of the USSR. Anthology*, 300–316. USSR: Progress.
- Galperin, P.Ya. (1998). *Psicología como ciencia objetiva*. Moscú, Academia de las Ciencias Pedagógicas y Sociales de Rusia.
- Glozman, J.M. (2013). *Developmental Neuropsychology*. London: Routledge.
- Glozman, J.M. & Potanina, A.Y. (2004). La concepción de A.R. Luria acerca de los tres bloques cerebrales para la corrección de la disgrafía y la dislexia. En: *Materiales de VII Conferencia Internacional de Psicología, Pedagogía y Sociología de lectura. Parte I*, 13–17. Moscú: Ciencia.
- Kotik-Friedgut, B. & Solovey, P. (2003). How to learn language to learn it better? Jerusalem, Lira.
- Kotik-Friedgut, B. (2006). Development of the Lurian Approach: A Cultural Neurolinguistic Perspective. *Neuropsychology Review*, 16(1), 43–52. <https://doi.org/10.1007/s11065-006-9003-9>
- Leontiev, A.N. (1960). The needs and motives of the activity. In A.A. Smirnov, S.L. Rubinstein, A.N. Leontiev, & B.M. Tieplov (Eds.). *Psychology*, 341–354. Mexico: Grijalbo.
- Leontiev, A.N. (2003). Génesis de la actividad. En: A.N. Leontiev. *Formación de la psicología de la actividad*, 373–385. Moscú: Sentido. Serie: Clásica viva.
- Leontiev, A.N. (1975). *Activity, consciousness, personality*. Moscow, Moscow State University.
- Leontiev, A.N. (2009). *Bases psicológicas del desarrollo del niño y de la enseñanza*. Moscú, Sentido.
- Lezak, M.D. (1982). The problem of assessing executive functions. *International Journal of Psychology*, 17, 281–297. <https://doi.org/10.1080/00207598208247445>
- Luria, A.R. (1947). *Traumatic aphasia*. Moscow: Academy of Medicine Sciences.
- Luria, A. (1970). The functional organization of the human brain. *Scientific American*, 222, 406–413. <https://doi.org/10.1038/scientificamerican0518-66>
- Luria, A.R. (1973). The origin and cerebral organization of man's conscious action. In: S. Spair & A. Nitzburg (Eds.) *Children with learning problems: Readings in a developmental-interaction*. New York, Brunner/Mazel, 109–130.
- Luria, A.R. (1975). *Basic fundamentals of neurolinguistics*. Moscow: Moscow State University.
- Luria, A.R. (1987). *The man with a shattered world*. Cambridge, MA: Harvard University Press. <https://doi.org/10.1086/292375>
- Luria, A.R. (1982). *Scientific autobiography*. Moscow: Moscow State University.
- Machinskaya, R.I., Sokolova, L.S., & Krupskaya, E.V. (2007) Formation of the functional organization of the cerebral cortex at rest in young schoolchildren varying in the maturity of cerebral regulatory systems: II. Analysis of EEG a-rhythm coherence. *Human Physiology*, 33, 2, 129–138. <https://doi.org/10.1134/S0362119707020016>
- Machinskaya, R., Semenova, O., Absatova, K., & Subogrova, G. (2014). Neurophysiological factors associated with deficit in children with ADHD symptoms: EEG and neuropsychological analysis. *Psychology and Neuroscience*, 7(4), 461–73. <https://doi.org/10.3922/j.psns.2014.4.05>
- Machinskaya, R., Subogrova, G., & Semenova, O. (2016). An interdisciplinary approach to analysis of the cerebral mechanisms of learning difficulties in children. Experience of studies of children with signs of ADHD. *Neuroscience & Behavioral Physiology*, 45(1), 58–73. <https://doi.org/10.1007/s11055-014-0040-1>
- Matute, E. (2012). *Tendencias actuales de las neurociencias cognitivas*. México, Manual Moderno.
- Mikadze, Yu. M. (2008) *Child neuropsychology*. Moscow, Piter Press.

- Plaisted, J., Gustavson, J., Wilkening, G., & Golden, C. (1983) The Luria-Nebraska neuropsychological battery-children's revision: Theory and current research findings. *Journal of Clinical Child Psychology*, 12, 13–21. <https://doi.org/10.1080/15374416.2016.1266649>
- Quintanar, L. & Solovieva, Yu. (2010). *Evaluación neuropsicológica de la actividad verbal*. México, Universidad Autónoma de Puebla.
- Quintanar, L., Solovieva, Yu., & León-Carrión, J. (2013). *Evaluación Clínico Neuropsicológica de la Afasia Puebla-Sevilla*. México: Universidad Autónoma de Puebla.
- Rodríguez, F., Solovieva, Yu., Bonilla, R., Pelayo, H., & Quintanar, L. (2011). Rehabilitación neuropsicológica en un caso de afasia semántica. *Revista Neuropsicología Latinoamericana*, 3(2), 39–49. <https://doi.org/10.5579/rnl.2011.0067>
- Rains, D. (2004). *Principios de neuropsicología humana*. México Ed. McGraw Hill.
- Rosselli, M., Matute, E., & Ardila, A. (2010). *Neuropsicología del desarrollo infantil*. México, Manual Moderno.
- Rosselli, M., Matute, E., Ardila, A., Botero, V., Tangarife, G., Echevería, S., & Ocampo, P. (2004). Evaluación Neuropsicológica Infantil (ENI): una batería para la evaluación de niños entre 5 y 6 años de edad. Estudio normativo colombiano. *Revista de Neurología*, 38, 8, 720–731.
- Solovieva, Y., Bonilla, M. del R., & Quintanar, L. (2006). Análisis Neuropsicológico de los Problemas de Aprendizaje en Adolescentes. *Revista de Ciencias Clínicas*, 7(2), 55–63.
- Solovieva, Yu. & Quintanar, L., (2009). Introducción a la lectura desde el enfoque histórico-cultural. En: E.A. Escotto, M. Pérez y M.A. Villa (Eds.) *Desarrollo y alteraciones del lenguaje, neuropsicología y genética de la inteligencia*. México, UNAM, 137–159.
- Solovieva, Yu. & Quintanar, L. (2012). *Evaluación neuropsicológica en la edad escolar*. México, Universidad Autónoma de Puebla.
- Solovieva, Yu. & Quintanar, L. (2013). *Evaluación neuropsicológica infantil breve*. México, Universidad Autónoma de Puebla.
- Solovieva, Yu. & Quintanar, L. (2013). *Antología del desarrollo en la edad preescolar*. México: Trillas.
- Solovieva, Yu. (2014). *La actividad intelectual en el paradigma histórico-cultural*. México: CEIDE.
- Solovieva, Yu. & Quintanar, L. (2014a). Syndromic analysis of ADHD at preschool age according to A.R. Luria's concept. *Psychology and Neuroscience*, 7, 4, 443–452. <https://doi.org/10.3922/j.psns.2014.4.03>
- Solovieva, Yu. & Quintanar, L. (2014b). Principios y objetivos para la corrección y el desarrollo en la neuropsicología infantil. En: H. Patiño & V. López (Eds.) *Prevención y evaluación en Psicología*. Manual Moderno, 61–74.
- Solovieva, Yu., Bonilla, R., & Quintanar, L. (2014). Corrección neuropsicológica de problemas de aprendizaje escolar en la adolescencia. En: M. Perez, A. Escotto, J. Arango & L. Quintanar *Rehabilitación neuropsicológica. Estrategias en trastornos en la infancia y del adulto*. México: Manual Moderno: 77–96.
- Solovieva, Yu. & Quintanar, L. (2016). Análisis sindrómico en casos de problemas de desarrollo y aprendizaje: siguiendo a A.R. Luria. In: D.F. Da Silva, J.H. Ávila, H. Góis, J. Leonel, N. Ferreira, Yu. Solovieva & L. Quintanar (Eds.) *Neuroscience to Neuropsychology: The study of the human brain (vol. I)*, 387–414. Barranquilla, Ed. Corporación Universitaria Reformada.
- Solovieva, Yu. & Quintanar, L. (2015). Qualitative syndrome analysis by neuropsychological assessment in preschoolers with attention deficit disorder with hyperactivity. *Psychology in Russia: State of the Art*, 8, 3, 1–12. <https://doi.org/10.11621/pir.2013.0202>
- Solovieva, Yu. & Quintanar, L. (2017b). Stages for introduction of drawing actions in pre-school age. *Journal of Education and Culture Studies*, 1(1), 12–24. <https://doi.org/10.22158/jecs.v1n1p12>

- Solovieva, Yu., Machinskaya, R., Quintanar, L., Bonilla, R., & Pelayo, H. (2013) *Neuropsicología y electrofisiología del TDA en la edad preescolar*. México, Universidad Autónoma de Puebla.
- Solovieva, Yu. (2016). *Enseñanza del lenguaje escrito*. Mexico: Trillas.
- Solovieva, Yu. & Quintanar, L. (2017a). Psychological concepts of activity theory in child neuropsychology. *Journal of Education and Cultural Studies*, 1(1), 25–41. <https://doi.org/10.22158/jecs.v1n1p25>
- Solovieva, Yu., Rivas, X., Méndez-Balbuena, I., Machinskaya, R., & Pelayo, H. (2016). Neuropsychology and electroencephalography to study attention deficit hyperactivity disorder. *Rev. Fac. Med*, 64(3), 427–434. <https://doi.org/10.15446/revfacmed.v64n3.54924>
- Solovieva, Yu., Torrado, O., Maravilla, L., & Rivas, X. (2017). Análisis neuropsicológico diferencial en dos casos diagnosticados con TDAH. *Informes psicológicos*, 17(1), 121–141.
- Talizina, N.F. (2001). *Formation of abilities of mathematical thinking*. San Luis Potosí: Autonomous University of San Luis Potosí.
- Talizina, N.F. (2008). Psychological mechanisms of generalization. *Acta Neurológica Colombiana*, 24(2), Supplement., 76–88. <https://doi.org/10.22379/issn.2422-4022>
- Talizina, N.F. (2009). *The theory of activity applied to teaching*. Mexico: Universidad Autónoma de Puebla.
- Talizina, N., Solovieva, Y., & Quintanar, L., (2010). The approach of the activity in psychology and its relation with the historical-cultural approach of L.S. Vygotsky. *Educational News*, (230), 4–8.
- Teeter P. (1986) Standard neuropsychological test batteries for children. In: J. Obrzut & G. Hynd (Eds.) *Child neuropsychology*, 187–227. Orlando: Academic Press. <https://doi.org/10.1016/B978-0-12-524042-0.50013-9>
- Toomela, A. (2014). There can be no cultural-historical psychology without neuropsychology. And vice versa. In: A. Yasnitsky, R. Van Der Veer, & M. Ferrari (Eds.). *The Cambridge Handbook of Cultural-Historical psychology*, 315–349. New York: Cambridge University Press. <https://doi.org/10.1017/S0956796812000081>
- Tsvetkova, L. (2016a). Bases teóricas, objetivos y principios de la enseñanza rehabilitatoria. In Y. Solovieva & L. Quintanar (Eds.). *Rehabilitación Neuropsicológica Historia, teoría y Práctica*, 177–191. México: Universidad Autónoma de Puebla.
- Tsvetkova, L.S. (2016b). Hacia una teoría de la enseñanza rehabilitatoria. In Y. Solovieva & L. Quintanar (Eds.). *Bases teóricas, objetivos y principios de la enseñanza rehabilitatoria*, 167–176. México: Universidad Autónoma de Puebla.
- Vygotsky, L.S. (1984) *Problems of child psychology. Selected Works. Vol. 4*. Moscow, Pedagogy.
- Weschler, D. (1987) *Weschler Memory Scale-Revised*. New York, Psychological Corporation.

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Psychological security as the foundation of personal psychological wellbeing (analytical review)

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Background. Security as a socio-cultural phenomenon requires a comprehensive approach and integrates a multitude of aspects of social reality, each of which is important both for an individual and society as a whole. It has been shown that there are certain universal desires and needs which are valued by all cultures and peoples as essential to providing a high quality of life; one of such universals is the need for security. Consequently, the status of people's security in a society directly depends on the processes taking place in the society as a whole, and a craving for security and the need for it act as powerful stimulators of social changes.

Aim. A theoretical analysis of studies on psychological security as a socio-cultural phenomenon.

Method. Sources were selected according to the following principles of scientific cognition: development, systematicity, and determinism.

Result and discussion. It has been shown that, on the one hand, an individual's security is the result of an effective political, economic, social, and cultural environment. On the other hand, a society's security is a combination of individual people's security. It has been proved that the strengthening of a society's psychological security is key to achieving the wellbeing of different categories of people.

It has been demonstrated that security is a dynamic process, since at every point in time we are dealing with a new type of danger. As a result, psychological security must constantly be created all over again. The latent character of security is shown by the fact that a person starts to strain after it only when an actual threat to life, health, and wellbeing emerges. What's more, the use of an interdisciplinary approach (psychological and sociological, in particular) appears to be the most fruitful, especially with regard to such latent phenomena as security and wellbeing.

It has been shown that all aspects of human behavior in all spheres of life can be interpreted in the context of both the sense of security and actual security, and in most cases it is the need for security that guides man's action. It has also been demonstrated

that people's perceptions and assessment of their state of security are psychological processes, and thus, they are exposed to individual and group differences.

Modern research has shown that, in the modern world, the link between a sense of wellbeing and sense of security is drawing increasing attention. Yet it should be noted that there is a tendency to interpret the concept of security restrictively as protection from harm and satisfaction of basic needs. In other words, the idea that psychological wellbeing and security are complementary and mutually conditioned concepts has not been dealt with so far.

Keywords: psychological security, psychological wellbeing, "ontological" security, "security theater," need for security, perception of security.

Introduction

Today's society has a level of actual security which, according to all basic parameters — from the probability of death by violence to the normal level of hygiene — is higher than it used to be. Yet, people still feel the need for more security, and are consumed with tracking down various possible dangers and threats in the social realm. International conflicts, the danger of nuclear war, and environmental threats stir up feelings of fear, uncertainty, and the senselessness of existence. When a person experiences instability in his milieu, his psychological wellbeing shrinks, and he is extremely sensitive to "future shock" (Toffler, 2002). In addition, highly industrialized societies have not succeeded in formulating an ideology "capable of satisfying man's need for meaningful existence and sense of community" (Ross & Nisbett, 1999, p. 326). In the modern world, security is no longer an abstract notion; it becomes a concrete phenomenon created by interacting individuals.

Erratic turbulences have transformed the world arena over the past decades. Among them the following ones are worth noting: globalization (Sloterdijk, 2013); the development of increasingly lethal technologies; the financial crisis of 2008; inequality of wealth (Milanovic, 2016); and the increasing lack of "common human decency" (Orwell, 2001). Wars (Broch, 1996), invasions, territorial alterations (Hogenraad, 2016; Kershaw, 2016; Hogenraad & Garagozov, 2010), demographical shifts (Jameson, 2016), terrorism, and corruption (Delumeau, 1990) are all threatening stability. As a Belgian psychologist noted, it looks as if we are entering a new historical period, as yet unnamed, without a compass (Hogenraad, 2017), but it is undeniable that the key challenge is providing security. "We are short of conceptions to understand what we have experienced" (Musil, 1990, p. 117).

One can hardly name a period in the history of Russia when a person could feel completely secure. His environment has always been fraught with lots of threats. As Russia's power and social structures and its society itself evolved, the types and the degrees of dangers and threats have undergone various changes. Therefore, in 2017 a Russian faced different threats than those of 1717 (Serov, 2013). In the opinion of O.N. Yanitsky, "there is no consent (consensus) in the Russian society with regard to basic values and purposes as well as a coordinated scenario of the future... The underlying, normative model of a society includes security, survival, preservation of the accumulated or earlier acquired" (Yanitsky, 2003, p. 20).

Ongoing social transformations can alter ordinary dangers, create new risks, and change a society's strategies. Thus, over the last decade, Russia has encountered new forms of social movements and spontaneous manifestations of different social groups, which are sure to have a great impact on the life of every person. The character of these new social groupings matches the modern stage of the development of Russian society and its evolving structure of social stratification. So, in I. Panarin's view, "reconsideration of priorities and emphases for treating problems of national security presented science and practices with the necessity to work on an entirely new aspect of this problem — the problem of psychological security" (Panarin, 2001. p. 34).

On the whole, when considering the issue of security, one's starting assumption is that its essential characteristic is its relativity. The state of security is influenced by a huge number of factors which are individualized. To make an absolute characterization of a state under consideration is impossible, as it could lead either to the exclusion of a lot of phenomena, or to taking into account a great number of phenomena which are irrelevant.

This paper provides a theoretical analysis of studies into psychological security as a socio-cultural phenomenon; identifies the purposes of security; and considers various views on the nature of security, as well as outlines the prospects for further research. The analysis we present is aimed at providing a clearer understanding of the structure, functions, and genesis of psychological security; and accentuating significant psychological factors and formative mechanisms.

In what follows, we shall analyze a variety of perspectives from which psychological security has been interpreted.

Method

Our sources were selected on the basis of the following principles of scientific cognition:

- The principle of development, on the basis of which psychological security is considered to be a phenomenon with phylo- and ontogenesis.
- The principle of systematicity, thanks to which security can be seen as a structure in itself, on the one hand, and as interconnected with many manifestations of the personality, on the other.
- The principle of determinism, which allows for taking into account the actual reasons for the formation and development of psychological security, and for the individual personality as both the subject and object of security.

Results and discussion

Psychological security: definition, features, and specifics of interpretation

Security psychology today can definitely be treated as a relatively sustainable, coherent, and holistic system of knowledge which integrates the most relevant layers of modern cognition.

Thanks to dozens of foreign (Bar-Tal, 1991; Beck, 1992; Beck, 1999; Giddens, 1984; Giddens, 1990; Giddens, 1991; Schneier, 2003; Wæver, 1995) and domestic (Baeva & Bordovskaia, 2015; Malakhov, 2013; Zhuravlyov & Tarabrina, 2012; Zotova, 2011) researchers, this field of knowledge has become an independent branch of science. The inter-disciplinary character of its subject-matter has been increasingly identified as an overall, multi-dimensional phenomenon which requires system-based and comprehensive research with the help of methods and tools adequate to its content.

That said, considering the general context of modern security psychology, most authors agree that this discipline is still under development as a science.

Arguably, scientific methods of analysis have been formulated, an internally-consistent scholarly language has been constructed, and a basic set of methodological tools for interpretation and analysis has been defined.

However, it must be noted that the discipline's own "language," its specific principles and laws, and its subject matter, are still being concretized and acquiring their categorical content, methodology, and cognitive meaning.

Psychological security is the state of an individual when he/she can satisfy his/her basic needs for self-preservation and perceive his/her own (psychological) shelteredness *in socium* (Zotova, 2011).

Very few people would deny that security, both individual and national, along with international, stands at the top of the international agenda.

Strategies associated with the provision of security are aimed at identifying and preventing threats. The purpose of security can be interpreted variously:

1. Protection of human life.
2. Protection of people from existing threats.
3. Provision of vital rights and freedoms for all people.
4. Creation of political, economic, social, and cultural conditions under which people can live knowing that their rights and freedoms are secured.

The above-mentioned approaches demonstrate that man's security is more likely to be the result of an effective political, economic, social, cultural, and natural environment than of the accomplishment of a set of ministerial directives. But this is only one side of the "coin." On the other hand, society's security is a byproduct of its members' sense of being secure.

The idea of security can be more easily applied to things than to people. Since material values are often replaceable, their safety and security can be increased by means of loss insurance. What comprises the security of individuals cannot be defined so easily. Factors affecting their security — life, health, status, wealth, freedom — are more complicated, and many of them cannot be replaced in the event of their loss. That is why the key to people's wellbeing is the strengthening of their psychological security.

It is worth mentioning that psychological security refers, to a large extent, to hypothetical constructions which are hard to measure. We cannot see "insecurity" except in the cases where people themselves talk about it. Also, we should note that the creation of psychological security is an elaborate and labor-consuming process, and then it can be destroyed by one wrong move, from one breath to the next.

Psychological security embraces conative, cognitive, and emotional constructs which make it possible to treat security as a psychological phenomenon with a standard structure. Hence security can be described as a state of inner peace, confidence, positive attitude, trust, subjective wellbeing, openness, and relaxation.

Many psychological theories, to a lesser or greater extent, address the issue of security by trying to answer these questions: What is the nature of security? What defines a hazard to man? What are the characteristics of man's behavior in risk situations?

Despite the diversity of answers to these questions, some affinity of views can be identified.

First, quite a number of authors agree that security is a dynamic process. At each point in time, we deal with a new type of danger, and as a result, psychological security must constantly be created anew.

Second, the latent character of security should be noted. We strive for it only when a threat to our life, health, or wellbeing appears. In a stable society, the issue of security is not brought up for discussion, as a rule.

Third, a healthy feeling of security is a basic sensation of a normal person. All aspects of human behavior in all spheres of life can be treated in the context of security, and most of our actions are guided by our need for security.

Each of these perspectives raises its own questions, and deals with the security phenomenon under consideration from a specific angle, identifying certain criteria, levels, and notions of security.

Within the framework of our review, we believe that scholars should focus on the following orientations toward the psychological connotations of security:

A definition of security with regard to risk perception.

Some researchers assume that the sense of security/insecurity reflects a presentiment of risk or danger, a risk or danger that can or cannot happen, and a feeling about the situation's manageability (Cong & An, 2004).

Since the middle of the 1990s the concepts of the "risk society" (Beck, 1992) and "global risk society" (Beck, 1999; Beck, 2011) have arisen in both the social sciences and international relations (see Brauch, 2011). Many disciplines have aimed at risk analysis. Although risk calculations as a function of probability — i.e., whether the event can occur in fact — belong to the field of natural sciences, people's reactions to risk situations belong to the area of psychology (Renn et al., 2007). So, Lofstedt and Frewer argued that people's reactions to dangers depend on their knowledge and experience (Lofstedt & Frewer, 1998).

U. Beck (Beck, 1992) claimed that risk increases along with technological complexity. His theory of the "risk society" posed the problem of risk in the context of the theory of modernity, focusing mainly on technical hazards and, to a lesser extent, on social actions. W. Bonß (Bonß, 1995, pp. 18–19) assumed that risks should be analyzed in the context of the social construction of uncertainties. Although uncertainties about dangers exist irrespective of man's actions, uncertainties associated with risks include intentions as well as actions. Therefore, risks often result

from decisions made under uncertainty. Since complete confidence can hardly be achieved, Llewellyn (see Brauch, 2011) states that “risk and uncertainty are integral to human behavior.” “Uncertainty arises when the future is unknown.” Consequently, risk analysis is applied to situations with indefinite results.

Based on Ronald Laing’s interpretation of ontological defenselessness, E. Giddens put forward the term *ontological security* (Giddens, 1984; Giddens, 1991), which he saw as the product of the modern era — times of uncertainty and upheavals.

Speaking about dangers/risks and trust on the basis of which “ontological” security emerges, E. Giddens singled out two models of “conditions” which define the relationships between them: pre-modern and modern. Hazards for pre-modern cultures are represented by the Physical World (diseases, the caprices of the weather), human violence, and “existential” fears, while the model of trust and security is based on family and community ties, religious cosmology, and tradition, which are treated by E. Giddens as routine practices and rituals. In the modern world, threats are modifying: ecological, wartime, and psychological risks are mostly connected with the development of industries and technologies. Hence, security is achieved with the help of “abstract systems” which establish a network of state, or super-state, institutions.

For E. Giddens, the sense of security stems from order, stability, and routine, the combination of which gives meaning to life. When a state of security is achieved, man is no longer troubled with existential matters. And vice versa: Chaos, unrest, and violence bring about threats to security, create anxiety, and nullify trust in life’s predictability.

Man in the state of ontological insecurity is characterized by obsessive over-exaggeration of risks to his personality, extreme self-analysis, and moral emptiness (Giddens, 1991). E. Giddens considers ontological security to be an emotional phenomenon entailing “the conviction that the majority of people have continuity of their own identity, that social and material world around them is changeless” (Giddens, 1990, p. 92). Ontological security is “an emotional, and not a cognitive phenomenon, and it stems from the unconscious” (Giddens, 1990, p. 92).

Security through the lens of socio-constructivist approach

Wolfers (see Brauch, 2011) pointed to two sides of security: “Security, in the objective sense, measures the lack of threats to values acquired, and, in the subjective sense, it speaks about absence of fear that these values will be attacked.” From the perspective of social constructivism in international affairs (Adler, 1997; Fearon & Wendt, 2002; Risse, 2003; Wendt, 1992; Wendt, 1999), “security is seen as the result of the process of social and political interaction where social values and norms, collective identities and cultural traditions are important.” From this standpoint, security is always subjective, or “security is ‘man-made’” (Wendt, 1992). In order to achieve security, not only a lack of objective dangers but also the absence of subjective apprehension is essential. In other words, objective security is achieved when dangers associated with various threats, challenges, vulnerabilities, and risks are avoided, managed, and eliminated.

Subjective theories of security

Perceptions of security are shaped individually, and they represent subjective reflections of reality. The content of security perceptions has a wide scope. Thus, the person himself, his family, his ethnic or religious group, his nation, and the entire world can act as the object of security. Categories of security perceptions also include a lot of other factors relating to conditions that can either weaken or strengthen security.

Pioneering works in this field come from J. Der Derian (1993), B. Busan (1991), and O. Wæver (1995). These authors were at the forefront of the “postmodernist” (or “poststructuralist”) approach to the theory of international relations. They shifted focus from the analysis of “security” and “insecurity,” to the analysis of their meaning in a bit different context. As a result, the epistemological foundations of the scientific discipline called “security studies” are emphasized. Moreover, the authors do not set “security” against “threats” or “dangers”; they set it against “insecurity,” thus adding a subjective component (feelings and sensations) to the analysis of the phenomenon (Weldes et al., 1999).

In the opinion of Russian philosopher and political analyst V. Malakhov (2013), modern rhetoric about security “frames” our reality, a fact which is reflected in “the mobilization of certain perceptions” through the use of new meanings. The use of “insecurity” language results not only in the mobilization of thinking but also in the transformation of the semantic field (Huysmans, 2006. p. 24). That is why the struggle between different perceptions and visions of the problem always lies behind varying behavioral strategies and the politics of insecurity.

The perception and assessment of security are psychological processes; hence, they are subject to individual and group differences (Bar-Tal, 1991). At the level of an individual, even members of the same group can differ from each other in their security perceptions. In other words, the perceptions of security or danger within one and the same group may follow no particular pattern.

Individual distinctions in security perceptions and the security state arise due to differences in people’s experience, their ability to perceive, perceptive selectiveness, and individual ways of processing information, motivation, and knowledge, all of which influence the interrelations between the information perceived and the ability to cope with threats (Bar-Tal et al., 1997; Epstein, 1994; Fiske & Taylor, 1991; Kruglanski, 1989; Lazarus et al., 1985; Nisbett & Ross, 1980). These distinctions imply that, on the one hand, people evaluate the degree of danger and threat in different ways; on the other, they differ in their evaluation of their group’s abilities to overcome and sort out difficulties (Bar-Tal et al., 1995; Jacobson & Bar-Tal, 1995). The distinctions mentioned are most clearly seen in situations of uncertainty, which, in fact, make up the majority of cases. Few situations contain genuine physical dangers, as in the cases of natural disasters, war conflicts, ecological catastrophes, etc. However, even in situations of this kind, the information received can be of indefinite character, and hence, can be assessed in different manners by different people.

Security Theater

In the light of subjective theories of security, not without interest is the concept of a “Security Theater,” which denotes a package of measures aimed at providing secu-

rity but, in fact, fails to provide it (Schneier, 2003). For that reason E. Felten (Felten, 2004) gives the definition “security theater” to the safety precautions introduced in airports after the September 11 terrorist attacks.

The fact is that sometimes the sensation of security is more important than actual security. If potential victims feel sheltered, they can avoid crippling fear even if white lies are used. In addition, potential evil-doers may abandon the idea of attacking in a place that looks heavily protected. A security theater, as a rule, imposes limitations, or makes people undergo very specific procedures which can be taken as restrictions of personal liberty and privacy rights.

Two studies carried out by a research group from Cornell University demonstrated that the security upgrade in U.S. airports following the September 11 terrorist acts led to the rise in the number of car accidents, as potential air travelers gave up the idea of traveling by air and chose overland transport, thus exposing themselves to a greater risk than an air crash fatality. The researchers found out that in 2005, changes in passengers’ flight regimes caused 242 car crash fatalities, the equivalent of “full passenger loads of four Boeing 737s.” If these people had preferred going by air, they might have avoided their sad fate.

In many cases, the obtrusive measures of a security theater create secondary negative consequences whose real cost is hard to evaluate. These after-effects are often associated with fear. For example, on seeing a lot of armed security men and thorough searches, a person may get nervous, thinking that there is a real threat at his elbow. In the context of flights, such an unreasonable fear can create a situation where some citizens give up traveling by air.

Security and psychological wellbeing

Security and psychological wellbeing are concepts comprising hosts of factors, and the first of them is subjectivity. These concepts belong to those constructs which, like other beliefs and feelings, are embedded in the human mind. This means that particular people or group members (for instance, ethnic groups and national representatives) perceive security and wellbeing through the lens of their personal experience, or from the perspective of their group and its systems. Thus, security and wellbeing represent a psychological experience which, in most cases, can be measured by questioning whether people feel secure/insecure, balanced/imbalanced, etc. Security and wellbeing cannot be assessed objectively. We can deal here only with the subjective estimates of those who are assessed.

“The subjective” is what people feel and sense. The subjective factor involves both cognitive and emotional aspects. The interrelations between the cognitive and emotional components of security testify to the fact that, at the level of cognition, satisfaction is accompanied by a sense of inner serenity, whereas cognitive dissatisfaction is felt as being in danger and jeopardized.

When at risk, people often make decisions on the basis of their own subjective judgments. Consequently, their reactions depend on how they perceive this or that situation (Huang et al., 2007).

The next factor which ties together security and wellbeing as socio-psychological phenomena is identity. In this context, the perception of security and subjective wellbeing can affect social beliefs, and serve as a factor determining social action. In this case, perceptions contribute to a feeling of uniqueness and social identity,

as well as differentiation from other peoples. These perceptions become the lens through which whole societies see the world. Perceptions of security and subjective wellbeing are stored in the cognitive repertoire of society's members, and appear in different social products such as books and films; they are pronounced via media (newspapers, television, or radio) and are presented in public institutions (schools, colleges, universities, etc.). They are often part of the social agenda and the focus of public debate since they are connected with the current issues and challenges facing the society.

Security and psychological wellbeing are closely tied up with the factor of personal control over a situation. M. Kreuter and V. Strecher found that people are likely to assess a situation as less dangerous if, as they suggest, they can gain control over it (Kreuter & Strecher, 1995). This often occurs in drivers who demonstrate over-exaggerated confidence associated with control over their vehicle, and in people with high levels of professionalism and competence (Slovic et al., 1976). Hence, it is most likely that highly qualified people can overestimate their ability to control a situation since they do not consider it dangerous.

Security and psychological wellbeing are concepts consisting of a host of objective and subjective factors. The opportunity to study and measures them is an important source of information for a society. Security and wellbeing studies deal with the following subjects:

- Internal and external security factors;
- Economic, ecological, and social security;
- Threats to cultural and public security;
- Shelteredness of cultural diversity, etc.

Human wellbeing is basically defined by three fundamental factors: material wellbeing, health, and security. The pace of modern life, a growing complexity of social systems and relationships, as E. Giddens (Giddens, 1990) and U. Beck (Beck, 1992) emphasized, and the increasing number of unintended consequences of social actions are essential considerations for the study of psychological security, which can also develop and change with time. A great portion of the current concepts and theories of psychological security provides a comparatively narrow insight in how psychological security evolves, grows, wanes, or even collapses.

Research on psychological wellbeing is quite topical in our country where a security deficit exists. Interestingly, public opinion polls with regard to the perception of security were conducted by the Public Opinion Fund (Public Opinion Fund, 2013) in 2013. Surveys focused on security in Russia have not been carried out since then. The results of the poll showed that 50% of the Russian people did not feel secure. The respondents within this half spoke about their defenselessness, and about the indifference of authorities towards them, which made them feel abashed and insulted.

The following responses are worth mentioning: "Our leaders don't want us, nobody takes care of us;" "Our state has no need of us;" "negligent attitude to people;" "no discipline, no one is responsible for us;" "The people in power sit on their hands." Many repined at the absence of stability and confidence in future: "I don't know what will happen tomorrow;" "little hope for the future;" "Nobody knows what will come;" "Disorder rules in the country, no stability;" "troubled times;"

"We live in a country where anything can happen." Some of the respondents felt jeopardized due to social defenselessness, describing this state of things quite definitely: "What security are you talking about? I'm mother of a large family and they don't provide me with a flat;" "small pension, shortage of money all the time;" "social defenselessness of citizens;" "no hospitals, no doctors."

One way or another, the sense of defenselessness in our country is widespread, and people feel they suffer from a lack of attention. It is no coincidence that when listing the values they considered most important for Russia, the respondents put "security" second only to "family," and the difference between these rankings was not significant. The vast majority of the respondents considered these two notions the most meaningful ones.

Societies that succeed in achieving a higher level of subjective wellbeing among their citizens depend heavily on government policies. One reason in favor of using public opinion polls to measure wellbeing resides in the fact that people highly evaluate them. Thus, E. Diener found that college students appreciate subjective wellbeing higher than values such as income, health, and even love (Diener, 2000; Diener et al., 1998). By keeping a close watch on the level of wellbeing and identifying the reasons for its fluctuations, one can do a lot for the growth of citizen satisfaction.

For example, according to the European Social Survey, when respondents within a country give high scores to values such as a good state of physical and mental health, they are likely to assess other aspects of subjective wellbeing highly as well (for instance, Switzerland), and vice versa. However, this is not always the case. In Hungary, for example, the respondents give low scores to their state of general health while they estimate their social wellbeing rather highly (European Social Survey, 2015). In Russia, the average score for physical and mental health is much lower than estimates of other aspects of subjective wellbeing.

A. Maslow (1954), and later C. Ryff and C. Keyes (1995), as well as R. Ryan and E. Deci (2000), argued that there are universal human needs, and that satisfying them will contribute towards wellbeing. From the perspective of sociology, R. Veenhoven and J. Ehrhardt (1995) stated that some societies have a higher quality of life because they have features which are universal and desirable for the majority of people. On the other hand, anthropologist R. Edgerton (1992) claimed that there are "sick societies" that do not produce happiness and health. The common idea here is that every culture and every people have universal desires and needs which they believe will guarantee a high quality of life.

Modern psychology is seeking to find integrative psychological characteristics and, in this light, as A.L. Zhuravlyov and N.V. Tarabrina argue, psychological security can be defined as "an integrative characteristic of the subject which reflects the degree of satisfaction of his need for security and which can be evaluated by the intensity that the experience of psychological wellbeing/ill-being has for the individual" (Zhuravlyov & Tarabrina, 2012, p. 9). The theoretical and empirical study of the phenomenon of psychological wellbeing shows that it can be categorized by integrative characteristics which are closely linked with the negative affectivity the subject exhibits.

The architecture of psychological wellbeing is, to a greater extent, defined and conditioned by a migrating configuration of binary relations, since, in this framework, the consistency of perception simultaneously brings together the whole collection of diverse and contradictory features and bonds of the object or phenom-

enon. That is, it is the consistency of the perception of wellbeing that acts as the prerequisite, and the basis upon which the construct necessary for normal functioning of a personality and its psychological security rests.

Over the last few decades the notion of wellbeing has come into general academic use, providing theoretical foundations for insights into health (World Health Organization, 1978). In its essence, a good level of wellbeing implies extending the sphere of physical health to include not only physical aspects but also psychological and social ones (Axford, 2009). Besides, the inclusion of such a parameter as wellbeing creates a conceptual space of interaction between both subjective and objective estimates (Rees et al., 2009).

Conclusion

In conclusion, it would be reasonable to underline a few key tendencies of the development of security psychology. These trends are tied up with changes in the life of society as a whole: with the growth of uncertainty and the materialization of new types of threats and dangers.

First, security as a socio-cultural phenomenon requires a comprehensive approach and integrates a multitude of aspects of social reality, each of which is important both for an individual and society as a whole.

Second, taking into consideration academic discourses dedicated to psychological wellbeing, greater attention is being paid to the interrelation between wellbeing and security. Yet, one should note the tendency for restrictive interpretations of the concept of security. Therefore, the bond between wellbeing and security has not been regarded as mutually reinforcing and interdependent so far.

Third, fluctuations in a population's level of psychological wellbeing can act as an indicator of the psychological security of the entire society, and reflect the accuracy or invalidity of many decisions and actions by the state.

Fourth, the use of an interdisciplinary approach (psychological and sociological, in particular) appears to be the most fruitful, especially with regard to such latent phenomena as security and wellbeing.

Over the past decades there has been a change of priorities in the development of global society. Research on subjective indicators which are more and more often referred to as valid measurements is evoking considerable interest. Moreover, the quality of objective conditions is being estimated with the help of subjective indicators. Hence, examination of security through the lens of psychology can be seen as a tool for creating wellbeing not only for a single individual, but also for the society as a whole.

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References

- Adler, E. (1997). Seizing the Middle Ground. Constructivism in World Politics. *European Journal of International Relations*, 3(3), 319–363. <https://doi.org/10.1177/1354066197003003003>

- Axford, N. (2009). Child well-being through different lenses: why concept matters. *Child and Family Social Work*, 14(3), 372–83. <https://doi.org/10.1111/j.1365-2206.2009.00611.x>
- Baeva, I.A. & Bordovskaia, N.V. (2015). The psychological safety of the educational environment and the psychological well-being of Russian secondary school pupils and teachers. *Psychology in Russia: State of the Art*, 8(1), 86–99. <https://doi.org/10.11621/pir.2015.0108>
- Bar-Tal, D. (1991). Contents and origins of the Israelis' beliefs about security. *International Journal of Group Tensions*, 21, 237–76.
- Bar-Tal, D., Jacobson, D., & Freund, T. (1995). Security feelings among Jewish settlers in the occupied territories: A study of communal and personal antecedents. *Journal of Conflict Resolution*, 39, 353–377. <https://doi.org/10.1177/0022002795039002007>
- Bar-Tal, Y., Kishon-Rabin, L., & Tabak, N. (1997). The effect of need and ability to achieve cognitive structuring on cognitive structuring. *Journal of Personality and Social Psychology*, 73(6), 1158–1176. <https://doi.org/10.1037/0022-3514.73.6.1158>
- Beck, U. (1992). *Risk Society. Toward a New Modernity*. London: Sage Publications.
- Beck, U. (1999) *World Risk Society*. Cambridge: Polity Press.
- Beck, U. (2011). *Living in and Coping with World Risk Society*. In H.G. Brauch, O.Ü. Spring, C. Mesjasz, J. Grin, P. Kameri-Mbote, B. Chourou, P. Dunay, & J. Birkmann (Eds.). *Coping with Global Environmental Change, Disasters and Security: Threats, Challenges, Vulnerabilities, and Risks*, 11–17. New York: Springer.
- Bonß, W. (1995). *Vom Risiko: Unsicherheit und Ungewißheit in der Moderne* [About Risk: Insecurity and Uncertainties in Modernity]. Hamburg: Hamburger.
- Brauch, H.G. (2011). *Concepts of Security Threats, Challenges, Vulnerabilities and Risks*. In H.G. Brauch, O.Ü. Spring, C. Mesjasz, J. Grin, P. Kameri-Mbote, B. Chourou, P. Dunay, & J. Birkmann (Eds.). *Coping with Global Environmental Change, Disasters and Security: Threats, Challenges, Vulnerabilities and Risks*, 61–106. New York: Springer. https://doi.org/10.1007/978-3-642-17776-7_2
- Broch, H. (1996). *The sleepwalkers*. New York: Vintage.
- Busan, B. (1991). *People, States and Fear. An Agenda for International Security Studies in the Post-Cold War Era*. London: Harvester Wheatsheaf.
- Cong, Z.H. & An, L. (2004). Developing of Security Questionnaire and its Reliability and Validity. *Chinese Mental Health Journal*, 18, 97–99.
- Delumeau, J. (1990). *Sin and Fear: The Emergence of the Western Guilt Culture, 13th-18th Centuries*. Basingstoke, Hampshire: Palgrave Macmillan.
- Der Derian, J. (1993). *The Value of Security: Hobbes, Marx, Nietzsche and Baudrillard*. In D. Campbell and M. Dillon (Eds.). *The Political Subject of Violence*, 94–113. Manchester: Manchester University Press.
- Diener, E. (2000). Subjective well-being. The science of happiness and a proposal for a national index. *American Psychologist*, 55, 34–43. <https://doi.org/10.1037/0003-066X.55.1.34>
- Diener, E., Sapyta, J., & Suh, E. (1998). Subjective well-being is essential to well-being. *Psychological Inquiry*, 9, 33–37. https://doi.org/10.1207/s15327965pli0901_3
- Edgerton, R.B. (1992). *Sick Societies: Challenging the Myth of Primitive Harmony*. New York: Free Press.
- Epstein, S. (1994). Integration of the cognitive and psycho-dynamic unconscious. *American Psychologist*, 49, 709–724. <https://doi.org/10.1037/0003-066X.49.8.709>
- European Social Survey (2015). *Measuring and Reporting on Europeans' Wellbeing: Findings from the European Social Survey*. London: ESS ERIC.
- Fearon, J.D. & Wendt, A. (2002). *Rationalism v. Constructivism: A Skeptical View*. In W. Carlsnaes, B. Simmons, T. Risse (Eds.). *Handbook of International Relations*, 52–72. London: Sage.
- Felten, E. (2004). *Security Theater. Freedom to Tinker*. Retrieved from: <http://freedom-to-tinker.com/2004/07/09/security-theater/>

- Fiske, S.T. & Taylor S.E. (1991). *Social Cognition*. New York: McGraw-Hill.
- Giddens, A. (1984). *The Constitution of Society*. Cambridge: Polity Press.
- Giddens, A. (1990). *The Consequences of Modernity*. Cambridge: Polity Press.
- Giddens A. (1991). *Modernity and Self-identity: Self and Society in the Late Modern Age*. Cambridge: Polity Press.
- Hogenraad, R. & Garagozov, R.R. (2010). Words of swords in the Caucasus: About a leading indicator of conflicts. *Peace and Conflict: Journal of Peace Psychology*, 16(1), 11–28. <https://doi.org/10.1080/10781910903479594>
- Hogenraad, R. (2016). Deaf Sentences Over Ukraine: Mysticism Versus Ethics. *Digital Scholarship in the Humanities*, 31(4), 725–745. <https://doi.org/10.1093/llc/fqv021>
- Hogenraad, R. (2017). Smoke and mirrors: Tracing ambiguity in texts. *Digital Scholarship in the Humanities*, 33(2), 297–315. <https://doi.org/10.1093/llc/fqx044>
- Huang, D., Rau, P. P., & Salvendy, G. (2007). A survey of factors influencing people's perception of information security. In J. Jacko (Ed.). *Human-Computer Interaction, Part IV*. Heidelberg: Springer. https://doi.org/10.1007/978-3-540-73111-5_100
- Huysmans, J. (2006). *The Politics of Insecurity: Fear, Migration, and Asylum in the EU*. London, New York: Routledge.
- Jacobson, D. & Bar-Tal, D. (1995). Structure of security beliefs among Israeli students. *Political Psychology*, 16, 567–590. <https://doi.org/10.2307/3792227>
- Jameson, F. (2016). *Raymond Chandler: The Detections of Totality*. London: Verso
- Kershaw, I. (2016). *To Hell and Back: Europe, 1914-1949*. London: Penguin.
- Kreuter, M.W. & Strecher, V. (1995). Changing inaccurate perceptions of health risk: Results from a randomised trial. *Health Psychology*, 14, 55–63. <https://doi.org/10.1037/0278-6133.14.1.56>
- Kruglanski, A.W. (1989). *Lay epistemics and human knowledge: Cognitive and motivational bases*. New York: Plenum. <https://doi.org/10.1007/978-1-4899-0924-4>
- Lazarus, R., DeLongis, A., Folkman, S., & Gruen, R. (1985). Stress and adaptational outcomes. *American Psychologist*, 40, 770–779. <https://doi.org/10.1037/0003-066X.40.7.770>
- Lofstedt, R. & Frewer, L. (1998). *Risk and Modern Society*. London: Earthscan.
- Malakhov, V. (2013). Tehnika bezopasnosti: politika straha kak instrument upravleniya [Occupational Safety and Health: Policy of Fear as Instrument of Management]. *Otechestvennye zapiski [Home Proceedings]*, 2(53). Retrieved from: <http://www.strana-oz.ru/2013/2/tehnika-bezopasnosti-politika-straha-kak-instrument-upravleniya>
- Maslow, A.H. (1954). *Motivation and personality*. New York: Harper & Row.
- Milanovic, B. (2016). *Global Inequality: A New Approach for the Age of Globalization*. Hardcover. Cambridge, MA: Harvard University Press. <https://doi.org/10.4159/9780674969797>
- Musil, R. (1990). *Precision and Soul: Essays and Addresses*. Chicago, IL: University of Chicago Press.
- Nisbett, R. & Ross, L. (1980). *Human inference: Strategies and shortcomings of social judgment*. New York: Prentice Hall.
- Orwell, G. (2001). *The Road to Wigan Pier*. London: Penguin.
- Panarin, I.N. (2001). *Informacionnye vojny i Rossiya [Information Wars and Russia]* In Vneshnopoliticheskaja informacija i sovremennaja diplomatija [Foreign-policy Information and Modern Diplomacy], 34–42. Moscow: Biznes-press.
- Public Opinion Fund (2013). Deficit bezopasnosti [Security Deficit]. *Otechestvennye zapiski [Home Proceedings]*, 2(53). Retrieved from: <http://www.strana-oz.ru/2013/2/deficit-bezopasnosti>
- Rees, G., Bradshaw, J., Goswami, H., & Keung, A. (2009). *Understanding Children's Well-being: a National Survey of Young People's Well-being*. London: Children's Society.

- Renn, O., Schweizer, P.J., Dreyer, M., & Klinke, A. (2007). *Risiko. Über den gesellschaftlichen Umgang mit Risiko [On Public Attitude to Risk]*. München: Oekom.
- Risse, T. (2003). *Social Constructivism and European Integration*. In T. Diez, A. Wiener (Eds.). *European Integration Theory*. Oxford: Oxford University Press.
- Ross, L. & Nisbett, P. (1999). *Chelovek i situacija. Perspektivy social'noj psihologii* [Man and Situation. Prospects of Social Psychology]. Moscow: Aspekt Press.
- Ryan, R.M. & Deci, E.L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55, 68–78. <https://doi.org/10.1037/0003-066X.55.1.68>
- Ryff, C.D. & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, 69, 719–727. <https://doi.org/10.1037/0022-3514.69.4.719>
- Schneier, B. (2003). *Beyond Fear: Thinking Sensibly about Security in an Uncertain World*. New York: Copernicus Books.
- Serov, D. (2013). Bezopasnost' russkogo cheloveka v nachale XVIII veka [Security of the Russian Man in early XVIII century]. *Otechestvennye zapiski [Home Proceedings]*, 2(53). Retrieved from: <http://www.strana-oz.ru/2013/2/bezopasnost-russkogo-cheloveka-v-nachale-xviii-veka>
- Sloterdijk, P. (2013). *In the world interior of capital: Towards a philosophical theory of globalization*. Cambridge: Polity Press.
- Slovic, P., Fischhoff, B., & Lichtenstein, S. (1976). *Cognitive processes and social risk taking*. In J.S. Carroll & J.W. Payne (Eds.). *Cognitive and Social Behavior*, 165–184. Potomac, MD: Lawrence Erlbaum Associates, Inc.
- Toffler, A. (2002). *Shok budushhego* [Future Shock]. Moscow: AST.
- Veenhoven, R. & Ehrhardt, J. (1995). The cross-national pattern of happiness: Test of predictions implied in three theories of happiness. *Social Indicators Research*, 34(1), 33–68. <https://doi.org/10.1007/BF01078967>
- Wæver, O. (1995). *Securitization and desecuritization*. In R. Lipschutz (Eds.). *On Security* (pp. 46–86). New York: Columbia University Press.
- Weldes, J., Laffey, M., Gusterson, H., & Duvall, R. (1999). *Constructing Insecurity* In Jutta Weldes, Mark Laffey, Hugh Gusterson and Raymond Duvall (Eds.). *Cultures of Insecurity: States, Communities, and the Production of Danger*, 1–34. Minneapolis: University of Minnesota Press.
- Wendt, A. (1992). Anarchy is what States Make of it: The Social Construction of Power Politics. *International Organization*, 46 (2), 391–425. <https://doi.org/10.1017/S0020818300027764>
- Wendt, A. (1999). *Social Theory of International Politics*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511612183>
- World Health Organization (1978). *Declaration of Alma Alta*. Geneva: WHO.
- Yanitsky, O.N. (2003). Sociologiya riska: ključevye idei [Sociology of Risk: Key Ideas]. *Mir Rossii [The World of Russia]*, 1, 3–35.
- Zhuravlyov, A.L. & Tarabrina, N.V. (2012). *Vmesto predisloviya [Instead of Introduction]* In A.L. Zhuravlyov, N.V. Tarabrina (Eds.). *Problemy psihologicheskoy bezopasnosti [Problems of Psychological Security]*. Moscow: The Russian Academy of Sciences, Psychology Institute.
- Zotova, O.Yu. (2011). *Bezopasnost' lichnosti kak social'no-psihologicheskij fenomen* [Personality Security as a Socio-psychological Phenomenon]. Yekaterinburg: Liberal Arts University-University for Humanities.

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SOCIAL PSYCHOLOGY

Emotional intelligence, patterns for coping with decisional conflict, and academic achievement in cross-cultural perspective (evidence from selective Russian and Azerbaijani student populations)

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Background. Choice, under conditions of uncertainty, is mediated by integral dynamic regulatory systems that represent hierarchies of cognitive and personality processes. As such, individual decision-making patterns can be studied in the context of intellectual and personality potential. This article presents the results of a cross-cultural comparison of personality characteristics, such as coping with uncertainty, emotional intelligence, and academic achievement, between Azerbaijani and Russian university students.

Objective. We aimed at establishing metric invariance and at highlighting relationships between emotional intelligence and the scales of the Melbourne Decision Making Questionnaire (MDMQ).

Design. Azerbaijani and Russian student samples were selected for this study due to the almost identical educational programs offered by Moscow State University to students in Moscow and its branch in Baku. Coping with uncertainty was measured by the MDMQ, emotional intelligence by the EmIn questionnaire, and academic achievement by GPA scores. Confirmatory factor analysis was used to verify factor structure invariance and congruence.

Results. The congruence of factor structures for both questionnaires was verified. For the MDMQ four-factor structure for both samples was confirmed. For the EmIn questionnaire, invariance for two scales was established — “Understanding other people’s emotions” and “Managing own emotions”. Relationships among personality traits, gender, age, and academic achievements are explained for the Lomonosov Moscow State University students in Moscow (Russia) and its branch in Baku (Azerbaijan). No cross-cultural differences were found for emotional intelligence and productive coping (Vigi-

lance). A cultural difference was established in unproductive coping preference for Buck Passing. A similarity between the cultures was captured in the relationship of higher emotional intelligence (EQ) scores to higher Vigilance scores and to lower levels of unproductive coping patterns. Vigilance was a predictor of academic achievement, but only in the Russian sample.

Conclusion. The similarity of the educational systems, as both samples studied similar programs, demonstrates very few cross-cultural differences.

Keywords: uncertainty, emotional intelligence, vigilance, buck passing, procrastination, GPA, Melbourne Decision Making Questionnaire (MDMQ)

Introduction

We conducted a cross-cultural comparison of: (a) EQ and individual decision-making patterns in Russian and Azerbaijani university student samples on the basis of congruence testing of the factor structures of two questionnaires — the Melbourne Decision Making Questionnaire and the “EmIn” questionnaire; and (b) the correlations of these psychological variables with academic achievement.

This comparison of the academic achievement correlations is justified by the fact that students of the Moscow State University branch in Baku studied identical programs and had the same teachers as the students in Moscow. Thus we controlled for the difference in educational systems that usually encumbers cross-cultural comparisons of student samples.

When talking about constructs with regard to which there are continuing disputes as to whether they “belong” to the cognitive or personality realm, the focus should be on the connections between those components of the intellectual and personality potential that could help shed light on the now “classical” idea of the unity of intelligence and affect. These constructs include *emotional intelligence* (EQ) (Salovey & Mayer, 1990; Caruso & Salovey, 2004). Further, we can add the *individual patterns of decision making* to these integrated formations, since a person’s choice under conditions of uncertainty is mediated by the actual development of integral dynamic regulatory systems that represent hierarchies of both cognitive and personality processes (Kornilova, 2016a; Kornilova, Chumakova, Novikova, & Kornilov, 2010).

To diagnose both EQ and individual characteristics of coping with uncertainty in decision-making, achievement tests and questionnaires are utilized. The latter usually give results that differ from “objective” tests. However, it is precisely the questionnaire results that permit discussion the interrelationships of these integrative properties as they are represented in an individual’s self-awareness.

Attitude towards uncertainty has been regarded as one of the sources of cross-cultural differences, as determined by the Hofstede index, allowing the differentiation between cultures more and less *intolerant of uncertainty*¹. Based upon responses to three questions about the work in an organization, the index incorporated a rather broad generalization: “Uncertainty-avoiding cultures shun ambiguous situations. People in such cultures look for structure in their organizations, institu-

¹ Hofstede defined culture as “a collective programming of the mind that distinguishes members of one group or category of people from another” (Hofstede, 2001, p. 9).

tions, and relationships, which makes events clearly interpretable and predictable” (Hofstede, 2001, p. 148). This corresponds to an analysis of economic decisions and to comparisons of economic development levels of countries. However, it does not seem right to directly map cultural differences onto psychological differences. Keeping in mind the faultiness of such direct mapping, in our comparison of personality variables, we were able to describe cross-cultural differences between Russian and Azerbaijani students, relying on questionnaires that capture their tolerance and intolerance of uncertainty (Kornilova, Chumakova, & Izmailova, 2015). In particular, greater *intolerance of uncertainty* was registered among the Azerbaijani men, while no cross-cultural differences were found among the women.

Another dimension of cultural differences, namely *individualism vs. collectivism*, was examined in a study of emotional intelligence (Pankratova, Osin, & Lyusin, 2013). The Emotional Intelligence questionnaire, often shortened to “EmIn”, was developed on Russian samples by D.V. Lyusin (2009), based on the Salovey-Mayer-Caruso mixed model. Like many other questionnaires such as the SREIT (Self-Report Emotional Intelligence Test) (Schutte et al., 1998), “EmIn” measures subjects’ notions of their EQ-related abilities. The Melbourne questionnaire was especially developed to measure individual decision-making patterns, and its factor structure was verified on Russian samples (Kornilova, 2013). Its scales reflect the style patterns of coping with uncertainty in decision making (DM). Our previous research permits us to assume the associations with each other of EQ and uncertainty attitudes, as well as their association with the academic achievements of students (Kornilova, & Gadzhieva, 2016).

Emotional Intelligence

Approaches to understanding EQ as a cognitive ability on the one hand, and as a personality trait on the other, lie at the heart of many studies and measures. The relationship of EQ with a number of personality features, especially the Big Five traits, was discussed in the context of the Salovey-Mayer-Caruso mixed model applicability (Mayer, Salovey, & Caruso, 2008). Bracket and Mayer (2003) demonstrated EQ correlations with the Big Five traits in the NEO-PI-R — neuroticism, extraversion, agreeableness, conscientiousness, and a moderate correlation with openness to experience. The relationship of Emotional Intelligence to academic intelligence and the Big Five has been discussed for a number of countries — for example, the Netherlands, Greece, Spain (e.g., Pérez-González & Sanchez-Ruiz, 2014; Van der Linden, Tsaousis, & Petrides, 2012; Van der Zee, Thijs, & Schakel, 2002). EQ was a significant predictor of empathy (e.g., Imran, 2013).

Today, research is aimed at correlating EQ — as “hot” intelligence — not only with “cold” (verbal and nonverbal) intelligence, but also with memory and executive functions (Mayer et al., 2001; Schneider, Mayer, & Newman, 2016). Multiple EQ connections were established with IQ (e.g., Husin, Santos, Ramos, & Nordin, 2013; Kornilova, 2016a), with creativity (e.g., Averill, 2000; Ivcevic, Brackett, & Mayer, 2007; Pavlova, & Kornilova, 2016). Meanwhile, one of the leading pioneers in this field shifted from EQ to another construct — personal intelligence (Mayer, 2014).

The data on the connections to academic success of students in different countries is rather inconclusive (Novikova & Kornilova, 2013; Sanchez-Ruiz, Mavroveli & Poullis, 2013), although the notion of a relationship among EQ, social success, and management was affirmed (Stain & Buck, 2007; Caruso, 2016). H. N. Perera and M. DiGiacomo (2013) conducted a meta-analysis of research on EQ and student performance. However, no data was available on countries representing different cultures in which the students studied by common educational programs. We highlight precisely this aspect in our cross-cultural comparison of Russian and Azerbaijani students.

In Russian psychology, attention to the construct of EQ was due to both ideas of the unity of intelligence and affect with regards to the regulation of choice (Kornilova et al., 2010; Kornilova, 2016b), and to the successful development of EQ diagnostic tools that followed the popularization of the concept of multiple intelligences (e.g., Gardner, 2007). It was demonstrated on Russian samples that EQ is associated with such personality variables as *self-evaluation of intelligence* (at the level of self-awareness) (Novikova & Kornilova, 2013), *tolerance of uncertainty*, and *levels of autonomous morality* (Kornilova & Novototskaya-Vlasova, 2009; Kornilova, 2016a), intuitive style (Kornilova, Kornilov, 2013), “psychological reasonableness” (Novikova & Kornilova, 2014), as well as cognitive strategies (Krasavtseva & Kornilova, 2016; Kornilova, 2014).

The development of emotional intelligence research took place in the context of the undoubtedly positive nuances of this construct. Emotional culture was associated with the moral values of individuals, uniting them with humanity (Andreeva, 2009), and with the extent to which cultural differences (encompassed by the analysis of distal and proximal stimuli as conductors of cultural influence) can be reflected in the specifics of EQ relationships and the personality traits valued within certain societies.

Cross-cultural studies have established a higher level of emotional expression in countries with a higher level of individualism within the culture (Matsumoto, Yoo, & Fontaine, 2008). However, no intercultural differences were found in the accuracy of emotion recognition (Soto & Levenson, 2009). In a number of studies, the processes mediating cross-cultural differences in EQ were identified: For the individualistic culture of Germany, the balance between negative and positive emotions, measured by the SREIT, served as a mediator between life satisfaction and EQ, while for an Indian sample (a collectivistic culture), social support did (Koydemir, Şimşek, Schütz, & Tipandjan, 2013). Greater accuracy of women in emotion recognition was noted for many cultures.

Russian colleagues tried to construct a single version of the questionnaire aimed at measuring EQ for Azerbaijani and Russian samples, but, in our opinion, they used a questionable procedure for merging the test data of students from the two countries into a single sample (Pankratova et al., 2013). We consider the procedure of establishing the factorial data structure congruence, as obtained by adapting psychological tools to different cultures, to be more reasonable (e.g., Kornilov, Kornilova, & Grigorenko, 2016).

Advantages of Cross-Cultural Comparison of Azerbaijani and Russian Samples

The reference to the cultural similarity of Azerbaijan, Iran, and Turkey due to their territorial proximity, common history, similar cultural traditions, religion (Islam), and language was the questionable criterion accepted by the authors of the above-mentioned comparison of EQ in Azerbaijani and Russian samples. Labeling Azerbaijani culture as “traditionalist” or “collectivistic” or tapping into other sociological clichés facilitates the schematization and simplification of understanding its members’ psychological profile. A more important factor of cross-cultural differences could be the duality of general cultural conditions, stemming from seven decades that the inhabitants of Azerbaijan shared a common developmental path with the inhabitants of Russia. Now Azerbaijan is developing independently. In secular universities in the Republic of Azerbaijan, education tends to lean towards both European and Russian standards. In secondary school, education is conducted in two sectors — Russian and Azerbaijani — using the corresponding languages. Graduates from both sectors then enroll in universities.

The difference in educational systems within which the intellectual and personality potential of a person develops in different cultures, presents a challenge in cross-cultural studies. The existence of similar educational systems and institutions within the various countries in the post-Soviet space contributes to leveling this extremely significant factor. In particular, in the branches of Moscow State University (in Baku, Tashkent, and other cities), the educational process is based on similar programs, which allows cross-cultural validation of psychological diagnostic tools, promoting the development of psychological research in these countries.

Azerbaijani culture can be regarded as more collectivistic than Russian, and gender inequality remains a problem there, although the adoption of a relevant law testifies to the ongoing attempt to eliminate it (Soto & Levenson, 2009). The observed high levels of Baku students’ emotionality in comparison with that of Moscow students allows us to assume its large role in interpersonal communication. However, it is possible that we are talking about culturally accepted forms of self-expression, rather than emotional intelligence as such.

The conditions of university education are more uncertain than those of secondary school, and thus challenge students’ independence. These conditions are included in a wider context of personal development within the cultural norms characterizing their life conditions. This broad context of individual attitudes toward uncertainty is recorded by the Melbourne Decision Making Questionnaire (MDMQ).

Our *objectives* were to test hypotheses of *cross-cultural differences* in EQ and individual features of decision-making regulation, represented by self-reports, among Azerbaijani and Russian samples, most of whom were students at Moscow State University. This would allow a differentiated approach to the discovery of relations between these individual personality characteristics and the *academic achievements* of the students.

With this aim, we tested (a) the invariance of the factor structures of the MDMQ and EmIn questionnaires for the two compared samples; (b) differences in personality variables, reflecting individual decision-making features and attitudes towards uncertainty among Russian and Azerbaijani students; (c) their possible role as predictors of academic achievement.

Methods

Samples and Design

The study was conducted by psychological testing of two samples — Russian and Azerbaijani — and included three stages:

1. Establishing the factor structure invariance of the MDMQ for the two compared samples;
2. Establishing the factor structure invariance of the EmIn questionnaire for the two compared samples;
3. Cross-cultural comparison of psychological variables and an analysis of their correlation to GPA; identification of academic achievement predictors.

All students were tested individually or in small groups, with informed consent. The questionnaires were presented in Russian.

First stage

The initial sample for establishing the cross-cultural invariance of the MDMQ factor structures consisted of 521 people (374 women, 147 men), aged 16 to 66 ($M=20.65$, $SD=5.37$). Of these, 252 people (161 women and 91 men) aged 16 to 23 were examined in Baku ($M=18.76$, $SD=1.41$); in Moscow there were 269 people (213 women, 56 men) aged 18 to 66 ($M=22.43$, $SD=6.9$). The groups differed significantly in age. To compare the indicators of the MDMQ scales, student-age participants studying at Moscow State University were selected from this sample (in the 18–25 age range).

The final sample for comparing the factor structure invariance included 416 people (309 women, 107 men). Of these, Baku students comprised 196 people (129 women and 67 men) aged 18 to 25 ($M=19.27$, $SD=1.16$); Moscow students comprised 220 people (180 women, 40 men) aged 18 to 25 ($M=19.75$, $SD=1.18$). The samples still differed significantly in age ($t=-4.2142$, $df=409.932$, $p<0.001$) and gender ($\chi^2=13.0672$, $df=1$, $p<0.001$). Therefore, gender and age factors were taken into account as *covariates* when comparing the groups.

Second stage

The initial sample for establishing the *factor structure invariance of the EmIn questionnaire* included 1,078 people (761 women, 317 men), aged 16 to 69 ($M=22.79$, $SD=8.06$). Of these, Azerbaijani participants from Baku comprised 382 people (260 women and 122 men) aged 16 to 69 ($M=21.62$, $SD=9.18$) and Russian participants from Moscow comprised 696 people (501 women, 195 men) between the ages of 17 and 68 ($M=23.43$, $SD=7.30$). Samples differed significantly in age ($t=-3.3083$, $df=648.41$, $p<0.001$), but did not differ in the ratio of men and women ($\chi^2=1.6416$, $df=1$, $p=0.200$).

The Azerbaijani sample comprised students from the university's so-called Russian sector, fluent in Russian.

Third stage

This stage included the definition of GPA (for most student participants) and *correlation analysis* of the relationship between academic success and the measured variables for which metric invariance was established. *Regression analysis* was conducted to identify the predictors of the students' academic achievement.

Instruments

Melbourne Decision Making Questionnaire (MDMQ)

The MDMQ was previously tested on Russian samples (Kornilova, 2013). It is based on the theoretical model of I. Janis and L. Mann (Janis & Mann, 1977), according to which coping with a stressful situation generated by uncertainty includes a focus on risk awareness in the process of choosing the best of possible alternatives. When motivations are conflicted, individual tendencies in the regulation of choice arise, such as (a) productive coping (Vigilance — a careful, unbiased, and thorough evaluation of alternatives and rational decision making) and unproductive coping — (b) Buck Passing (leaving decisions to others and avoiding responsibility), (c) Procrastination (delaying decisions), (d) Hypervigilance (a hurried, anxious approach with untenable vacillation between alternatives) (Mann et al., 1997).

The 22 items of the questionnaire contain statements on the model of “When I make a decision, I ...” that the participant rates on a 3-point scale from “not true for me” to “true for me”.

Emotional Intelligence questionnaire — EmIn (Lyusin, 2009)

The questionnaire is based on the concept of Salovey-Mayer-Caruso's EQ and includes 46 items with a 4-point scale from “completely disagree” to “completely agree”.

Primary and secondary scales are then based on the answers. Two dimensions are defined: *intrapersonal and interpersonal emotional intelligence* and *the ability to understand and manage emotions*, which form the following scales:

1. *Understanding own emotions*: the ability to identify one's own emotions, verbally describe them, and understand the causes of the emotional state;
2. *Understanding other people's emotions*: the ability to recognize another person's emotions from non-verbal signals (facial expressions, gestures, tone of voice), sensitivity to the inner states of other people;
3. *Controlling own emotions*, including:
 - *Regulation of one's inner state*: the ability to evoke and maintain the desired emotions and reduce the intensity of unwanted emotions;
 - *Control of expression*: the ability to control the external manifestations of one's emotions;
4. *Controlling other people's emotions*: the ability to evoke other people's emotions, reduce the intensity of unwanted emotions.

GPA (Grade Point Average) — Average Academic Performance over the Last Three Semesters

The international standard GPA was used to assess academic achievements. Despite the popularity of the average score in research within the field of education, some authors note its imperfection. For example, this type of research does not take into account grade inflation — the tendency to give higher scores for the same level of subject mastery at different levels of education or simply over time (Johnson, 1997). This affects the ability to compare the results of different student samples, and creates a “ceiling effect” when the average score of the sample approaches the upper bound of the grades. However, despite its shortcomings, grade point average is considered a scale with good reliability (Bacon & Bean, 2006) and good criterial validity (Poropat, 2009), so it is rather successfully used as an indicator of academic achievement in most studies in the field of education.

Results

Cross-Cultural Comparison of Coping with Uncertainty (Measured by MDMQ)

The MDMQ factor structure of the Azerbaijani sample

We conducted a cross-cultural analysis for data concordance on the Azerbaijani and Russian samples.

For the Baku student sample testing results ($n=252$), the factor structure of the questionnaire was verified, showing satisfactory characteristics of the initial four-factor model: $\chi^2=313.949$, $df=204$, $p<0.001$; CFI=0.934; RMSEA=0.046 (CI RAMSEA for Moscow was 0.036 and 0.056). The factor load of one of the items (item 4 of the Vigilance scale) was insignificant; however, we did not exclude it from further calculations as it contributed to the value of the sample means.

Differences in individual characteristics of decision-making

For the cross-cultural comparison, individual values of latent variables were used, calculated based on the models with scalar invariance.

Comparison of the sample means showed no difference between the Moscow and Baku samples on the Vigilance scale; Buck Passing and Procrastination levels were higher for students in Moscow, and Hypervigilance was higher for students in Baku (see Figure 1).

Assuming the interaction of variables, we then used a *multivariate analysis of variance* (MANOVA) to identify cross-cultural differences. Dependent variables were the MDMQ scales; the independent variables gender, age, group (Baku or Moscow), and their interaction. Thus, the analysis tested the effect of seven variables (post hoc power 0.92).

For the Vigilance scale, no significant differences were found; that is, in this *productive* coping with uncertainty, Moscow and Baku students were similar. Differences were revealed for unproductive coping.

For Vigilance, no influence of the *age* factor was found; for the remaining scales (unproductive strategies in decision-making), a significant decrease in levels with age was found only in the Baku sample.

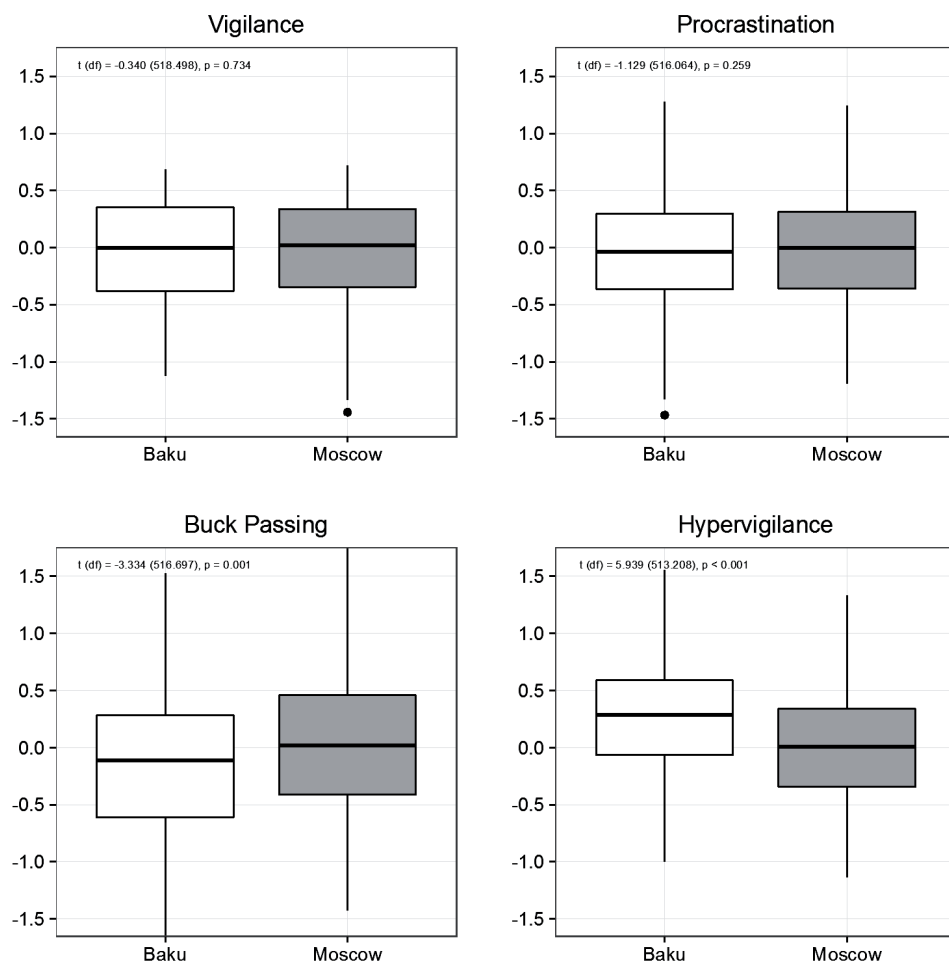


Figure 1. Differences in the individual tendencies of decision-making (according to the MDMQ) between student groups in Baku and Moscow. On the Y-axis is the score on the scale in the latent variable metric

For the Buck Passing scale, *group* factor influence was found ($F=15.604, p<0.001$) — with a higher indicator for the Russian students (see Figure 1), as well as the interaction of *age* and *group* factors ($F=6.969, p=0.009$). For the Procrastination scale, similar influence of the *group* factor ($F=4.575, p=0.033$) and the interaction of *age* and *group* factors ($F=9.197, p=0.003$) were shown.

For the Hypervigilance scale, which had a lower level in the Moscow sample, the influences of *age* ($F=5.027, p=0.025$), *group* ($F=10.660, p=0.001$), and their interaction ($F=13.809, p<0.001$) were significant.

Specificity of the relationship between psychological variables as measured by MDMQ in Moscow and Baku students

In the Russian sample, the index of productive coping (Vigilance) was negatively associated with indices of unproductive coping — with Procrastination

($p=0.001$) and Hypervigilance ($p=0.019$), and in the Azerbaijan sample, with Buck Passing ($p=0.026$) and Procrastination ($p=0.0001$)).

Cross-Cultural Invariance of the EmIn Questionnaire Scales

Initially, to establish the cross-cultural invariance of the EmIn questionnaire, we conducted a confirmatory factor analysis for the author's results (Lyusin, 2009) on the Moscow sample. The analysis was performed using the lavaan package for R; the answers to the questionnaire items were considered ordinal variables. This model demonstrated low robustness indicators ($\chi^2=3427.951$, $df=979$, $p<0.001$, CFI=0.821, TLI=0.811, RMSEA=0.060 (90% CI RMSEA 0.058 and .062), which

Table 1. Cross-cultural invariance for the EmIn questionnaire scales

| | χ^2 (df) | CFI | TLI | RAM-SEA | 90% CI RMSEA | $\Delta \chi^2$ (Δ df) | p |
|--|-----------------|------|------|---------|--------------|--------------------------------|------|
| <i>Understanding other people's emotions</i> | | | | | | | |
| Original model Moscow | 403.99 (54) | .937 | .923 | .097 | .088 .105 | | |
| Modified model Moscow (correlation of residual dispersions were added for items 42–46; 29–34; 38–42; 38–46; 32–42) | 143.62 (49) | .983 | .977 | .053 | .043 .063 | | |
| Model Baku | 117.44 (49) | .962 | .949 | .061 | .047 .075 | | |
| Configural invariance | 257.10 (98) | .979 | .972 | 0.055 | .047 .063 | | |
| Metric invariance | 271.75 (109) | .979 | .974 | .053 | .045 .061 | 13.32 (7.82) | .094 |
| Scalar invariance | 308.32 (132) | .977 | .977 | .050 | .043 .057 | 6.29 (18.75) | .998 |
| <i>Controlling own emotions</i> | | | | | | | |
| Original model Moscow | 152.93 (14) | .920 | .880 | .119 | .103 .137 | | |
| Modified model Moscow (correlation of residual dispersions were added for items 4–25; 4–33; 25–33) | 58.17 (11) | .973 | .948 | .079 | .059 .099 | | |
| Model Baku | 31.55 (11) | .950 | .904 | .070 | .042 .099 | | |
| Configural invariance | 87.60 (22) | .970 | .943 | .074 | .058 .091 | | |
| Metric invariance | 91.35 (28) | .971 | .957 | .065 | .050 .080 | 4.60 (4.57) | .409 |
| Scalar invariance | 137.16 (41) | .956 | .955 | .066 | .054 .078 | 14.27 (130.04) | .358 |

prompted the decision to implement invariance modeling separately for each scale of the questionnaire.

The general design for establishing cross-cultural invariance for the EmIn scales included: Step 1) verification of the model on the Moscow sample; Step 2) correction of the model on the Moscow sample using the Lagrange indices; Step 3) verification of the final model from Step 2 on the Baku sample; Step 4) establishing configural invariance of the models in multi-group confirmatory factor analysis; Step 5) establishment of metric invariance of the models for our two samples; and Step 6) establishing scalar invariance for the two samples. The results are presented in Table 1. For models obtained as a result of multi-group analysis (steps 4–6), the significance of changes in robustness indicators was also assessed. Table 1 summarizes the results for the scales that demonstrate cross-cultural invariance, in order to save space.

The scales *Understanding other people's emotions* and *Controlling own emotions* were applicable in the context of cross-cultural invariance. For these scales, the models obtained in the estimation of the *configural invariance* demonstrated satisfactory robustness indicators, and with the introduction of restrictions on the equality of factor loads and the equality of residual averages, the robustness indicators of the model did not change significantly.

Cross-cultural differences in the scales of emotional intelligence

The main result is the absence of significant differences in the EQ levels on invariant scales: $t=0.384$, $df=8930.052$, $p=0.701$ for *Understanding other people's emotions* and $t=0.895$, $df=949.655$, $p=0.371$ for *Controlling own emotions* (see Figure 2).

Significant differences were established in the *gender* factor for both EmIn scales and for the interaction of *age* and *gender* for the *Controlling own emotions* scale. In the whole sample, women scored higher on *Understanding other people's emotions* ($t=2.291$, $df=525.56$, $p=0.022$), and men scored higher on *Controlling own emotions* ($t=-2.944$, $df=581.669$, $p=0.003$). With age, women's *Understanding other people's emotions* increased, and men's decreased (see results of regression analysis in Table 2).

Table 2. Regression analysis of the effect of age on the EmIn scores of men and women

| | Understanding other people's emotions | | Controlling own emotions | |
|-------------------------|--|---------------|-----------------------------|---------------|
| | female | male | female | male |
| F | 0.041 | 4.902 | 8.505 | 3.804 |
| p (F) | 0.839 | 0.028 | 0.004 | 0.052 |
| df | 759 | 315 | 759 | 315 |
| Adjusted R ² | 0.000 | 0.012 | 0.010 | 0.009 |
| β (Age) | 0.001 | -0.008 | 0.004 | -0.004 |
| SE (β) | 0.003 | 0.004 | 0.002 | 0.002 |
| p (β) | 0.839 | 0.028 | 0.004 | 0.052 |

Note: Significant results are in bold italics.

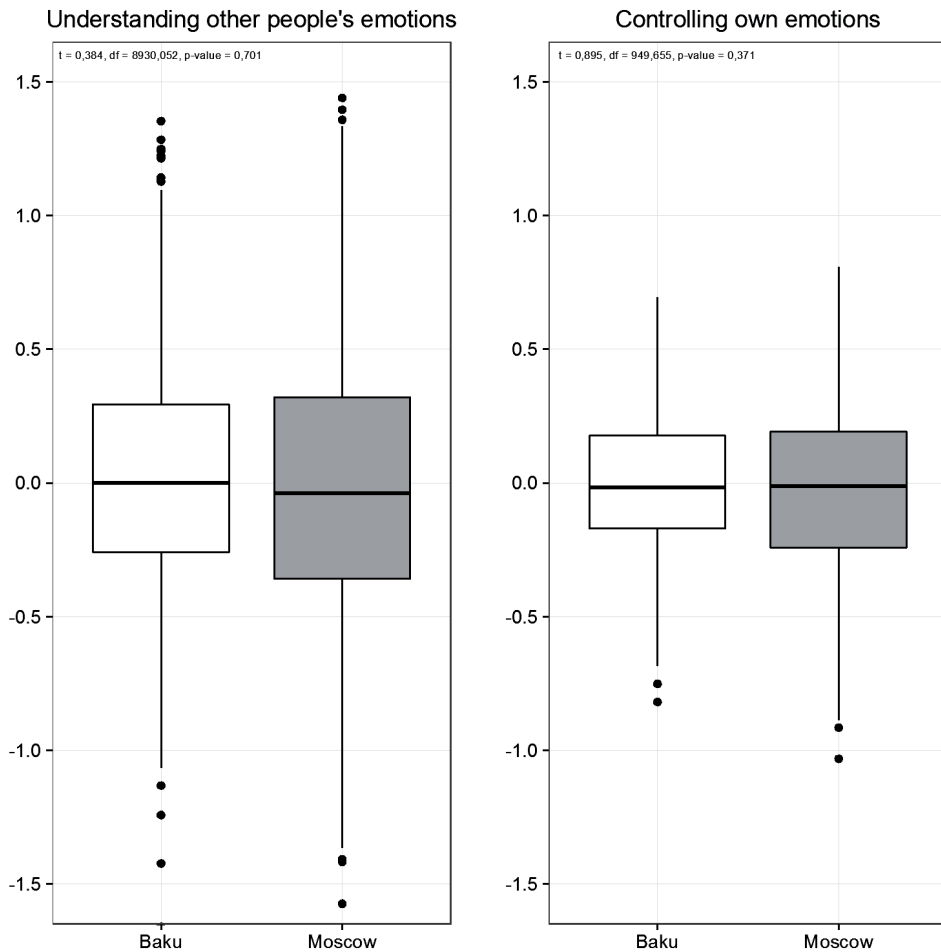


Figure 2. Comparison of sample averages of Azerbaijani and Russian samples (along the Y-axis is a scale score in the metric of latent variables)

Separately for each sample, a comparison of levels in men and women demonstrated that in the Baku sample, *Understanding other people's emotions* was significantly higher in women ($t(df)=2.5527(208.587)$, $p=0.011$), and *Controlling own emotions* was higher in men ($t(df)=-1.9896(227.3)$, $p=0.048$). In the Moscow sample, no significant differences were found in *Understanding other people's emotions* ($t(df)=1.0971(313.004)$, $p=0.273$), and for *Controlling own emotions*, the same differences as in the Baku sample were observed: Men scored higher for this scale ($t(df)=-2.1954(346.423)$, $p=0.029$). When comparing the indices for men in different samples, no differences were found on either EQ scale ($t(df)=-0.6657(288.473)$, $p=0.506$ and $t(df)=0.3215(297.427)$, $p=0.748$). No significant differences were established when comparing the parameters for women either ($t(df)=1.1339(608.234)$, $p=0.257$ and $t(df)=0.7118(647.864)$, $p=0.477$).

Cross-Cultural Differences in Academic Performance and Personality Predictors of Academic Achievement

Since GPA was not obtained for all students, the sample for cross-cultural comparison of academic achievement consisted of 274 people (208 women, 66 men), aged 16 to 28 ($M=19.29$, $SD=1.30$). Of these, Baku students comprised 79 people (50 women and 29 men) aged 16 to 22 ($M=18.48$, $SD=1.33$), and Moscow students comprised 195 people (158 women, 37 men) aged 18 to 28 ($M=19.62$, $SD=1.14$).

In the identification of cross-cultural differences in academic achievement, multivariate variance analysis (MANOVA) was used. Academic achievement (GPA) was the dependent variable; gender, age, group (Baku or Moscow) and their interaction were the equivalent of the independent variables. Significant influence was established for the factors of *age* ($F=20.156$, $p<0.001$), *gender* ($F=24.871$, $p<0.001$), and *group* ($F=10.660$, $p<0.001$).

Achievement was significantly higher in the *Russian* students ($M=4.43$, $SD=0.474$ for Moscow, $M=3.62$, $SD=0.686$ for Baku, p -value (t -test) <0.001) in general, and in each sample it was higher in women (Figure 3).

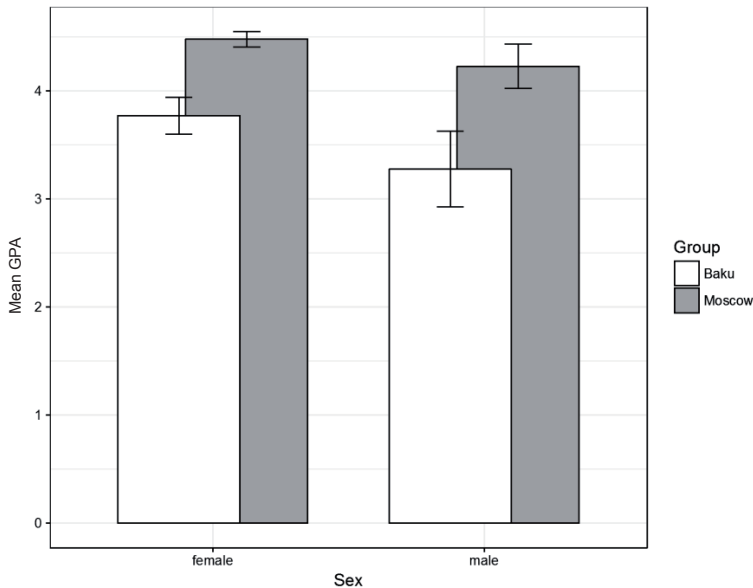


Figure 3. Gender differences in academic achievement (GPA) for Russian and Azerbaijani students

The correlation analysis of the relationship between personality traits and *academic achievement* demonstrated that Vigilance was significantly positively associated with academic achievement in the Russian sample ($\rho=0.18$) and with *both scales of emotional intelligence*. In the Azerbaijani sample, academic performance was associated only with the *Controlling own emotions* scale ($\rho=0.24$), and Vigilance was positively related to *Understanding other people's emotions*.

With the higher unproductive coping scores on the MDMQ, the levels of EQ are lower in all the samples (Table 3).

Table 3. The interrelationships of gender, age, group (Baku or Moscow), and psychological variables, with academic achievement in the Baku and Moscow samples (below the diagonal — Baku; above the diagonal — Moscow; differing correlations are highlighted in bold)

| | GPA | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|--------------|------|---------------|--------------|----------------|----------------|----------------|----------------|
| GPA | | .01 | -.02 | -.05 | .18* | -.06 | -.10 | .01 |
| 1 Age | -.04 | | -.02 | -.02 | -.08 | .01 | .09 | .04 |
| 2 Understanding other people's emotions | .11 | .06 | | .19** | .17* | -.26*** | -.29*** | -.15* |
| 3 Controlling own emotions | 0.24* | -.10 | .06 | | .18* | -.28*** | -.30*** | -.38*** |
| 4 Vigilance | .08 | -.06 | .24* | .14 | | -.42*** | -.41*** | .07 |
| 5 Buck Passing | .04 | -.08 | -.27** | -.11 | -.35*** | | .77*** | .59*** |
| 6 Procrastination | .01 | -.11 | -.19 | -.09 | -.43*** | .83*** | | .68*** |
| 7 Hypervigilance | -.01 | -.14 | -.16 | -.13 | -.34*** | .85*** | .96*** | |

Regression analysis revealed only Vigilance as a predictor of academic achievement of students, as well as of gender and age (Table 4). EQ did not act as a predictor.

Table 4. Linear regression: dependent variable — academic achievement; independent variables — gender, age, group, MDMQ scales, EmIn scales

| | Estimate | SE | t value | p |
|---|---------------|--------------|---------------|-------------------|
| <i>Model 1 (F (df)=15.15 (262), p<0.001, adj R=0.36)</i> | | | | |
| Group | 0.708 | 0.093 | 7.577 | < 0.001 |
| Gender | -0.349 | 0.080 | -4.377 | < 0.001 |
| Age | 0.009 | 0.028 | 0.327 | 0.744 |
| Understanding of other people's emotions | -0.012 | 0.082 | -0.151 | 0.880 |
| Controlling own emotions | -0.071 | 0.131 | -0.541 | 0.589 |
| Gender x Understanding of other people's emotions | -0.013 | 0.147 | -0.086 | 0.931 |
| Gender x Controlling own emotions | -0.366 | 0.282 | -1.297 | 0.196 |
| Vigilance | 0.219 | 0.098 | 2.230 | 0.027 |
| Buck Passing | 0.030 | 0.091 | 0.326 | 0.745 |
| Procrastination | 0.008 | 0.134 | 0.059 | 0.953 |
| Hypervigilance | -0.072 | 0.132 | -0.544 | 0.587 |

| | Estimate | SE | t value | p |
|---|---------------|--------------|---------------|-------------------|
| <i>Model 2 (F (df)=7.947 (250), p<0.001, adj R=0.37)</i> | | | | |
| Group | 0.501 | 0.187 | 2.671 | 0.008 |
| Gender | -0.343 | 0.082 | -4.184 | < 0.001 |
| Age | 0.018 | 0.041 | 0.443 | 0.658 |
| Understanding of other people's emotions | -0.020 | 0.082 | -0.243 | 0.808 |
| Controlling own emotions | -0.136 | 0.136 | -1.000 | 0.318 |
| Gender x Understanding of other people's emotions | -0.030 | 0.151 | -0.196 | 0.845 |
| Gender x Controlling own emotions | -0.331 | 0.290 | -1.141 | 0.255 |
| Vigilance | 0.335 | 2.467 | 0.136 | 0.892 |
| Buck Passing | -2.700 | 2.887 | -0.935 | 0.351 |
| Procrastination | -0.321 | 5.818 | -0.055 | 0.956 |
| Hypervigilance | 0.691 | 3.715 | 0.186 | 0.853 |
| Group x Vigilance | 3.939 | 3.010 | 1.309 | 0.192 |
| Group x Buck Passing | 2.633 | 3.654 | 0.721 | 0.472 |
| Group x Procrastination | 7.316 | 6.763 | 1.082 | 0.280 |
| Group x Hypervigilance | -7.993 | 4.839 | -1.652 | 0.100 |

Factors of *age* and *group* in interaction with the MDMQ scores demonstrated influence only in the Moscow sample.

Discussion

Cross-cultural comparison of student samples did not establish differences in the levels of productive coping (Vigilance), but the samples did differ in the preference of the unproductive coping of Buck Passing as a tendency to avoid solving problems. As our additional research on the same samples demonstrated, with the measurement of tolerance and intolerance of uncertainty (Kornilov & Bakhshaliyeva, 2016), the Buck Passing levels decreased with higher tolerance of uncertainty in the Azerbaijani students. Unexpected for this study were the links of growth of intolerance of uncertainty with the growth of Vigilance.

The age factor did not influence the Vigilance scores, but it positively influenced the reduction of unproductive coping with uncertainty in decision-making (on the MDMQ) in the Azerbaijani sample.

Comparison of sample averages in Vigilance coping permitted us to reject the hypothesis of cross-cultural differences and to affirm similar levels of positive coping with uncertainty to be an individual decision-making tendency, in both the compared samples. On the basis of a comparison of sample averages, we hypothesized that students in the Russian sample were more susceptible to such *unproductive* coping with uncertainty styles such as Procrastination and Buck Passing, and that students in the Azerbaijani sample were more inclined to Hypervigilance (as an untenable vacillation between alternatives).

Factor structure congruence verification is an essential step that allows researchers to avoid artifacts, as the results of our cross-cultural study demonstrate. The fact that not only quantitative comparisons, but also interpretations, can be artifacts makes it even more pertinent. In our opinion, examples of this are the discussion of alleged differences in EQ between Russian and Azerbaijani students and the concept of “culture of shame” as applied to Azerbaijani culture (Benedict, 2005).

For data on the EmIn questionnaire on Russian and Azerbaijani samples, we established that only two scales are congruent: *Understanding other people's emotions* and *Controlling own emotions*; therefore, it was only correct to identify cross-cultural differences on these scales. In both samples, these EQ variables correlate significantly with each other. Cross-cultural differences between the two samples on these metrically invariant scales were not established, which contradicts our colleagues' conclusion that “the representatives of Russian culture, in contrast to the representatives of Azerbaijani culture, have higher scores in understanding their own emotions and controlling them” (Pankratova et al., 2013, p. 11).

Within-group differences in psychological variables were determined in both samples by gender/age factors and their interaction. The fact that women's scores on *Understanding other people's emotions* were higher corresponds to much of the cross-cultural data. The fact that *Controlling own emotions* increases with age in women, corresponds to the notions of socialization processes with age. However, the fact that men's scores on *Controlling own emotions* in both samples decrease with age, may indicate different requirements from society (allowing greater freedom of self-expression for men and requiring greater self-regulation for women). We do not discuss cross-cultural specifics in this context.

We have not confirmed the greater emotional restraint of Russian men (higher scores on *Controlling own emotions*) in comparison to Azerbaijani men, as was discussed in our Russian colleagues' article.

We established a similarity in the relations of *productive* coping (Vigilance) with the increase of EQ in both samples and the decrease of *unproductive* coping with the growth of EQ. This is generally consistent with the hypothesis of the positive role of EQ in the regulation of coping with uncertainty. Cross-cultural differences were that Vigilance was the predictor of academic achievement only in the Russian sample, although the relationship between the MDMQ and EmIn scales was similar in both samples. EQ did not affect student achievement.

As the results of the regression analysis demonstrated, Vigilance, as productive coping with uncertainty (which is a factor in students' independence), can contribute to improving academic performance. In this quality it is part of the self-regulation system among Russian students, but not among Azerbaijani students.

Conclusions

1. Cross-cultural invariance was established for all MDMQ scales, and the questionnaire can be applied to both Russian and Azerbaijani samples.
2. The factor structures congruence test for the EmIn questionnaire demonstrated only a partial similarity in the measurements of emotional intelligence in

- the two cultures — on the scales of *Understanding other people's emotions* and *Controlling own emotions*.
3. Cross-cultural comparison of student samples did not establish any differences in the levels of productive coping (Vigilance); however, the samples differed in the preference of unproductive coping — Buck Passing, as a tendency to avoid problem solving.
 4. There were no differences between the Azerbaijani and Russian university students in the levels of EQ scales.
 5. Cross-cultural similarity was established in the relationship between higher EQ scores with higher productive coping (Vigilance) indices and lower unproductive coping.
 6. Vigilance was a predictor of academic achievement only in the Russian sample.
 7. The EQ scores were not predictors of academic achievement.
 8. The influence of age, gender, and cultural affiliation on academic achievement and their relationship to psychological variables was demonstrated (higher rates of achievement for Russian students, for girls in both samples, and for older students in the Russian sample).

Limitations

The first limitation of this study is the disproportion of men and women (158 women and 37 men in the Russian sample; 61 women and 36 men in the Azerbaijani sample). Therefore, the results concerning gender differences require further research. Secondly, the study was conducted in two capital cities (Moscow and Baku), which limits the generalizability of obtained results to Russian and Azerbaijani cultures in general. Thirdly, as most of the participants attended Moscow State University and its branch in Baku, the results of this study may be most applicable to students concerned with intellectual excellence and international integration. In order to achieve more robust results in cross-cultural research, the selected samples should include participants from a wider range of social groups.

References

- Andreeva, I.N. (2008). O stanovlenii ponjatija 'ehmocional'nyj intellekt' [On the development of the 'Emotional Intelligence' concept]. *Voprosy Psikhologii*, 5, 83–95.
- Averill, J.R. (2000). Intelligence, emotion, and creativity: From trichotomy to trinity. *Handbook of emotional intelligence* (pp. 363–376). San Francisco: Jossey-Bass.
- Bacon, D.R., & Bean, B. (2006). GPA in research studies: An invaluable but neglected opportunity. *Journal of Marketing Education*, 28(1), 35–42. <https://doi.org/10.1177/0273475305284638>
- Benedict, R. (2005). *The chrysanthemum and the sword: Patterns of Japanese culture*. New York: Houghton Mifflin Harcourt.
- Brackett, M.A., & Mayer, J.D. (2003). Convergent, discriminant, and incremental validity of competing measures of emotional intelligence. *Personality and Social Psychology Bulletin*, 29(9), 1147–1158. <https://doi.org/10.1177/0146167203254596>
- Caruso, D.R., & Salovey, P. (2004). *The emotionally intelligent manager: How to develop and use the four key emotional skills of leadership*. San Francisco: John Wiley & Sons.

- Imran, N., Aftab, M.A., Haider, I.I., & Farhat, A. (2013). Educating tomorrow's doctors: A cross sectional survey of emotional intelligence and empathy in medical students of Lahore. *Pakistan Journal of Medical Sciences*, 29(3), 710. <https://doi.org/10.12669/pjms.293.3642>
- Ivcevic, Z., Brackett, M.A., & Mayer, J.D. (2007). Emotional intelligence and emotional creativity. *Journal of Personality*, 75(2), 199–236. <https://doi.org/10.1111/j.1467-6494.2007.00437.x>
- Janis, I.L., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice, and commitment*. New York: Free Press.
- Johnson, J.L. (1997). Commuter college students: What factors determine who will persist and who will drop out? *College Student Journal*, 31, 323–332.
- Gardner, H. (2011). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
- Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*. Beverly Hills: Sage Publications.
- Husin, W.N.I.W., Santos, A., Ramos, H.M., & Nordin, M.S. (2013). The place of emotional intelligence in the 'intelligence taxonomy': crystallized intelligence or fluid intelligence factor? *Procedia-Social and Behavioral Sciences*, 97, 214–223. <https://doi.org/10.1016/j.sbspro.2013.10.225>
- Kornilov, S.A., Kornilova, T.V., & Grigorenko, E.L. (2016). The cross-cultural invariance of creative cognition: A case study of creative writing in US and Russian college students. *New Directions for Child and Adolescent Development*, 151, 47–59. <https://doi.org/10.1002/cad.20149>
- Kornilova, T.V. (2016). *Intellektual'no-lichnostnyĭ potentsial cheloveka v usloviyakh neopredelennosti i riska*. [The individual's intellectual and personality potential in uncertain and risky conditions]. SPb.: Nestor-Istoriya.
- Kornilova, T.V. (2016). Mel'burnskij oprosnik prinjatija reshenij: russkojazychnaja adaptacija [Melbourne Decision Making Questionnaire: A Russian adaptation]. *Psikhologicheskie Issledovaniya*, 6(31), 4. Retrieved from <http://psystudy.ru>
- Kornilova, T.V. (2016b). Psikhologija vybora kak myslitel'noe i lichnostnoe oposredstvovanie preodolenija neopredelennosti [Psychology of choice and decision making as cognitive and personality moderated overcoming of uncertainty]. *Psikhologicheskii Zhurnal*, 37(3), 113–124.
- Kornilova, T.V. (2014) Tolerantnost' k neopredelennosti i jemocional'nyĭ intellekt pri prinjatii reshenij v uslovijah podskazki [Tolerance of uncertainty and emotional intelligence and the use of hints in decision-making]. *Psychology. Journal of the Higher School of Economics*, 4, 19–36.
- Kornilova, T.V., & Bakhshaliyeva, S.I. (2016). Kross-kul'turnoe issledovanie individual'nyh osobennostej prinjatija reshenij i tolerantnosti k neopredelennosti u rossijskih i azerbajdzhanskih studentov [A cross-cultural study of the relationship between decision making and tolerance of uncertainty in Russian and Azerbaijani students]. *Psikhologicheskie Issledovaniya*, 9(47), 2. Retrieved from: <http://psystudy.ru>
- Kornilova, T.V., Chumakova, M.A., & Izmailova, A.M. (2015, April). *Implicit theories of intelligence and personality, attitudes towards uncertainty, and academic achievement in college students: Cross-cultural study*. Paper presented at the 3rd International Academic Conference on Social Sciences (IACSS 2015), Istanbul, Batumi, 189–202.
- Kornilova, T.V., Chumakova, M.A., Novikova, M.A., & Kornilov, S.A. (2010) *Psikhologiya neopredelennosti: Edinstvo intellektualno-lichnostnogo potenciala cheloveka* [The psychology of uncertainty: Unity of human intellectual-personality potential]. Moscow: Smisl.
- Kornilova, T.V., & Gadjeva, G.I. (2016). Cross-cultural study of connection between the dark triad and emotional intelligence (for Russian and Azerbaijani samples). In V.V. Gritsenko (Ed.). *Theoretical issues of ethnical and cross-cultural psychology: Proceedings of the Fifth In-*

- ternational Scientific Conference 27–28 May 2016 in 2 vols.: vol. 1 (pp. 238–241). Smolensk: Smolensk Humanitarian University.
- Kornilova, T.V., & Novikova, M.A. (2013). Self-assessed intelligence, psychometric intelligence, personality, and academic achievement: Two structural models. In M. Gowda and A. Khanderia (Eds.). *Educational achievement: Teaching strategies, psychological factors and economic impact* (pp. 197–212). New York: Nova Science Publishers.
- Kornilova, T.V., & Novotockaja-Vlasova, E.V. (2009). Sootnoshenie nraavstvennogo samosoznaniia lichnosti, jemocional'nogo intellekta i prinjatija neopredelennosti [Levels of a person's moral self-awareness, emotional intelligence and tolerance of uncertainty]. *Voprosy Psikhologii*, 6, 61–70.
- Koydemir, S., Şimşek, Ö. F., Schütz, A., & Tipandjan, A. (2013). Differences in how trait emotional intelligence predicts life satisfaction: The role of affect balance versus social support in India and Germany. *Journal of Happiness Studies*, 14(1), 51–66. <https://doi.org/10.1007/s10902-011-9315-1>
- Krasavtseva, Y.V., & Kornilova, T.V. (2016). Svojstva temnoj triady v reguljacii strategij prinjatija reshenij (na materiale igrovoj zadachi ajova — IGT) [The dark triad traits in the regulation of decision-making strategies]. *Vestnik MGOU*, 2, 22–33.
- Lyusin D.V. (2009). Oprosnik na ehmocional'nyj intellekt EmIn: novye psihometricheskie dannye [The EmIn emotional intelligence questionnaire: New psychometric data]. In D.V. Lyusin & D. V. Ushakov (Eds.). *Socialnyy i ehmocionalnyy intellekt: Ot processov k izmereniyam* [Social and emotional intelligence: From processes to measurements] (pp. 264–278). Moscow: Institut psikhologii RAN.
- Mann, L., Burnett, P., Radford, M., & Ford, S. (1997). The Melbourne Decision Making Questionnaire: An instrument for measuring patterns for coping with decisional conflict. *Journal of Behavioral Decision Making*, 10(1), 1–19. [https://doi.org/10.1002/\(SICI\)1099-0771-\(199703\)10:1<1::AID-BDM242>3.0.CO;2-X](https://doi.org/10.1002/(SICI)1099-0771-(199703)10:1<1::AID-BDM242>3.0.CO;2-X)
- Mayer, J.D. (2014). *Personal intelligence: The power of personality and how it shapes our lives*. New York: Farrar, Straus and Giroux.
- Mayer, J.D., Caruso, D.R., & Salovey, P. (2016). The ability model of emotional intelligence: Principles and updates. *Emotion Review*, 8(4), 290–300. <https://doi.org/10.1177/1754073916639667>
- Mayer, J.D., & Salovey, P. (2001). Emotional intelligence as a standard intelligence. *Emotion*, 1(3), 232–242. <https://doi.org/10.1037/1528-3542.1.3.232>
- Mayer, J.D., Salovey, P., & Caruso, D.R. (2008). Emotional intelligence: New ability or eclectic traits? *American Psychologist*, 63(6), 503–517. <https://doi.org/10.1037/0003-066X.63.6.503>
- Matsumoto, D., Yoo, S. H., & Fontaine, J. (2008). Mapping expressive differences around the world: The relationship between emotional display rules and individualism versus collectivism. *Journal of Cross-Cultural Psychology*, 39(1), 55–74. <https://doi.org/10.1177/0022022107311854>
- Novikova, M.A., & Kornilova, T.V. (2014). Shkaly 'psikhologicheskoy razumnosti': aprobaciya oprosnika na rossijskih vyborkah [The scales of 'Psychological Mindedness': Adaptation of a questionnaire to Russian samples]. *Psikhologicheskij Zhurnal*, 35(1), 63–78.
- Pankratova, A.A., Osin, E.N., & Lyusin, D.V. (2013). Osobennosti jemocional'nogo intellekta u predstavitelej rossijskoj i azerbajdzhanskoj kul'tur [Differences in emotional intelligence in Russian and Azerbaijani culture]. *Psikhologicheskie Issledovaniya*, 6(31), 11. Retrieved from <http://psystudy.ru>
- Pavlova, E.M., & Kornilova, T.V. (2016). The 'positive triad' of the regulation of personal choice among creative professionals. In G.B. Moneta & E. Rogaten (Eds.). *Psychology of creativity* (pp. 153–166). New York: Nova Science Publishers.

- Perera, H.N., & DiGiacomo, M. (2013). The relationship of trait emotional intelligence with academic performance: A meta-analytic review. *Learning and Individual Differences*, 28, 20–33. <https://doi.org/10.1016/j.lindif.2013.08.002>
- Pérez-González, J.C., & Sanchez-Ruiz, M.J. (2014). Trait emotional intelligence anchored within the Big Five, Big Two and Big One frameworks. *Personality and Individual Differences*, 65, 53–58. <https://doi.org/10.1016/j.paid.2014.01.021>
- Poropat, A.E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin*, 135(2), 322. <https://doi.org/10.1037/a0014996>
- Salovey, P., & Mayer, J.D. (1990). Emotional intelligence. *Imagination, Cognition And Personality*, 9(3), 185–211. <https://doi.org/10.2190/DUGG-P24E-52WK-6CDG>
- Sanchez-Ruiz, M.J., Mavroveli, S., & Poullis, J. (2013). Trait emotional intelligence and its links to university performance: An examination. *Personality and Individual Differences*, 54(5), 658–662. <https://doi.org/10.1016/j.paid.2012.11.013>
- Stein, S.J., & Book, H. (2010). *The EQ edge: Emotional intelligence and your success* (Vol. 25). John Wiley & Sons.
- Schneider, W.J., Mayer, J.D., & Newman, D.A. (2016). Integrating hot and cool intelligences: Thinking broadly about broad abilities. *Journal of Intelligence*, 4(1), 1. <https://doi.org/10.3390/jintelligence4010001>
- Schutte, N.S., Malouff, J.M., Hall, L.E., Haggerty, D.J., Cooper, J.T., Golden, C.J., & Dornheim, L. (1998). Development and validation of a measure of emotional intelligence. *Personality and individual differences*, 25(2), 167–177. [https://doi.org/10.1016/S0191-8869\(98\)00001-4](https://doi.org/10.1016/S0191-8869(98)00001-4)
- Soto, J.A., & Levenson, R.W. (2009). Emotion recognition across cultures: The influence of ethnicity on empathic accuracy and physiological linkage. *Emotion*, 9(6), 874. <https://doi.org/10.1037/a0017399>
- Van der Linden, D., Tsaousis, I., & Petrides, K.V. (2012). Overlap between general factors of personality in the Big Five, Giant Three, and trait emotional intelligence. *Personality and Individual Differences*, 53(3), 175–179. <https://doi.org/10.1016/j.paid.2012.03.001>
- Van der Zee, K., Thijs, M., & Schakel, L. (2002). The relationship of emotional intelligence with academic intelligence and the Big Five. *European Journal of Personality*, 16(2), 103–125. <https://doi.org/10.1002/per.434>

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Psychological characteristics of art specialists with a highly productive creative imagination

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Background: Notwithstanding all the different forms of art, the source of the creative process, its initial impulse, is an artistic image, and its creation is closely connected with the imagination. L. Vygotsky held the view that artistic creativity has great importance in overall development. In this regard, it is relevant to study the role of personal psychological characteristics that stimulate creativity, determine creative potential, and indicate personal predisposition to artistic activity.

Objective: to study individual psychological characteristics of art specialists with a highly productive creative imagination.

Design: There were 240 respondents: art specialists (artists, actors) and specialists who do not work in artistic fields. The empirical research included: assessment of the level of productivity of the creative imagination and psychological testing. All the participants, within the bounds of their profession, were divided into high productivity and low productivity groups. The productivity level of the creative imagination was assessed by expert judgment of art works made by the participants using a monotype technique. For psychological testing, the following methods were used: Freiburg Personality Inventory (FPI); Volitional Self-Control Inventory by A. Zverkov and E. Eidman; the “Choose the Side” test by E. Torrance; the “Unfinished Figures” subtest by E. Torrance; and the technique of pair comparisons by V. Skvortsov. Statistical data processing was conducted on the basis of percentage distribution and comparative analysis using the Student parametric t-test. We used STATISTICA 13.0 software.

Results: We found the following psychological characteristics of art specialists with highly productive creative imagination: high emotionality, inclination to affective reactions, high anxiety and excitability, and need for self-realization. Artists with highly productive creative imagination were characterized by immersion in their own emotions, psychic estrangement, high sensitivity, flexibility, ingenuity, right-hemisphere and combined types of thinking, and a high level of nonverbal creativity. Actors with highly productive creative imagination were characterized by stability, relaxation, self-satisfaction, and average nonverbal creativity; the mixed type of thinking predominated in this group.

Conclusion: The differences in the intensity of the psychological characteristics of representatives of these different professional groups may be determined by the level of productivity of their creative imagination. We discovered general and specific (depending on professional activity) psychological characteristics of art specialists with a high level of productivity of the creative imagination.

Keywords: artists, actors, creative imagination, monotype, volitional regulation, type of thinking, creativity

Introduction

Creativity is an integral part of human life, requiring mobilization of resources, knowledge, skills, and life experience. The character of the creative process depends on the particular features of the art form: poetry, painting, music, etc. L.S. Vygotsky (1998) held the view that artistic creativity has great importance in overall development. During the process of artistic activity, students master a new language to express their feelings, thoughts, and relationships; broaden their knowledge; foster feelings; and learn, with the help of an image, language that cannot be brought to consciousness in any other way.

Notwithstanding all the different art forms, the source of the creative process, its initial impulse, is an artistic image, and its creation is closely connected with the imagination. From the scientific point of view, imagination has traditionally been conceived as a mental process of creating new images through the transformation of perceptions and conceptions. The formation of an image according to its description is defined as reproductive imagination, and the formation of new, original images is defined as creative imagination (Petuhov, 1997).

The question of how a new image is created is one of particular interest and still requires specification. A. Melik-Pashaev regards artistic imagination as the ability to realize human orientation by the transformation of impressions that are caused by an aesthetic attitude to life, in expressive, sense-perceptible images (Melik-Pashaev, Novlyanskaya, Adaskina, & Chubuk, 2005).

The scientific literature discusses the personal characteristics that contribute to realization of creative abilities, define creative potential, and indicate a personal predisposition to artistic activity (Batey & Furnham, 2006; Benedek et al., 2012; Bogoyavlenskaya & Bogoyavlenskaya, 2013; Silvia & Beaty, 2012). Among the individual psychological characteristics of artists, researchers single out: emotionality, empathy, spontaneity, independence, inner freedom, and self-regulation (Feist, 1999; Rozhdestvenskaya, 1980).

Artistic giftedness, as well as general giftedness, is a systemic mental quality, the basis of which is not special abilities, but the intensity of integration processes "inside" the person, which shapes his personal sphere (Bogoyavlenskaya & Bogoyavlenskaya, 2013). Personality as the main system-creating factor of giftedness may define the productivity of the creative imagination, the key phenomenon of artistic giftedness (Bogoyavlenskaya & Bogoyavlenskaya, 2008). That is why the study of individual psychological characteristics of art specialists with different levels of productivity of the creative imagination is of interest.

Method

Aim, Hypotheses, and Participants

The aim of the empirical research was to study individual psychological characteristics of art specialists with a high level of productivity of the creative imagination.

There were two hypotheses:

1. For art specialists with a high level of productivity of the creative imagination, both general and specific psychological characteristics may exist, depending on the field of their professional activity.
2. Differences in the intensity of psychological characteristics of representatives of different professional groups may be formed by the level of productivity of the creative imagination.

Participants comprised 240 right-handed respondents aged 23 to 27, both males and females. The participants were divided into three groups, according to their professional activities: artists (80 persons), actors (74 persons), and specialists who do not work in artistic fields (84 persons). The artistic specialists had higher education or specialized secondary education, and at least three years of work experience in their field.

The participants were briefed about the research procedure in advance and confirmed their voluntary agreement to take part in it.

Empirical Research

To develop our empirical research procedure, we started from Vygotsky's idea (1998), that through the analysis of art one can come to a psychological synthesis. First, an expert review was carried out of works of art created by participants. Then the subjects were given an array of psychological tests. We studied the psychological characteristics of the subjects, depending on the level of productivity of their creative imagination, as defined by the experts through analysis of the respondents' works of art.

Thus the empirical research procedure included:

- assessment of the subjects' level of productivity of the creative imagination;
- psychological testing.

The experts judged art works that were made by the participants using the monotype technique. Monotyping is a special form of art, which is considered to be an effective means for artistic image formation (Novikova, 2012).

Monotyping (from the Greek *monos* — one, only; and *typos* — stencil) is a graphic technique first used in the 17th century by the Italian artist and engraver Giovanni Castiglione, which involves stamping paint on paper. In the resulting mono- or polychrome paint-blot, an artistic image is detected and the missing details are added. Figure 1 presents examples of the monotypes and some artistic images based on them.

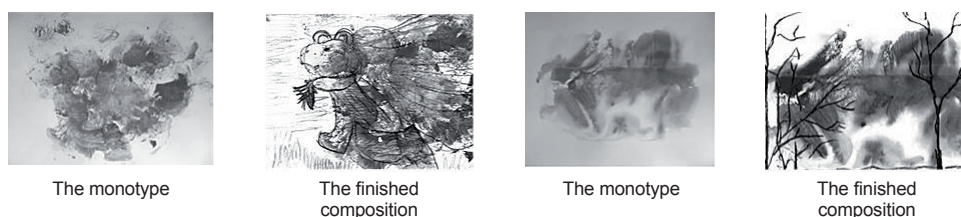


Figure 1. Examples of monotypes and finished compositions based on these artistic images

This technique has, in our view, certain advantages:

1. Monotypes not showing anything concrete are the threshold-extension stimuli, facilitating the process of creating free associations, ideas, and images. It should be noted that subjects' initial perceptions of the monotyping material do not really determine their concrete actions: The task may be the means of the artist's self-expression, or it may initiate the artistic process in a test subject as an externally induced behavior. We judge the external or internal sources of the artistic process by means of the expert opinion about the results of working with the paint-blots.
2. The ease of the task minimizes the level of laboratory stress, which could distort test subjects' ideas of their potential abilities. Monotyping can be used with test subjects who have no experience with artistic self-expression and otherwise don't know how to begin. Success in accomplishing the tasks does not depend directly on learning, which makes it possible to compare the results achieved by different people.
3. Monotyping suggests solving the task via insight, which makes it possible for us to register the steps of the artistic process.
4. The uniqueness of the stamps makes it impossible for subjects to prepare for the experiment beforehand. Thus we can state that the artistic process unfolds during the experiment itself and does not reflect any previous patterns of solving such a task.

The work of the participants in monotyping included:

1. Artistic image creation using one of the ten offered monotypes, working out its mental compositional elaboration;
2. Producing the planned artistic image on the sheet of paper with the selected monotype.

The level of productivity of the creative imagination of the participants was assessed by expert judgment of the art works created by respondents during the monotyping process (Dikiy, Dikaya, & Karpova, 2014). The expert committee consisted of five professional art teachers who, in the course of many years (at least 15 years), have been permanent jurors of regional and all-Russian contests, taking part as experts on applicant selection committees of general secondary schools in Rostov-on-Don.

The criteria for assessing the level of productivity of the creative imagination proceeded from the idea that the process of creative imagination becomes appar-

ent in the creation of an expressive image and in using appropriate means from a given art form in its implementation (Melik-Pashaev et al., 2005; Novikova, 2012). The expert judgment of the art works included two levels of estimation and was conducted in accordance with the following criteria:

1. The way an artistic image is created in monotyping:
 - the use of monotyping as an image's foundation (1 point),
 - the partial use of monotyping as an image's figure (2 points),
 - the use of monotyping as the background for an idea and the development of a sensory image (3 points).
2. Expressiveness of the artistic image in the overall composition:
 - degree of the composition's elaboration and completeness (1–3 points),
 - technical quality of the picture: compositional order, treatment of light and shade, color match, dynamic characteristics (line directions, sense of rhythm) (1–4 points).

To ensure equal conditions for expert judgment of the work of artists and the work of participants without artistic experience, the assessment was carried out separately for the representatives of each professional group.

In conference with the expert committee, the criteria for assessing the art works' productivity level were fixed for each professional group. For specialists who do not work in artistic fields, the key criteria were total or partial use of monotyping as an image's foundation, and also the degree of elaboration and completeness of the composition. Highly productive participants were those who got at least a total of 4 points for these criteria. For actors, whose professional activity is connected with a process of artistic image formation, the key criteria of productivity were the way an artistic image was created and the degree of elaboration and completeness of the composition. Highly productive participants were those who used monotyping as the background for an idea and the development of a sensory image, and who had at least 2 points for the composition's elaboration. For artists, whose professional activity is connected not only with the process of artistic image formation, but also with technical means of realizing an idea on paper, the productivity estimation involved all the above-mentioned criteria. Highly productive participants were those who used monotyping as the background for an idea and the development of a sensory image, and who revealed the concept of the whole composition with the help of technique (at least a total of 8 points for these criteria).

All the participants, keeping within the bounds of their professional groups, were divided into high-productivity and low-productivity subgroups: an *artist group* — 50 high-productivity and 30 low-productivity participants; an *actor group* — 45 high-productivity and 29 low-productivity participants; a group of *specialists who do not work in artistic fields* — 49 high-productivity and 37 low-productivity participants.

The psychological testing consisted of the following methods: Freiburg Personality Inventory (FPI) for detection of the main personality traits; the Volitional Self-Control Inventory by Zverkov and Eidman (1990) for detection of the volitional self-regulation level; the "Choose the Side" test by Torrance (1990) for detection of the prevailing type of thinking; the "Unfinished Figures" subtest by E. Torrance

for detection of the level of nonverbal creativity (Tunik, 2013); the technique of pair comparisons by V. Skvortsov (Raigorodskii, 2011) for detection of the primary needs satisfaction level.

Statistical data processing

Statistical data processing was conducted on the basis of percentage distribution and comparative analysis with the Student parametric t-test. We used STATISTICA 13.0 computer software.

Results

Personal characteristics of art specialists, depending on the level of productivity of their creative imagination

Comparative analysis with the Freiburg Personality Inventory (FPI) distinguished the psychological characteristics of art specialists — artists and actors — with high and low levels of productivity of the creative imagination. Typical traits of all the artists included: high emotional lability, low emotional balance, and pronounced introversion.

Artists with a high level of productivity of the creative imagination, as opposed to those with a low level, had reliably higher average signs of neurosality (high degree of neurotism) ($p < .01$), irritability (high degree) ($p < .01$), shyness (high degree) ($p < .05$), spontaneous aggression (medium degree) ($p < .01$), reactive aggression (medium degree) ($p < .01$), depression (medium degree) ($p < .01$).

Actors with a high level of productivity of the creative imagination, as opposed to the artists with a low level, had reliably higher average signs of irritability (high degree) ($p < .01$), neurosality (medium degree) ($p < .01$), spontaneous aggression (medium degree) ($p < .01$), emotional balance (medium degree) ($p < .05$), emotional lability (high degree) ($p < .01$). (Figure 2).

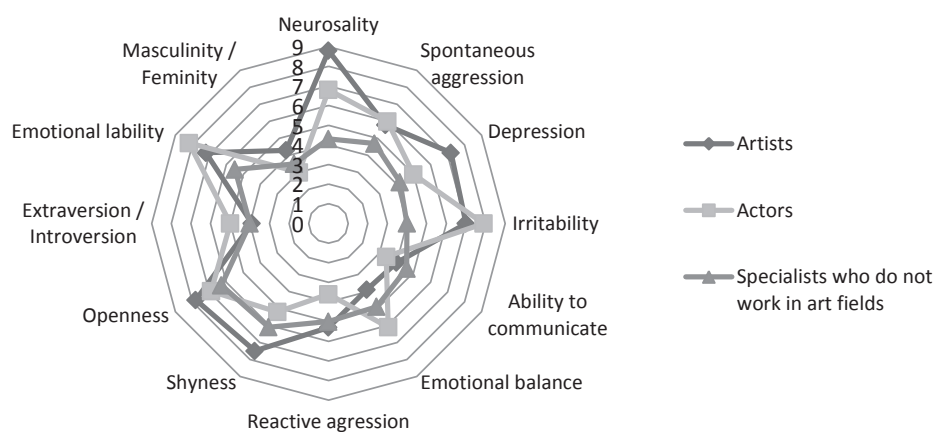


Figure 2. An average personal profile of representatives of different professional groups with a high level of productivity of the creative imagination

Note: • — reliable distinctions between appropriate indexes of specialists of different professional groups ($p < .05$).

The results of the FPI for different specialists with a high level of productivity of the creative imagination, using the Student parametric t-test, indicated that the art specialists had reliably higher average values of irritability ($p < .01$) and emotional lability ($p < .01$) than did specialists who do not work in artistic fields. The average sign of neurosality ($p < .01$) was reliably higher in the artist group than in the two other groups; however, in the actor group, the values of neurosality ($p < .01$) were higher than in the group of participants who do not work in artistic fields.

Comparing two groups, artists and actors, we should mention that the average signs of depression were reliably higher in the artist group ($p < .01$); actors have reliably higher values of emotional balance ($p < .01$) (Figure 2).

Volitional self-regulation of art specialists, depending on the level of productivity of their creative imagination

The artists with a high productivity level, as opposed to those with a low one, had reliably lower average values of total volitional self-regulation (low level) ($p < .01$), persistence (low level) ($p < .01$), and self-regulation (low level) ($p < .01$).

The actors with a high level of productivity of the creative imagination, as opposed to actors with a low level, had reliably lower average values of total volitional self-regulation (medium level) ($p < .01$) and of persistence (medium level) ($p < .01$).

The FPI of the specialists with a high level of productivity of the creative imagination, using the Student parametric t-test, indicated that the artists had reliably lower average values of volitional self-regulation ($p < .01$), persistence ($p < .01$), and self-regulation ($p < .01$) than those in the other two groups (Figure 3).

Art specialists with a high level of productivity of the creative imagination, especially artists, had low reflection, but high sensitivity, flexibility, and ingenuity. Specialists with a high level of productivity who do not work in artistic fields, had steady intentions, a developed sense of duty, a high level of rational control, and realistic opinions.

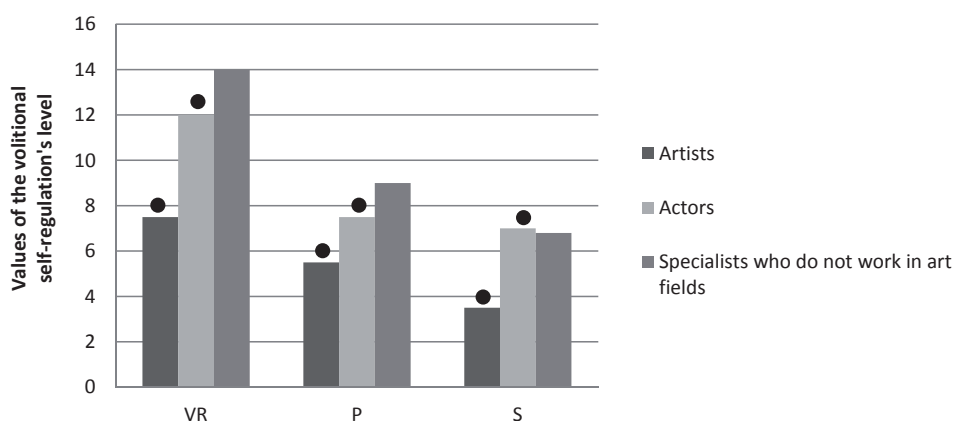


Figure 3. Average values of volitional self-regulation of representatives of different professional groups with a high level of productivity of the creative imagination

Note: VR — general level of volitional regulation; P — persistence; S — self-control; • — reliable distinctions between appropriate indexes of specialists of different professional groups ($p < .05$).

Prevailing types of thinking of art specialists, depending on the level of productivity of their creative imagination

Analysis of the distribution of the prevailing types of thinking among artists with a low level of productivity of the creative imagination reflected the distributive evenness of all types of thinking: right-hemisphere thinking — 27% (8 persons); combined type — 23% (8 persons); mixed type — 33% (10 persons); and left hemisphere — 17% (5 persons).

52% (26 persons) among artists with a high level of productivity of the creative imagination were characterized by a combined type of thinking; 40% (20 persons) had a right hemisphere type, and a small number of artists (8%, 4 persons) had a mixed type.

Analysis of the distribution of the prevailing types of thinking among actors with a low level of productivity of the creative imagination shows that 38% (11 persons) had a mixed type of thinking, 28% (8 persons) had a combined type, 24% (7 persons) had a left-hemisphere type, and 10% (3 persons) had a right-hemisphere type.

49% (22 persons) among actors with a high level of productivity of the creative imagination were characterized by a mixed type of thinking, 24% (11 persons) had a right-hemisphere type, and 27% (12 persons) had a combined type.

Generalizing the results of the distribution of the prevailing types of thinking among different subjects with high levels of productivity of the creative imagination, we may point out that the prevailing right-hemisphere type of thinking was discovered in all the groups, but in different percentages: 40% — artists, 24% — actors, 10% — specialists who do not work in artistic fields. The prevailing left-hemisphere type of thinking was typical of specialists who do not work in artistic fields (30%). 52% of artists, 55% of specialists who do not work in artistic fields, and 27% of actors had a combined type of thinking. A mixed type of thinking was mainly pronounced in the actors group (49%), but a small number of artists (8%) and specialists who do not work in artistic fields (5%) showed this type of thinking too (Figure 4).

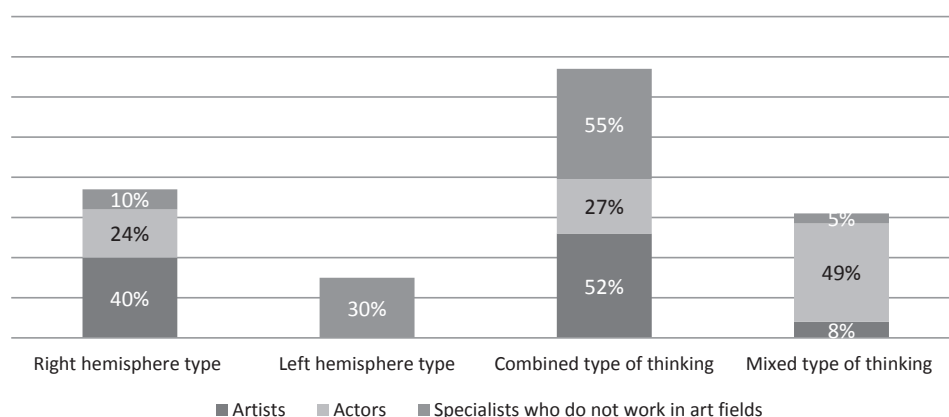


Figure 4. Distribution of the prevailing types of thinking among representatives of different professional groups with a high level of productivity of the creative imagination

Nonverbal creativity of art specialists, depending on the level of productivity of their creative imagination

The distribution of nonverbal creativity among the art specialists, depending on the level of productivity of their creative imagination, had the following characteristics. The majority of artists with a low productivity level had an average level of nonverbal creativity — 90% (27 persons); a small number of this group had an above average level of nonverbal creativity — 10% (3 persons). 50% (25 persons) of artists with a high level of productivity of the creative imagination had a high level of nonverbal creativity, 34% (7 persons) had a medium level, and 16% (8 persons) had a higher than medium level.

Half of the representatives of the actor group with low (62%, 18 persons) and high (51%, 23 persons) levels of productivity of the creative imagination had an average level of nonverbal creativity. The other actors with a low level had low (24%, 7 persons) and below average (14%, 4 persons) levels of nonverbal creativity, and actors with high levels of productivity of the creative imagination were characterized by high (24%, 11 persons) and above average (24%, 11 persons) levels of nonverbal creativity.

Generalizing the results of the distribution of the nonverbal creativity levels among different specialists with high levels of productivity of the creative imagination, we should point out that low and below average levels of nonverbal creativity occur only in the group of specialists who do not work in artistic fields, whereas average, above average, and high levels of nonverbal creativity were discovered in all the groups, but in different percentages (Figure 5).

However, it is not enough to examine the quantitative characteristics of the distribution of nonverbal creativity in order to judge, by this test, nonverbal creativity's influence in the different professional groups on the productivity of the creative imagination. It is important to take into account that the test estimation of the total creativity level is conducted by summing up its separate signs — originality, elaboration, abstract name of a picture — which can have different correlations

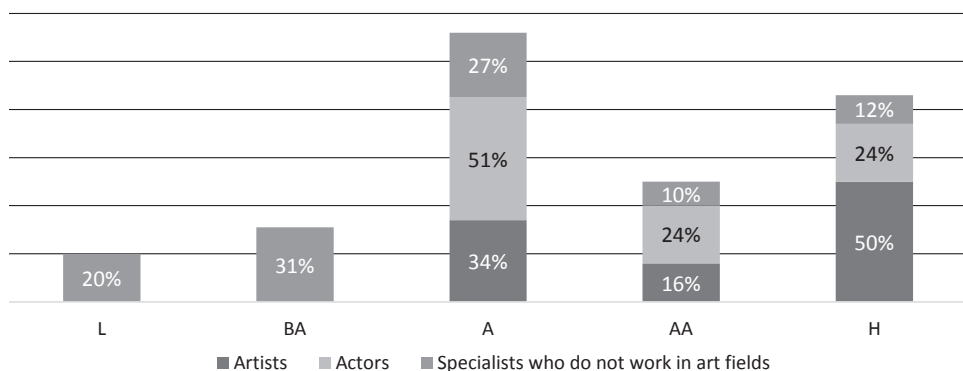


Figure 5. Distribution of nonverbal creativity among the representatives of different professional groups with a high level of productivity of the creative imagination

Note: L — low level of nonverbal creativity; BA — below average; A — average; AA — above average; H — high.

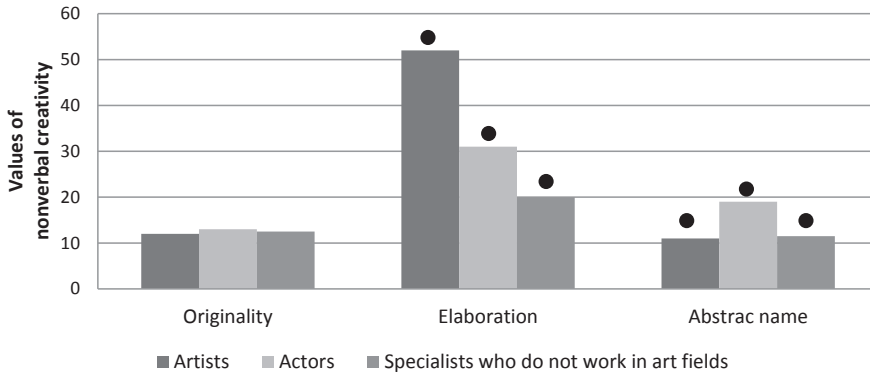


Figure 6. Average values of nonverbal creativity of the representatives of different professional groups with a high level of productivity of the creative imagination.

Note: • — reliable distinctions between appropriate indexes of specialists of different professional groups ($p < .05$).

in different professional groups and a different influence on preparation for the process of realizing creative imagination (Tunik, 2013).

As a result of the creativity indexes' comparison of different professional groups' representatives with a high level of productivity of the creative imagination, we discovered that the art specialists had reliably higher average values of the "elaboration" index ($p < .01$) than the specialists who do not work in this field. Comparing the artist and actor groups, we found that the "elaboration" index was reliably higher in the artist group ($p < .01$), but the "abstract" index was reliably higher in the actor group ($p < .01$). In the different professional groups with a high level of productivity of the creative imagination, reliable differences for the "originality" index were not discovered (Figure 6).

The discovered differences among creativity values may indicate different perceptions and interpretations of the instructions ("complete the figures and think up names for each picture") by different specialists. For specialists who do not work in artistic fields, during the testing process the originality of the devised picture and its uniqueness were of great importance. The transference of the composition's main concept was important for art specialists; the completed figure was just part of the artistic design here. In connection with the specific character of their professional activity, the actors transferred ideas with the help of names and had higher "abstract name" indexes than the artists, but the artists used artistic means and had higher "elaboration" indexes than the actors.

Prevailing needs of art specialists, depending on the level of productivity of their creative imagination

As a result of the distribution analysis among specialists of different professional groups with a high level of productivity of the creative imagination, we discovered that in the artist group with a low productivity level, need for respect (40%, 12 persons), and need for self-actualization as well as material needs (20%, 6 persons) predominated. A small number of artists (10%, 3 persons) felt the need for safety and interpersonal connection.

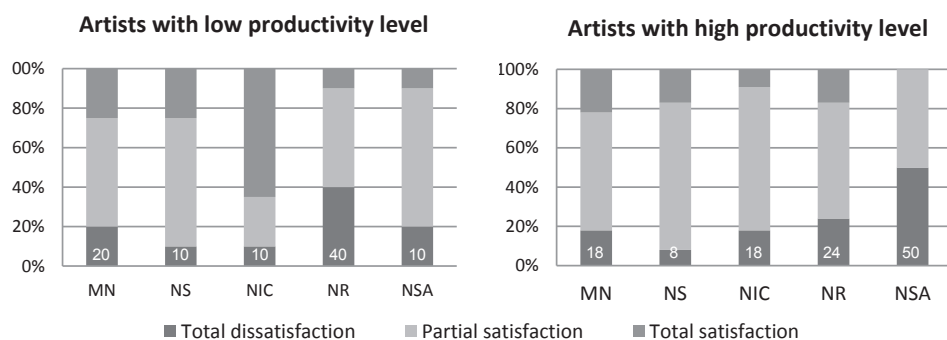


Figure 7. Distribution of the main needs among the artists with a high level of productivity of the creative imagination.

Note: MN — material needs; NS — need for safety; NIC — need for interpersonal connection; NR — need for respect; NSA — need for self-actualization.

The main needs of the artists with a high level of productivity of the creative imagination were:

- need for self-actualization (50%, 25 persons);
- need for respect (24%, 12 persons).

A small number of this group felt the need for interpersonal connection and material needs (18%, 9 persons) and for safety (8%, 4 persons) (Figure 7).

In the actor group with a low productivity level, need for respect (48%, 14 persons), need for self-actualization (52%, 15 persons) and material needs (38%, 11 persons) predominated. A small number of participants (10%, 3 persons) pointed out interpersonal connection as an unsatisfied need (Figure 8).

Most actors had a prevailing need for self-actualization (62%, 28 persons). And just a small number of representatives of the different groups (10%, 3 persons) pointed out the need for respect (13%, 6 persons), interpersonal connection (11%, 5 persons), and material needs (11%, 5 persons) as unsatisfied needs (Figure 8).

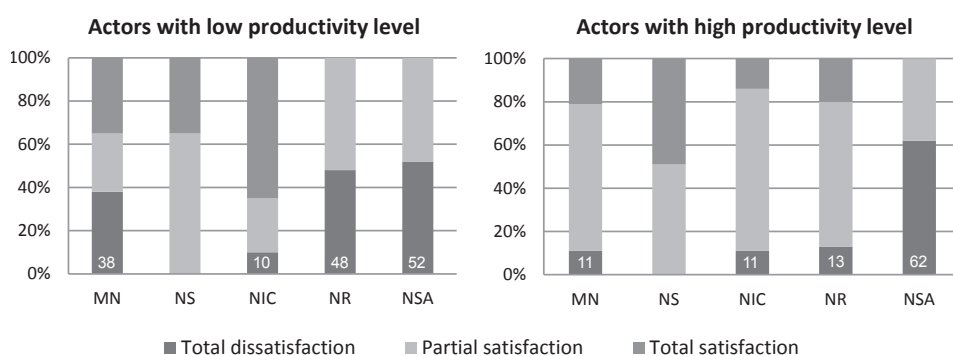


Figure 8. Distribution of the main needs among the actors with a high level of productivity of the creative imagination.

Note: MN — material needs; NS — need for safety; NIC — need for interpersonal connection; NR — need for respect; NSA — need for self-actualization.

Summing up the main needs among the different groups with a high level of productivity of the creative imagination, we should mention that a great number of the art specialists had a prevailing need for self-actualization. A great number of the specialists (59%, 29 persons) who do not work in artistic fields, and a quarter of the artists, had a prevailing need for respect and recognition.

Discussion

Our data correlate with those of other authors. Feist (1999) points out that art representatives have great emotionality, instability, and asociality. Rozhdestvenskaya (1980) singles out the sensitivity to slight changes in the external environment and emotional excitability among those with artistic giftedness. This conforms to our research data about high levels of neurosality, irritability, and emotional lability among the art specialists with a high level of productivity of the creative imagination.

Specific personal features of artists in their orientation to the inner world are reflected by the work of Pavlova (2014). In our research, in the artist group with a high level of productivity of the creative imagination, such psychological characteristics as immersion in emotional experience and tending to isolation were discovered. Among personal characteristics of an artist, Sobkin and Lykova (2014) mention emotional instability, sensibility of social influence, impressionability, empathy, with a parallel increase of ease in behavior (relaxation). In our research, we found such psychological characteristics of actors with high levels of productivity of the creative imagination as stability, relaxation, and satisfaction with oneself.

The low level of volitional self-regulation of artists with a high productivity level that we found in our work conforms to the data of Rozhdestvenskaya (1980), where a high level of reflection can fetter subconscious creative work and block the imagination. With their research into gifted children with disharmonious development, disorders of general regulation and will were mentioned by Bogoyavlenskaya & Bogoyavlenskaya (2008). Gifted children are characterized by such personal qualities as perfectionism, which becomes apparent through high demands placed on themselves and entailing stress and anxiety.

The desire of artists for self-disclosure was revealed by Rozhdestvenskaya (1980) and is connected with the desire to influence people and transfer one's own worldview to them. An artist is dependent on the appreciation of his works by other people, on their opinions about his creative work. Probably this is connected with our finding of the combination of needs for respect and self-realization of artists with a high level of productivity of the creative imagination.

Conclusion

Relying on the results of this research, we come to the following conclusions:

1. The art specialists with a high level of productivity of the creative imagination were distinguished from other participants in that they were more emotional, inclined to affective reactions, highly anxious, and excitable.

2. The artists with a high level of productivity of the creative imagination were characterized by immersion in their own emotions, psychic estrangement, high sensitivity, flexibility, and ingenuity. The majority of these artists were characterized by right-hemisphere and combined types of thinking, a high level of nonverbal creativity, where an “elaboration” sign is pronounced. The need for self-realization and respect is strongly marked.
3. The actors with a high level of productivity of the creative imagination were characterized by stability, relaxation, and self-satisfaction. A mixed type of thinking predominated in this group. The majority of these actors were characterized by an average level of nonverbal creativity, where an “abstract name” sign is pronounced. The need for self-actualization was strongly marked.

These results can be used in educational programs for art students, based on the harmonious combination of the development of productivity of the creative imagination with due regard for personal psychological qualities and for forming technical skills; this is true in the practice of art psychotherapy as well.

Possibilities for further investigation include studying the psychological characteristics of art specialists differentiated by age and sex.

References

- Batey, M., & Furnham, A. (2006). Creativity, intelligence, and personality: A critical review of the scattered literature. *Genetic, Social, and General Psychology Monographs*, 132(4), 355–429. <https://doi.org/10.3200/MONO.132.4.355-430>
- Benedek, M., Franz, F., Heene, M., & Neubauer, A. (2012). Differential effects of cognitive inhibition and intelligence on creativity. *Personality and Individual Differences*, 53, 480–485. <https://doi.org/10.1016/j.paid.2012.04.014>
- Bogoyavlenskaya, D.B., & Bogoyavlenskaya, M.E. (2013). *Odarennost': priroda i diagnostika* [Giftedness: Nature and diagnosis]. Moscow: Autonomous Non-profit Organization “Theoretical and Practical Centre of Development and Expert Examinations in Education”.
- Bogoyavlenskaya, D.B., & Bogoyavlenskaya, M.E. (2008). Osobennosti razvitiya lichnosti s garmonichnym i disgarmonichnym tipami odarennosti [The particular features of personal development with harmonious and disharmonious types of giftedness]. *Rossiiskij psikhologicheskij zhurnal* [Russian psychological journal], 5(4), 11–21.
- Dikaya, L.A., & Dikiy, I.S. (2015). *Tvorcheskij mozg* [The creative brain]. Rostov-on-Don: Southern Federal University Press.
- Dikaya, L.A., & Skirtach, I.A. (2015). Neurophysiological correlates of musical creativity: The example of improvisation. *Psychology in Russia*, 8(3), 84–98. <https://doi.org/10.11621/pir.2015.0307>
- Dikiy, I.S., Dikaya, L.A., & Karpova, V.V. (2014). Inter- and intrahemispheric functional organization of brain cortex in artists during creative process. *International Journal of Psychophysiology*, 2(94), 161. <https://doi.org/10.1016/j.ijpsycho.2014.08.706>
- Feist, G. J. (1999). Affect in artistic and scientific creativity. *Affect, creative experience, and psychological adjustment*, 93–108.
- Melik-Pashaev, A.A., Novlyanskaya, Z.N., Adaskina A.A., & Chubuk, N.F. (2005). *Psikhologiya odarennosti: khudozhestvennaya odarennost* [The psychology of giftedness: Artistic giftedness]. Moscow: Moscow Institute of Open Education.

- Novikova, N.A. (2012). Tvorcheskii podkhod v khudozhestvennom obrasovanii [A creative approach to art education]. *Pedagogika iskusstva* [Pedagogy of Art], (1), 235–245.
- Pavlova, E.V. (2014). Psikhologicheskie i khudozhestvennye osobennosti kartiny mira u studentov-khudozhnikov i studentov drugih spetsial'nostei [Psychological and artistic characteristics of the worldview of art students and students of other specialties]. *Molodoi uchenyi* [Young scientist], (2), 689–693.
- Petuhov, V.V. (1997). Voobrazhenie i poznanie [Imagination and cognition]. In *Modeli mira* [World patterns] (pp. 27–35). Moscow: Russian Association of Artificial Intelligence.
- Raigorodskii, D.Y. (2011). *Prakticheskaya psikhodiagnostika. Metodiki i testy* [Practical psychodiagnostics. Procedures and tests] (pp. 624–626). Moscow: Bakhrah-M.
- Rozhdestvenskaya, N.V. (1980). Tvorcheskaia odarennost' i svoistva lichnosti (eksperimental'noe issledovanie akterskoi odarennosti) [Creative giftedness and personal characteristics (experimental study of actors' giftedness)]. In *Psikhologiya processov khudozhestvennogo tvorchestva* [The psychology of processes of artistic creativity] (pp. 57–67). Leningrad: Nauka.
- Silvia, P.J., & Beaty, R.E. (2012). Making creative metaphors: The importance of fluid intelligence for creative thought. *Intelligence*, 40(4), 343–351. <https://doi.org/10.1016/j.intell.2012.02.005>
- Sobkin, V.S., & Lykova, T.A. (2014). Specific features of personality changes among theatre college students during the first year. *Journal of Siberian Federal University. Humanities & Social Sciences*, 12 (7). 2099–2109. <https://doi.org/10.17516/1997-1370-2014-7-12-2099-2109>
- Torrance, E. (1990). Vseobemluzhshchii mir [The all-embracing world]. *OMNI*, 12(10).
- Tunik, E.E. (2013). *Luchshie testy na kreativnost'*. *Diagnostika tvorcheskogo myshleniya* [The best creativity tests. Diagnosis of creative thinking]. St. Petersburg: Piter.
- Vygotsky, L.S. (1991). *Voobrazhenie i tvorchestvo v detskom vozraste* [Imagination and creativity in children]. Moscow: Prosveschenie.
- Vygotsky, L.S. (1998). *Psikhologiya iskusstva* [Psychology of art]. Rostov-on-Don: Fenix.
- Zverkov, A.G., & Eidman, E.V. (1990). Diagnostika volevogo samokontrolya (oprosnik VSK) [Diagnosis of voluntary self-control (VSK questionnaire)]. In *Praktikum po psikhodiagnostike. Psikhodiagnostika motivatsii i samoregulyatsii*. [Workshop on psychodiagnostics. Psychodiagnostics of motivation and self-regulation] (pp. 116–124). Moscow: Moscow University Press.

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The new media and the evolution of the human psyche

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Background. The emergence of the new media — the Internet and social networks — has had a considerable impact not only on media technologies, genres of journalism, and environment the journalist works in, but also on every user of global communication. Ongoing changes are extending their influence to all the media, making it important for researchers to reconsider the role of journalism in modern society and the perspectives of its development in the information age.

Objective. In order to get an adequate picture of the ongoing changes, we need to understand how the new media impact their users. We studied the dependence of people's self-identification (values) on their Internet activity and use of social networks. Our hypothesis was that use of the new media leads to the formation of a new personality type, among whose most distinct characteristics is a much stronger desire for self-determination.

Design. The characteristic features of respondents' self-identification were studied by their choosing a reference group. Their desire for self-determination was revealed by giving them ethical dilemmas. A questionnaire was devised to study their communicative preferences and attitudes. Various methods of mathematical analysis were applied.

Results. Factor analysis revealed two psychological types of people, different from others in how much they use the new media. Statistical analyses of the group comparison data showed that the desire for self-determination is considerably higher for active users, and is especially high for those who adhere to spiritual values (by the Maslow pyramid). A two-way ANOVA confirmed the overall effect of these two factors — spiritual values and the new media — on the desire for self-determination.

Conclusion. The data obtained show that the new media support people's desire for self-determination. Using the new media and thereby acquiring the identity of a journalist becomes an important factor of personality development and is in line with the general evolution of the psyche.

Keywords: identity of a communicator, media psychology, citizen journalism, self-determination, new media

Introduction

The development of the Internet and the new media is having a considerable impact on the media worldwide and places the future of journalism at the top of the agenda (Young & Carson, 2016; Deuze, 2008; Vartanova, 2015; Prognozy, 2017; Lazutina, 2013). According to media experts, “the spread of media information through social networks and new channels has a considerable effect on the work of journalists and the understanding of the target audience” (Mediamakers, 2016, p. 19). We see changes not only in technologies and genres (Kokhanov, Kravtsov, & Shkondin, 2015; Frolova, 2014), journalists’ working environments (Vyrkovskiy et al., 2016), and social frames (Vartanova, 2014), but also in man himself (Kuznetsova, 2011; Kuznetsova & Chudova, 2008; Chudova, N.V., Evlampieva, M.A., & Rakhimova, N.A., 2002).

Today the new communication formats provide everyone with a means of creating and transmitting messages and even make it possible for individuals to have permanent media channels of their own (Amzin et al., 2016). This has changed the situation radically: the “big” media are in decline, while the “individual” ones are winning large audiences (Mediamakers, 2016). Blogs and social networks are overtaking well-known publications in popularity and are successfully competing with traditional sources of information. We live in a situation no one could ever have imagined: The “big” media are losing in their competition with the Internet and social networks in “the holy of holies” — the creation of news content — and the audience “looks on the institutional media as an information filter or means of verification, rather than a source of information” (Loseva, 2016, p. 53). The circulation of newspapers and magazines is declining, while popular blogs can sometimes have an audience of several million. Does this mean that journalism as such is disappearing, and that professional journalists are becoming an endangered species?

Before the Internet came into being, when institutional media entirely dominated the information space and the audience did not have its own voice, it was the personal qualities of a journalist that were very often the only guarantee of the reliability of information and gave the last hope for the protection of an ordinary person. Now the mass media have turned into a tool for information warfare, with journalists acting like technical personnel serving a propaganda machine. As a result, problems of professional ethics and professional identity have become a burning issue (Verbitskaya, 2006). However, electronic technologies have also made it possible for the “audience” to access information space and publish their own content there or to search for information they need directly. How does all this affect professional journalism, or the average person?

For a number of years, the Center of Media Psychology at the Moscow University Faculty of Journalism has been doing research on the identity of the journalist (and communicator in general) in the era of global mass communication. More than a thousand respondents participated in the research.

As was stated in our previous publications, active Internet users are significantly different from people preferring the traditional media, in terms of striving for the truth and the desire for self-determination (Pronin & Pronina, 2013). Moreover, active participation in social networks is accompanied by less stereotyped thinking and less interest in tabloids and glossy magazines (Pronina, 2014). And finally, it is rather symptomatic that the desire for self-determination and getting

full information correlates positively with using the Internet and social networks, and negatively with watching TV (the index of differences on the Mann-Whitney U test was quite high, with the probability of error 0.003). Hence we can speak about two different types of influence exerted by the traditional and the new media.

The next stage of the research gave us an even better picture of how the new mass media affect the audience. Another 400 respondents took part, including student journalists, professional journalists, and people who do not work in the mass media. Their ages were 20–50 years.

The research objective was to study the influence of the new media on the communicator. It involved analysis of the respondents' self-identification, depending upon how active they were as Internet and social network users.

Our **hypothesis** was that the new media — the Internet and social networks — contribute to the formation of a new personality type, whose most distinctive characteristic is a much stronger desire for self-determination.

Methods

The respondents were asked to complete a questionnaire which consisted of two parts:

1. The "Communication Preferences Form", with questions relating to information preferences and habits, attitude to modern journalism and the blogosphere, intensity of using the Internet and social networks, and assessment of the prospects for the development of journalism;
2. "The Dilemmas" form, with ten pairs of alternative statements dealing with the most urgent and controversial issues of modern mass communication.

Both of these methods, which had the goal of studying different aspects of the identity of the communicator, had been worked out by a group of researchers under the guidance of E. I. Pronin (2002).

The "Communication Preferences Form" was intended to collect data on the respondents' habits and character traits on the basis of their self-description. It was designed to reveal the dominant values of a respondent based on the reference group they chose. The following question was asked: "Which social circle would you like to belong to?" The options to answer this question were the nine groups that had been established earlier when the preferences of the audience were analyzed.

The description of each group was made in correspondence with A. Maslow's hierarchy of motives and needs (Maslow, 1987), VALS (Values and Lifestyles) models of the stratification of the audience (Mitchell, 1984), and by using the results of the factor analysis of the surveys conducted earlier (Pronin & Pronina, 1995). Each group had its own number (unknown to the respondents), which reflected a particular motive in Maslow's hierarchy of motives and needs, from the basic motives to the meta-motives (self-actualization) — nine groups altogether. The basic motives included acceptance and recognition; the meta-motives — knowledge, justice, self-actualization, overcoming, creativity, altruism, independence. The respondents could choose a reference group from the nine suggested options, or if none of them seemed suitable, they could mark the desirable social circle as "other".

Table 1. The options to answer the question “Which social circle would you like to belong to?”

| Number of group | Brief description | Dominant need (not shown to respondents) |
|-----------------|---|--|
| 1 | Have lots of relationships, like club life, parties, public events. Their main quality is sociability. | Emotional attachment, acceptance |
| 2 | Make useful contacts. Have a way with people. Career-oriented. Their main quality is ambition. Like to be seen and listened to. | Social status, recognition |
| 3 | Have a desire for knowledge. Knowledgeable in one or several subjects. Their main quality is erudition. Behave as if they were planning to study at a university again. | Knowledge |
| 4 | Protesters. Fighters for justice. Seekers for the truth. Their main quality is critical thinking. Love to argue. | Justice |
| 5 | Treat everything in a non-standard way. Are always looking for something unusual. Their main quality is originality. Present things in an unusual way. Have a vivid imagination. | Self-expression |
| 6 | See any difficult situation as a challenge. Ready to take a risk. Their main quality is adventurism. Eager to be the first. | Overcoming |
| 7 | Do not worry about tomorrow. Things take care of themselves in their lives. Tend to selflessly support other people. Their main quality is being carefree. They tend to come to the help of others because of their character traits. | Altruism |
| 8 | Devote a lot of time to the arts. Genuinely interested in theatre, cinema, literature, new types of art. Welcome any expression of creativity, which is their main quality. Able to perceive the spirit of the times. | Creativity |
| 9 | Always choose what they are interested in. As a rule, they work in jobs they like. Their main quality is correctness. They pursue their own interests, but not at the expense of others. | Independence |
| 0 | Other | |

The descriptions of the groups were not exhaustive and mono-semantic, as their purpose was not to classify the respondents but to stimulate their self-disclosure. A brief and incomplete description leaves room for the imagination and allows a respondent to be more flexible in applying it to himself. This technique, which is used in projective psychological methodologies, stimulates the respondents to open up in the desired way.

The rest of the points on the questionnaire were intended to flesh out the initial self-identification by revealing the behavioural attitudes and information preferences of the respondents, including their participation in network communication, preferred information channels, understanding of professional journalistic ethics, etc.

The second questionnaire — “The Dilemmas” — was intended to measure the strength of the desire for *self-determination* and *truth*. Self-determination in this particular case was understood as the wish of an individual to make choices in different situations by themselves, independently, and to be able to work out what to do on the basis of all information available. Each of the dilemmas dealt with an important ethical antinomy typical of modern information society, such as information openness and accessibility, public safety, journalistic ethics and political correctness, the priority of private or public interests. This methodology was described earlier (Pronina, 2014).

Research Procedure and Data Processing

The poll was conducted by handing out questionnaires, and online with the Simpoll service.

The statistical package IBM SPSS 20 was used to process the data, as well as frequency analysis, correlation analysis, factor analysis, and parametric and non-parametric criteria for the comparison of groups.

Results

Analysis of the Values of the Respondents

The frequency analysis of the answers to the question about the preferred social circle revealed the following distribution of dominant motives (%):

In Figure 1, we see that the motive of independence (Group 9) and that of recognition (Group 2) are in the first and second place. It should be noted that

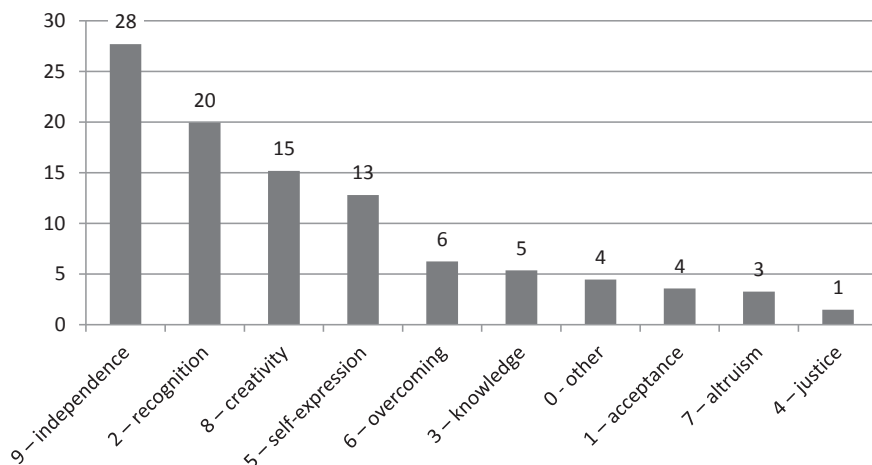


Figure 1. Frequency distribution of the dominant motives (%)

the need for independence corresponds with Maslow's top existential needs, while the need for recognition is connected with motivation for achievement, i.e., one of the basic needs. The difference in popularity between the groups is not large; however, the option of independence is chosen slightly more often, which means that the meta-level motivation still prevails. There is reason to believe that it is no coincidence that these groups are the leaders: The two dominant groups represent two major ways of self-identification and two basic types of identity. This assumption can be checked by comparing the subjective self-identification data with the objective picture of oneself. The latter can be reconstructed from the answers of the respondents to those questions that deal with information preferences, habits, and life attitudes.

Typology of the Communicative Behaviour of Respondents

A factor analysis was conducted in order to analyze the structure of a sample group in terms of communication preferences and life attitudes. The respondents themselves were used as the objects that were to be grouped, and the grounds for grouping them were similarities in how they answered the questionnaire. Calculations were done with the help of the Varimax rotation program (statistic package IBM SPSS Statistics 20), and two factors characterizing two basic types of answers were identified. Depending on the type of answers, the respondents were divided into two groups, each with its own communication pattern.

The comparison of the groups by different criteria, such as Student's t-distribution, the Mann-Whitney U test, and an analysis of variance (ANOVA), showed that the difference between the two types of respondents was primarily in how they used new means of communication. It turned out that the first group spent less time on social networks than the second group. And this difference was statistically very significant. Furthermore, the second group used the new social media, like Instagram and Twitter, a lot more often. They also had more subscribers to their network accounts, and tended to turn to social networks and blogs when searching for information. Therefore the first type of people were described as "moderate users" (of the new media), and the second type, devoted users of new communication formats, got the name of "active users" (of the new media). Among such respondents there were none who didn't use the new media at all. So there are just two gradations: moderate and high. However, the difference between them turned out to be not only quantitative, but also had to do with the attitude of the respondents toward information and even life itself.

For example, "moderate users" tended to choose to work for reputable "state-owned media, or local newspapers that could offer career opportunities", while "active users" preferred "large information agencies, such as Itar TASS, RIA Novosti, or Interfax".

There were also differences in interpersonal communication ethics. Supporters of a "moderate" communication style were more intolerant of their subscribers using obscene language. Network communication "fans" react negatively to "reposts containing doubtful messages about people who need help". They also had different attitudes to self-advertisement in one's own blog: Network communica-

tion supporters were more tolerant of that, while the “moderate” users regarded such behavior as “emotional pressure”, “imposing one’s opinion on others”. All the above-mentioned differences are statistically significant according to the multiple comparison tests conducted in the framework of the ANOVA and using the criteria of Student’s t-distribution and the Mann-Whitney U test.

The analysis allows us to draw the conclusion that the communicative types identified reflect not only information preferences, but also the morals and ethics of the users — i.e., there are good grounds to consider them personality types. The ratio between communicative types 1 and 2 expressed as a percentage is 57% to 47%. The number of respondents with the traditional communication pattern is a little higher.

Correlation Between Value-Based Self-Identification and Communicative Types of Behavior

Further research showed that the communicative types described above statistically correlate to a high degree with the dominant needs (linear correlation coefficient $p < 0.01$). In other words, there is a connection between the objective stratification of the sample (on the basis of factor analysis of their answers) and the subjective self-identification of the respondents (judging by the reference group they chose). According to Table 2, the respondents of the first type (moderate users) are more likely to be found in groups 3–9, which correspond to various forms of self-actualization; those of the second group are more likely to be in groups 1 and 2, which focus more on basic needs, or in the group where people were unable to make a choice.

Table 2. Ratio of dominant motives in psychotypes (% of respondents)

| Com- muni- cative types | Dominant motives | | | | | | | | | | Total |
|----------------------------------|------------------|----------------------|-----------------------|---------------------|-------------------|-------------------------------|---------------------------|--------------------|----------------------|-----------------------------|-------|
| | 0 other | 1 accep- tance | 2 recog- nition | 3 know- ledge | 4 jus- tice | 5 self- expres- sion | 6 over- com- ing | 7 altru- ism | 8 creati- vity | 9 inde- pend- ence | |
| type 1 | 4 | 3 | 13 | 7 | 2 | 14 | 6 | 4 | 18 | 31 | 100 |
| type 2 | 5 | 5 | 29 | 3 | 1 | 11 | 7 | 3 | 12 | 24 | 100 |

Note: Type 1 = moderate users of new media. Type 2 = active users of new media.

Since every need (marked as the code of the group) has its number, which corresponds to its level within the pyramid of values, the result was a linear correlation.

If we take a look at how the communicative types correspond to the levels of the values in Maslow’s pyramid (Table 3), we see that the correlation coefficients turn out to be even more significant, the probability of error being ≤ 0.001 (Table 4). Group 1 (needing acceptance) relates to the third level within the pyramid, Group 2 to the fourth one (needing recognition), and Groups 3–9 to different layers within the fifth level.

Table 3. Cross-tabulation of the communicative types and the levels of the values in Maslow's pyramid

| | | Types | | Total |
|---------------------------|---|------------|----------|-------|
| | | "moderate" | "active" | |
| Level in Maslow's pyramid | 3 | 5 | 7 | 12 |
| | 4 | 26 | 41 | 67 |
| | 5 | 154 | 88 | 242 |
| Total | | 185 | 136 | 321 |

Table 4. Correlation between the communicative types and the values in Maslow's pyramid

| | Value | Asymptotic standard error | Approx. T | Sig. |
|------------------------------------|--------|---------------------------|-----------|-------|
| Chi-square (χ^2) | 0.208 | | | 0.001 |
| Pearson's correlation coefficient | -0.197 | 0.056 | -3.583 | 0.000 |
| Spearman's correlation coefficient | -0.211 | 0.055 | -3.846 | 0.000 |

So, the first communicative type (moderate users) is statistically more likely to be on the fifth level of Maslow's pyramid, while the second one (active users) is more likely to be on the third or fourth. Moreover, we have confirmed the assumption expressed earlier, that the two leading groups of self-identification — Group 9 (independence) and Group 2 (recognition), in which most of the members belong to different types — represent two different patterns of behavior, and possibly two different types of identity.

Paradoxical as it may seem, there are proportionally more active users of the new media and network communication among the groups of the third and fourth level (needing acceptance and needing recognition) than among those of the fifth level (needing independence, etc.) — a fact that gives cause for thought. It may mean that the new and the traditional values are competing, and that the advocates of "eternal" values look down on the new technologies, while technologically advanced people try to reconsider the former priorities. However, the results of the research suggest that it is a combination of the two — holding onto one's values in life and involvement in modern mass communication formats — that has the best effect in people's development and strengthens their desire for self-determination.

To check this assumption, we did an analysis based on the two-way ANOVA methodology, in which values and Internet activity were considered to be the independent factors likely determining development. As is shown in Table 2, in each reference group there are representatives of both the "moderate" and the "active" type with regard to their attitude toward the new media. If the assumption is true about the combined influence of the two evolutionary factors (the value-based fac-

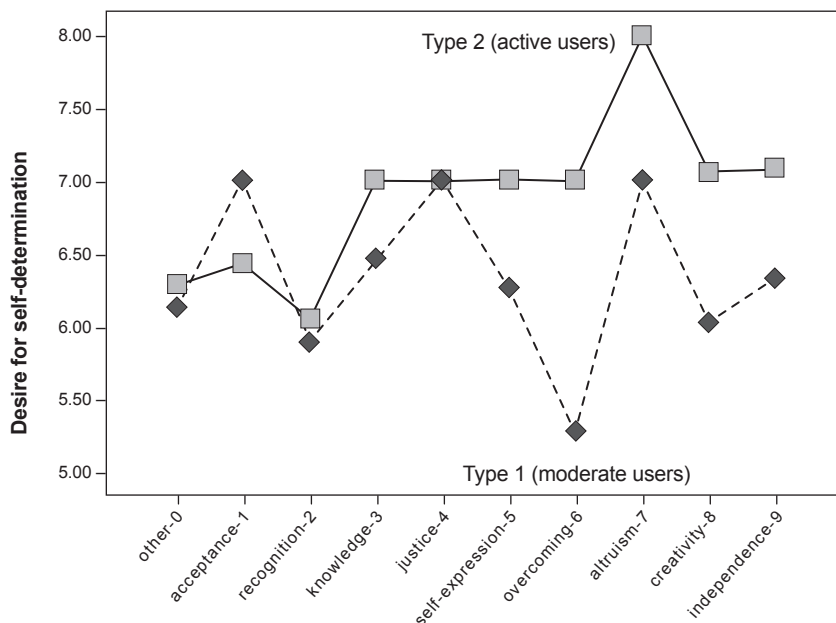


Figure 2. Average indexes of self-determination for members of different reference groups, depending on how actively they use the new media

tor and the technological one), then the indexes of self-determination will be considerably higher for those respondents who combine a spiritual orientation and active interest in the new media. Figure 2 shows indexes of self-determination for representatives of the reference groups described as “moderate” and “active”.

As is seen in the diagram, the indexes of “active users” in each group (solid line) are, as a rule, higher than those of “moderate users” (dotted line). If we compare the “active users” with one another, it turns out that the active users of groups 3–9 have a higher level of desire for self-determination than the active users of groups 0–2. And the highest values are observed in the subgroup of “active altruists” (Group 7 — solid line). These facts support the above-mentioned assumption that spiritual values (especially altruistic ones) produce the best positive effect on a person when they are combined with new technologies.

Analysis of how values and digital competence correlate with self-determination produced even more impressive results.

Figure 3 compares two gradations of values: “basic values” and “spiritual values”. The basic values cover all the levels below the fifth one in Maslow’s pyramid. Groups 1 and 2, in which the values of the third level (emotional intimacy, emotional acceptance) and the fourth level (success, career, social status) dominate, fall into this category. The respondents who could not make a choice and specified “other” in their answers were also included in this category. Groups 3–9, with their focus on different types of self-actualization and on such values as knowledge, justice, self-expression, overcoming, creativity, altruism, and independence, fall into the category of spiritual values.

Table 5. Effects of intergroup factors (two-way ANOVA)

| Source | Sum of squares type III | df | Mean square | F | Sig. |
|--|----------------------------|-----|-------------|----------|---------|
| Corrected model | 54.634a | 3 | 18.211 | 7.509 | 0** |
| Intercept | 10,560.828 | 1 | 10,560.828 | 4354.459 | 0** |
| Factor_A (Types of media activity) | 13.544 | 1 | 13.544 | 5.584 | 0.019* |
| Factor_B (Value levels) | 20.119 | 1 | 20.119 | 8.296 | 0.004** |
| Factor_A x Factor_B ("Types of media activity" x "Value levels") | 10.724 | 1 | 10.724 | 4.422 | 0.036* |
| Error | 805.197 | 332 | 2.425 | | |
| Total | 14,707 | 336 | | | |
| Corrected total | 859.83 | 335 | | | |

Note. * = correlation is significant at the 0.05 level; ** = correlation is significant at the 0.01 level.

Figure 3 shows that the desire for self-determination is generally higher for respondents who have spiritual values, but is especially high for those of them who are active Internet and social network users. Calculations based on the two-way ANOVA confirmed the overall effect of the two independent factors — values and digital competence — on the need for self-determination. Table 5 makes it clear that not only does each of the factors have its own effect (the effect of digital competence was confirmed at $p=0.019$, and that of values at $p=0.004$), but more importantly, their effect increases multifold when the factors are combined (the

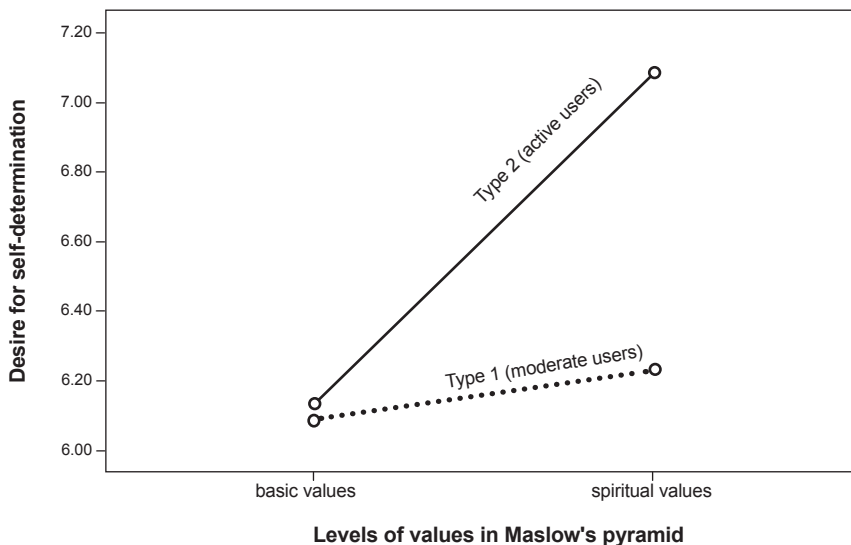


Figure 3. Average indexes of self-determination depending on value orientation and active use of the new media

significance of mutual reinforcement was at $p=0.036$). This supports the assumption made earlier that it is the combination of a value-based attitude towards life and involvement in modern formats of mass communication that has most contributed to the development of a psychotype with a strong desire for self-determination.

Discussion

To sum up, the original hypothesis has been proven: that active users of the new media have a stronger desire for self-determination and truth than others. This means that modern electronic media support and increase the desire for self-determination and truth, which is in line with the general vector of the evolution of the psyche. The highest level of self-determination occurs when altruistic values and network communication activity are combined.

The combination of selfless, prosocial motivation and communicative orientation is, in fact, an essential part of the professional identity of a journalist in its pure, “genotypic” form (Pronin, 2002). Changes occur in the work technologies used, professional requirements, and the format and style of texts. What remains unchanged is the identity of a journalist, which is determined by the essential social need for reliable information, on the one hand, and a person’s desire for independence and the common good, on the other. In this regard, “citizen journalism”, which is an essential part of an information society, serves as the most important means in the evolution of a person.

By using the new mass media, ordinary people assume the socially important functions of professional journalism; therefore, not only is journalism not disappearing, but, on the contrary, it is spontaneously “sprouting up” in the audience itself, as a self-reproducing gene, creating the basis for the future revival of professional journalism. Though the world media are in the process of transformation (Norris, 2017; Langett, 2013; Nygren & Stigbrand, 2013), we see no reason to worry about the future of journalism: The new media have become the main driving force behind the self-restoration of journalism, in a situation when the traditional media and other social institutions are in crisis.

The futuristic fantasies of M. McLuhan (1965) have turned out to be more realistic than many carefully worked out scientific forecasts thanks to the evolutionary approach: There is no doubt that the electronic media are changing our civilization by changing every individual. The desire for truth and self-determination is becoming a general trend based on the new media, and is creating a new type of person (Deryabina, 2016; Deryabina, 2017; Pronin & Pronina 2013). In an information society, the journalist’s self-identification is the main instrument of personality evolution, and so lays the groundwork for the next step in the evolution of civilization as a whole.

References

- Amzin, A., Galustian, A., Gatov, V., Kastel’s, M., Kul’chitskaia, D., Loseva, N. ... & van der Haak, B. (2016). *Kak novye media izmenili zhurnalistiku. 2012–2016* [How the new media has changed journalism. 2012–2016]. Ekaterinburg: Gumanitarnyy universitet [The Univer-

- sity of Humanities]. Retrieved from <http://newmedia2016.digital-books.ru/wp-content/uploads/2016/06/New-Media-2016.pdf>
- Chudova, N. V., Evlampieva, M. A., & Rakhimova, N. A. (2002). Psikhologicheskii portret potrebitelya internet-informatsii. [A psychological portrait of the consumer of online information]. In E. E. Pronina (Ed.), *Problemy mediapsikhologii* [Issues of media psychology] (pp. 117–131). Moscow: RIP-Holding. Retrieved from <http://evartist.narod.ru/text7/47.htm>
- Deryabina, A. S. (2016). Pravdivost', ob'ektivnost' i gumanizm v vospriyatii zhurnalistov razlichnykh SMI [Truthfulness, objectivity and humanism in the perception of journalists from different media]. *Mediascope*, 3. Retrieved from <http://www.mediascope.ru/?q=node/2133>
- Deryabina, A. S. (2017). Stremlenie k samodeterminatsii v strukture professional'noy identichnosti zhurnalista [Desire for self-determination in the professional identity of the journalist]. *Mediascope*, 4. Retrieved from <http://www.mediascope.ru/2391>
- Deuze, M. (2008). The professional identity of journalists in the context of convergence culture. *Observatorio (OBS) Journal*, 7, 103–117. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.476.9278&rep=rep1&type=pdf>
- Frolova, T. I. (2013). Grazhdanskie prilozheniya v strukture mediakommunikatsiy [Civil applications in the structure of media communications]. In E. L. Vartanova, A. A. Gladkova, & M. I. Makeenko (Eds.), *Natsional'nye mediasistemy mezhdu natsional'nym i globalnym: modeli i trendy 2010-kh* [National media systems between national and global: Models and trends of the 2010s] (pp. 282–289). Moscow: Faculty of Journalism, Moscow State University Publ.
- Frolova, T.I. (2014). Praktika grazhdanskikh kommunikatsiy v tsifrovoy srede: opyt sistematsizatsii. [Civil communications in a digital environment: The experience of systematization]. *Vestnik Moskovskogo Universiteta. Seriya 10, Zhurnalistika* [Moscow University Journalism Bulletin], 2, 29–47.
- Kokhanov, E.F., Kravtsov, V.V., & Shkondin, M.V. (2015). Zhanrovaya struktura novykh media v usloviyakh transformatsii mediasistemy. [Genre structure of the new media under conditions of transformation of the media system]. *Vestnik Volzhskogo universiteta im. V.N. Tatishcheva* [Bulletin of Tatishchev Volga University], 2, 36–39.
- Kuznetsova, Yu. M. (2011). Kartina mira i sovremennye tekhnologii: "legkost' bytiia" v Internet [Picture of the world and modern technology: "lightness of being" on the Internet]. *Chelovek kak sub'ekt i ob'ekt mediapsikhologii*. [Man as the subject and the object of media psychology]. Moscow: Izdatel'stvo MGU, 437–467.
- Kuznetsova, Yu. M., & Chudova, N.V. (2008). *Psikhologiya zhitel'ey Interneta* [The psychology of Internet inhabitants]. Moscow: Izdatel'stvo LKI.
- Langett, J. (2013). Blogger engagement ethics: Dialogic civility in a digital era. *Journal of Mass Media Ethics*, 28 (2), 79–90. <https://doi.org/10.1080/08900523.2013.751817>
- Lazutina, G.V. (2013). *Professional'naya etika zhurnalista* [Professional ethics of the journalist]. Moscow: Aspekt Press.
- Loseva, N. (2016). Auditoriya novykh media [The audience of the new media] In S. Balmaeva & M. Lukina (Eds.), *Kak novye media izmenili zhurnalistiku. 2012—2016* [How new media has changed journalism. 2012–2016]. Ekaterinburg: Gumanitarnyy universitet [University of the Humanities]. Retrieved from <http://newmedia2016.digital-books.ru/wp-content/uploads/2016/06/New-Media-2016.pdf>
- McLuhan, M. (1965). *Understanding media: The extensions of man*. New York: McGraw-Hill.
- Mediamakers: Trend report 2016–2020*. Third conference of RBS. Retrieved from <http://mediamakers.ru/upload/specials/mediamakers/MediaMakersTrendsReport.pdf>
- Mitchell, A. (1984). *Nine American lifestyles: Who we are and where we're going*. Warner Books.

- Nasledov, A.D. (2011). *SPSS 19 professional'nyy statisticheskiy analiz dannykh* [SPSS 19 professional statistical analysis of data]. Saint Petersburg.
- Norris, W. (2017). Digital humanitarians: Citizen journalists on the virtual front line of natural and human-caused disasters. *Journalism Practice*, 11, 213–228. <https://doi.org/10.1080/17512786.2016.1228471>
- Nygren, G., & Stigbrand, K. (2013). Professional identity in changing media landscapes. Stockholm: Elanders. Retrieved from <http://sh.divaportal.org/smash/get/diva2:665879/FULLTEXT01.pdf>
- Prognozy mediaekspertov [Predictions of media experts] (2017). *Mediatrendy* [MediaTrends], 1. Retrieved from https://drive.google.com/file/d/0B_IP1f66chKIeW50bGo5S3h6N1E/view
- Pronin, E.I. (2002). Psikhologicheskie problemy sovremennoy zhurnalistiki [Psychological issues in modern journalism]. In E.E. Pronina (Ed.). *Problemy mediapsikhologii* [Issues in media psychology] (pp. 5–18). Moscow: Rip-holding. Retrieved from <http://evartist.narod.ru/text7/39.htm>
- Pronin, E.I., & Pronina, E.E. (1995). Grazhdane, poslushayte sebya [People, listen to yourselves]. *Politicheskaya sreda* [Political Wednesday], 2.
- Pronin, E.I., & Pronina, E.E. (2013). Mediapsikhologiya: Noveyshie informatsionnye tekhnologii i fenomen cheloveka [Media psychology: The latest information technologies and the phenomenon of man]. *Obshchestvennye nauki i sovremennost'* [Social Sciences and Modernity], 2, 151–161.
- Pronina, E.E. (2014). Media psychology: Modern man and nonlocality of psyche. *Psychology in Russia. State of the Art*, 4 (7), 75–87. <https://doi.org/10.11621/pir.2014.0407>
- Vartanova, E.L. (2014). *Postsovetskie transformatsii rossiyskikh SMI i zhurnalistiki* [Post-Soviet transformation of Russian media and journalism]. Moscow: MediaMir.
- Vartanova, E.L. (2015). About three vectors of future journalism. *Medi@l'manakh* [Media almanac], 3 (68), 8–11.
- Verbitskaya, Yu.A. (2006). Massovaya kommunikatsiya kak tvorcheskaya problema: tekst i lichnost' [Mass communication as a creative problem: Text and personality] (Doctoral dissertation) Moscow State University, Moscow.
- Vyrkovskiy, A.V., Vartanov, S.A., Galkina, M.Yu., Kolesnichenko, A.V., & Obraztsova, A.Yu. (2016). Struktura rabochego protsessa rossiyskogo zhurnalista [The working process of a Russian journalist]. *Mediascope*, 2. Retrieved from <http://www.mediascope.ru/?q=node/2105>
- Young, S., & Carson, A. (2016). What is a journalist? The view from employers as revealed by their job vacancy advertisements. *Journalism Studies*, 0 (0), 1–21.

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