

icCSBs 2020**The Annual International Conference on Cognitive - Social and Behavioural
Sciences****THE CORRELATION OF CONCEPTS, INTELLIGENCE,
CREATIVITY AND COPINGS IN RUSSIAN YOUTH**

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Abstract

The relation of conceptual structures, intelligence, creativity and coping has not yet been the subject of a psychological research. Our study aimed to reveal interrelations between the features of the organization of the concept with intelligence, creativity and coping. A complex design was used in our research including assessment of IQ; creativity; copings; the semantic differential technique (stimulus word "potential"). Participants of the experiment were 408 students aged 18-24 years (mean 19, 32 ± 1 , 48) among them 79,2% of girls. We processed the data by mathematical and statistical approach: primary data that were collected from eligible respondents were subjected to be analyzed using linear regression. The findings revealed that the concept "potential" has considerable number of reliable interrelations both with indicators of the general abilities and with copings. It was shown that the maximum saturation of the concept with sensory-emotional features can lead to a decrease in the productivity of intellectual activity. It should be noted that the role of the considered indicators of concepts in efficiency of intellectual activity is slightly lower, than in creative activity. It was found that between the variable measures of differentiated participation of sensory-emotional features of the concept and indicators of copings there is quite close, but at the same time, multidirectional relationship. Thus, we may conclude that conceptual structures may act as the intermediary in relation to intelligence, creativity and copings. The finding of our research may be useful for solving the problem of human mental resources increasing through the development of conceptual thinking.

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Keywords: Concepts, intelligence, creativity, coping strategies, conceptual thinking.



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1. Introduction

The terms "potential" belongs to international vocabulary and is widely used in Russian language. The study of potential, due to the rapidly changing geopolitical and social situation, is increasingly attracting the researchers' attention from various fields of science such as social studies, philosophy, psychology etc. However, despite the wide range of studies devoted to the problem of potential, especially in the psychology of labour, mental resources and developmental psychology they are rather of a nature, aimed at expanding the ideas about the phenomenology of potential, which makes it difficult to collect, analyse and interpret the obtained results.

One of the ways to study human perceptions of a certain phenomenon of reality is the analysis of concepts (conceptual structures) as mental vector of ideas (Kholodnaya, 2002; Volkova, 2013a). Thus, the theory of certain mental structures (multidimensional representative cognitive structures in long-term memory) that underlie human psychological development including the development of intelligence, competence and creativity (Chuprikova, 2007; Kholodnaya, 2002; Vekker, 1976; Volkova, 2013a) is an urgent issue. Furthermore, there is a great number of studies devoted to the peculiarities of the organization and formation of mental structures "cognitive maps" (Tolman, 1948), "representation" (Chuprikova, 2007), "mental experience", "concept" (Kholodnaya, 2002), "core structure" (Sergienko, 2009).

From linguistic point of view, the concept (conceptual structures) is defined as an interdisciplinary phenomenon since it is used in the whole complex of sciences, including in different directions of linguistics; and has a complex and multi-dimensional structure Pimenova (2013).

In works of Russian psychologists, however, concepts are considered as a core factor in the structure of individual mental resources, that determines the intellectual productivity (Kholodnaya & Volkova, 2016). Concepts are 'substratum' of all mentioned types of conceptual abilities, a high level of formation of which is the basis of human intelligence (Vekker, 1976). Concepts take an active part in all forms of organization of mental experience, determining the peculiarities of the individual picture of the person's world, arbitrary self-regulation of mental activity and peculiarities of his social behaviour (Chuprikova, 2007; Kholodnaya & Volkova, 2016; Vekker, 1976).

Popova and Sternin (2003) note that since the concept (conceptual structure) is formed based on a person's personal sensory experience, it initially arises on a subject-shaped, sensual basis as a certain empirical image of an object or phenomenon and has an individual subject-shaped character. The original content of the concept is complicated due to the knowledge gained because of other types of cognitive activity, i.e., "acquires" thought content, logical signs. As the level of abstraction increases, the concept gradually evolves from the sensory to the actual thinking.

In studies conducted by Kholodnaya (2002), the following structural components of the concept are distinguished: sensory-emotional experience of human inter-action with the subject environment, the peculiarities of verbalization of different-quality features of the concept and their relationship with each other, the specificity of object-visual coding and fixation of subjectively significant markers.

Kholodnaya (2002) emphasizes that the analysis of these structural components of the concept allows to reconstruct in detail the representation of a person.

The theory of "embodied cognition" (embodied cognition theory (Lakoff & Johnson, 1999), the theory of "embodied mind" (Varela, Thompson, & Rosch, 1991), the theory of "perceptual symbols"

(Barsalou, 2009) draw a lot of attention nowadays. Lakoff and Johnson, (1999) believes that thinking is embodied in the sense that the conceptual categories that form our conceptual system "... originate from our sensory experience and are conceptualized in its terms; moreover, the core of our conceptual system is directly based on the perception of body movements and the experience of the physical and social nature.

In the independent empirical studies, the following pattern was also found: the higher the level of organization of conceptual structures (concepts), the higher the level of conceptualization, field dependence, intelligence and creativity, competence and success of professional activities (Kholodnaya, 2013; Kholodnaya & Volkova, 2016).

2. Problem statement

In the research of Kholodnaya (2002) devoted to the study of the relationship of intelligence, creativity and conceptual abilities revealed: the higher the level of organization of the concept (integral unit of conceptual abilities), the higher are the indicators of verbal, non-verbal creativity and intelligence. The empirical research of Volkova (2013a) confirmed, the data received by Kholodnaya (2002), but at the same time made clarifications: the emergence appearance of new ideas relates to the development of detailed-level concepts. Highly differentiated and integrated conceptual structures corresponding to the object of professional activity are the necessary basis for the manifestation of creativity in a particular field of professional activity. These structures are a systemic factor integrating the properties of a creative person as a whole (Volkova, 2013b).

The problem of coping behaviour is rather controversial nowadays. For instance, in the works devoted to the study of the regulatory role of general intelligence (intellectual abilities) in coping, very ambiguous relationship between the level of psychometric intelligence and coping strategies with a difficult life situation behaviour are presented (Kholodnaya, 2013; Kholodnaya & Volkova, 2016; Kryukova, 2004).

Thus, Sierralta (2002) studying the features of mental resources of the individuality in early adolescence noted that students with a high level of psychometric intelligence and high academic performance mainly choose a problem-oriented strategy of coping with difficult life situations, while S.A. Khazova (2014) provides different results: there are no links between the level of psychometric intelligence (in terms of IQ, "Cultural and independent intelligence test" R. Kettle), and that there is no predominant choice of any coping strategies.

A brief analysis of the literature sources shows that a key role in the distinguishing the relationship between intelligence, creativity and coping behaviour and can play conceptual structures.

3. Research question

- 3.1.** What impact conceptual structures have on variations of indicators of conceptual abilities, cognitive abilities creative abilities and on coping strategies on people in young adulthood?

4. Purpose of the study

The purpose of this empirical research is to identify the impact of indicators of conceptual structures (sensory-emotional signs) on variations of conceptual (categorical, generative abilities and ability to sort

the words) abilities, as well as on variations of cognitive abilities (level of analytical intelligence) and on variations of creative abilities (verbal and non-verbal creativity), and on variations of indicators coping strategies in adolescence.

5. Research Methods

5.1. Participants

The study was conducted from 2015 to 2018. The study involved 408 Russian-speaking respondents of 9 different humanitarian departments such as «Department of Psychology», «Department of Primary Education», «Department of Speech Therapy », «Department of Defectology», «Department of Foreign Languages», «Department of History and Social Studies», «Department of Management», «Department of Social Services» and «Department of Land Registry» aged 18 to 24 years (19.32 ± 1.48) took part in our research, among them were 79.2% female students.

5.2. Methods

A complex design was used in our research including the set of methods of assessment of concept organization (Semantic Differential) method modified by Kholodnaya (2002), conceptual (generative, voluntary categorical and involuntary categorical) abilities (“Conceptual abilities” technique by Kholodnaya (2002)), creativity (E.P. Torrance technique TTCT-Verbal, (Ball & Torrance, 1992; Torrance, 1974; Tunick, 1998), Raven’s intelligence test (SPM / RPM) and the variety of coping strategies typically used by adolescents in difficult life situations (the Russian adaptation by T.L. Kryukova (Kryukova, 2004) of Adolescent Coping Scale (ACS) designed by Erica Frydenberg and Ramon Lewis (Frydenberg & Lewis, 1991).

5.2.1. Method of assessment of concept organization

The modified version of the Semantic Differential technique modified by Kholodnaya (2002) was used to assess the participation of sensory-emotional experience (the experience of human interaction with a subject environment and the accumulated experience of various impressions and experiences of quality (visual, tactile, as well as emotional and evaluative impressions)) of the concept. It includes 34 bipolar pairs of adjectives that allow us to distinguish the groups of features:

1. Sensory features (dry – wet, cold – warm, sharp – rounded, etc.);
2. Emotionally-evaluative features (calm – anxious, gentle – rough, harmonious – chaotic);
3. Spatio-temporal features (straight – curve, close – far, thin – thick, etc.).

5.2.2. Methods of assessment of conceptual abilities

Different conceptual abilities such as *generative*, *categorical* abilities and ability to sort the word were assessed with such techniques as “Generalization of three words”, “Free sorting words”, “Conceptual Synthesis” were used. Psychometric verification of the “Conceptual synthesis» technique and “Generalization of three words” technique was performed and published in the article “Diagnostic techniques of Conceptual abilities” (Kholodnaya, M. A.; Trifonova, A. V.; Volkova, N. E.; Sipovskaya J. I., 2019 in print).

1. To assess *generative abilities* (the ability to ‘create’ connections between concepts based on three unconnected words) the “Conceptual Synthesis” [1] technique was used. The participants were asked using 3 different words (e.g., computer – tornado – pin) to make the maximum possible number of combinations expresses in the form of meaningful sentences. The time given to work with each triad of words is 3 minutes.

2. To estimate *ability to sort the words*, the “Free sorting words” [1] technique was used. The participants were asked to spread 35 cards with words denoting the different aspects of the category of “Time” into groups in the most logical, convenient and natural way, from their point of view.

3. To assess *categorical abilities* (ability to generalize the concepts based on their essential characteristics) the “Generalization of three words” (Kholodnaya, 2002) technique was used. The participants were given ten triads of words (the words in each triad differ in their semantic fields) such as newspaper – lighthouse – fire; soap bubble – vase – suitcase; etc. According to the instructions, the participants were asked to think about what ‘connects’ the words in each triad and name that common feature, if possible – in one or two words. The time to think and write an answer to each triad - 30 seconds.

5.2.3. Method of assessment of creativity

To assess both verbal and non-verbal creativity the Russian adaptation of the American version of Torrance Test of Creative Thinking (TTCT) (Ball & Torrance, 1992) was used. It consists of a Verbal (TTCT-Verbal) and None - Verbal creativity (TTCT-Figural) test batteries.

5.2.4. Method of assessment of analytical intelligence

To assess level of psychometric IQ the Raven’s Intelligence Test (SPM / RPM) was used. The test consists of 60 non - verbal items (Tunick, 1998). Each item consists of a 3×3 matrix with a missing piece to be filled in by selecting an answer from six or eight alternative pieces.

5.2.5. Method of assessment of coping strategies

To identify coping behavior (the most preferable ways of overcoming difficult, alarming and problematic situations) strategies the “The Adolescent Coping Scale - ACS” (Frydenberg & Lewis, 1991) in the adaptation of T.L. Kryukova - the general form (Kryukova, 2004) technique was used. The participants were given the general form of ACS and were asked to answer the questionnaire that contained 80 questions.

5.2.6. Statistical data processing

Statistical data processing was carried out based on the IBM SPSS software package. Statistics 22.0. It included descriptive analysis (mean, standard deviation) and analysis of variance (Linear Regression Modelling (Stepwise method)). Automatic Linear Modeling (linear) is used to accelerate the data analysis process through several automatic mechanisms. Furthermore, it provides the researcher with a diagnostic statistic (Cook’s Distance) that measures the impact of each of the identified outliers on the fitted model. Before starting statistical data processing, "raw scores" were converted to T- scores.

6. Findings

6.1. Results on concept organization

After running the LINEAR analysis with the concept (stimulus word - “potential”) data, following results outlying cases are identified as having an influential impact on the parameter estimates of the model. Evaluation of impact of each of the identified feature on the fitted model, indicating the different functioning of the concept of "potential" is presented in **Table 01**.

Table 01. Linear Regression Models of sensory, emotionally-evaluative and spatio-temporal features

Variables	N	Effects / Predictor Importance			Linear Regression Models	F Corrected model
		Sensory features (a)	Emotionally-evaluative features (b)	Spatio-temporal features (c)		
Sensory features (a)	375	–	0,059***	0,941***	$a=3,761+0,736*b+0,190*c$	552,234***
Emotionally-evaluative features (b)	408	–	–	1,00***	$b=9,566+0,808*c$	727,717***
Spatio-temporal features (c)	375	0,274***	0,726***	–	$c=1,956+0,529*a+0,368*b$	533,299***

p-Values for the main effects and interaction are indicated: $p^* < 0,05$; $p^{**} < 0,01$; $p^{***} < 0,001$.

In the variation of indicators of sensory-emotional features variations of indicators of sensory, emotionally-evaluative and spatial-temporal features have a different impact. Thus, the greatest contribution to the variation of indicators of the sensory features of the concept (stimulus word - “potential”) is made by the indicators of spatial-temporal and emotional-evaluative features. However, in variations of the indicator of emotional-evaluative features of the concept have impact only on variations of spatial-temporal features.

6.2. Results on concept organization and productivity of intellectual activity and coping strategies

A detailed study of the contributions (effects) of the sensory-emotional features of the concept in the variation of the indicators of productivity of intellectual activities and coping strategies is presented in **Tables 02 and 03**.

Table 02. Regression Models of sensory of features and general abilities

Variables	N	Effects / Predictor Importance			Linear Regression Models	F Corrected model
		Sensory features (a)	Emotionally-evaluative features (b)	Spatio-temporal features (c)		
IQ (SPM / RPM)	375	–	0,825***	–	IQ=57,946-0280*b	7,839***
Verbal Creativity (TTCT-Verbal)	408	–	1,00***	–	Verbal Creativity=41,238+0,177*b	9,296***
Generative abilities		1,000**	–	–	Generative abilities=42,784+0,151*a	6,369***

p-Values for the main effects and interaction are indicated: $p^* < 0,05$; $p^{**} < 0,01$; $p^{***} < 0,001$.

According to the results of the analysis presented in **Table 2**, between the variables of sensory-emotional features of the concept and the indicators of the productivity of intellectual there are quite close but multidirectional links.

It should be emphasized, the greatest impact on the variation of the indicator of analytical intelligence is made by the variations of the indicators of emotionally-evaluative features of the concept. The higher the indicators of emotionally-evaluative features of the concept, the lower the indicator of analytical intelligence, estimated by the Standard Progressive Matrices J. Raven.

In the variation of indicators of verbal creativity, the greatest contribution is made by variations of indicators of emotionally-evaluative features of the concept. The higher the indicators of emotionally-evaluative features of the concept, the higher the ability of verbal creativity. There are no reliable links to evaluate the impact on the indicators of the sensory-emotional features of the concept with the indicators of non-verbal creativity in general, and of its individual components.

It should be noted that among all indicators of conceptual abilities, a connection with the sensory-emotional features of the concept was revealed only in terms of the generative abilities. In variations of the indicator of generative abilities have impact only on variations of sensory features which may indicate the significant role of sensory experience for the construction of the semantic context as a special mechanism that provides the coagulation and deployment of mental spaces, causing the productivity of intellectual activity. The obtained results are consistent with the Lakoff's theory of embodied cognition in which thinking originates from our sensory experience and the core of our conceptual system is directly based on the perception of body movements and the experience of the physical and social nature "(Lakoff & Johnson, 1999).

As can be seen from **Table 03**, between the variables of sensory-emotional features of the concept and indicators of coping strategies, there are quite close and unidirectional links.

Table 03. Linear Regression Models of sensory of features and copings

Variables	N	Effects / Predictor Importance			Linear Regression Models	F Corrected model
		Sensory features (a)	Emotionally-evaluative features (b)	Spatio-temporal features (c)		
SocSup (Seeking Social Support)	375	0,285*	–	0,715***	SocSup=44,322– 0,213*b +0,330c	6,146***
SolvProb (Focus on Solving Problems)	375	–	1,00***	–	SolvProb =41,828+ 0162*b	7,684***
Work (Working Hard & Achieve)	375	–	1,00***	–	Work=42,433+0,153*b	6,782**
Worry	375	–	1,00***	–	Worry=41,943+0,165*b	7,633**
Friends (Invest in Close Friends)	375	–	–	1,00*	Friends=43,209+0,138*c	5,577**
Belong (Seek to Belong)	375	–	1,00***	–	Belong=41,899+0,166*b	7,706**
Wish Think (Wishful thinking)	375	–	–	1,00***	Wish Think =42,162+0,153*c	10,601***
SelfBl (Self-Blame)	375	–	1,00***	–	SelfBl=43,609+0,125*b	4,211*
FocPos (Focusing on the Positive)	375	–	–	1,00***	FocPos=40,873+0,185*c	10,819***
TensRed (Tension Reduction)	375	–	–	1,00***	TensRed=41,573+0,166*c	8,635***

p-Values for the main effects and interaction are indicated: p* < 0,05; p** < 0,01; p*** < 0,001.

Almost equal impact of emotionally-evaluative and spatio-temporal features of the concept on variations of indicators of strategy draws attention. However, in the variation of indicators of coping strategies variations of indicators of sensory, emotionally-evaluative and spatial-temporal features have a different impact. Thus, the higher are the indicators of the emotionally-evaluative features of the concept, the more often people turn to such coping strategies as *Focus on Solving Problems*, *Working Hard and Achieve*, *Worry*, *Seek to Belong* and *Self-Blame*. The higher are the indicators of the spatio-temporal features of the concept, the more often people prefer using such strategies as *Seeking Social Support*, *Invest in Close Friends*, *Wishful thinking*, *Focusing on the Positive*, *Tension Reduction* in difficult life situations.

7. Conclusion

Apparently, the maximum saturation of the considered concepts with sensory-emotional experience can lead to a decrease in intellectual productivity. These findings are consistent with studies conducted by; Kholodnaya (2013) and Volkova (2011).

Comparison of the data presented in the tables shows that the sensory-emotional features of the concepts have significant effects on both the productivity of intellectual activity and coping strategies. However, the emotionally-evaluative features of the concept make the greatest contribution both to the productivity of intellectual activity and to variations of coping strategies.

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References

- Ball, O. E., & Torrance, E. P. (1992). *Torrance Test of Creative Thinking*. Scholastic Testing Service, Inc., Illinois.
- Barsalou, L. W. (2009). "Simulation, situated conceptualization, and prediction," *Philosophical Transactions of the Royal Society of London: Biological Sciences*, 364, 1281–1289.
- Chuprikova, N. I. (2007). *Psychology of cognitive development: principle of differentiation*. SPb.: Piter.
- Frydenberg, E., & Lewis, R. (1991). Adolescent coping styles and strategies: Is there functional and dysfunctional coping? *Australian Journal of Guidance and Counselling*, 1, 35–43.
- Kholodnaya, M. A. (2002). *Psychology of Intelligence: Research Paradoxes*. (2nd ed). Piter: St. Petersburg.
- Kholodnaya, M. A. (2013). Differentiation and integration in organization of conceptual structures in connection with creativity manifestations. In *differentiation-integration theory of development: Philosophical interpretation and application to psychology, linguistics and education*. (pp. 28-29). M.: Publishing House "Institute of Psychology RAS".
- Kholodnaya, M. A., & Volkova, E. V. (2016). Conceptual structures, conceptual abilities and productivity of cognitive functioning: the ontological approach. *Procedia - Social and Behavioural Sciences* 217, 914-922.
- Kryukova, T. L. (2004). *Psychology of coping behavior*. Kostroma: Operative Printing Studio Avantitul.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought*. New York: Basic Books.
- Pimenova, M. V. (2013). Types of concepts and stages of conceptual research. *Herald of Kemerovo State University*, 2(2 (54)), 127-131.
- Popova, Z. D., & Sternin, I. A. (2003). *Language and national picture of the world*. Voronezh: Istoki.
- Sergienko, E. A. (2009). Principles of differentiation-integration and continuity-discrete mental development. In *The theory of development: differential-integration paradigm*. (pp. 131-150). Moscow: Languages of Slavic Cultures.
- Sierralta, Z. H. (2000). Features of the mental resources of the individual in early adolescence: coping strategies, defense mechanisms, social intelligence and general intelligence: (Dissertation). SPb.
- Tolman, E. C. (1948). Cognitive maps in rats and men. *Psychological Review*, 55, 189-208. <http://doi.org/10.1037/h0061626>
- Torrance, E. P. (1974). *The Torrance Tests of Creative Thinking-Norms-Technical Manual Research Edition-Verbal Tests, Forms A and B- Figural Tests, Forms A and B*. Princeton. NJ: Personnel Press.
- Tunick, E. E. (1998). *Diagnosis of creativity, Manual for test E. Torrance*. St. Petersburg: Imaton.

- Varela, F., Thompson, E., & Rosch, E. (1991). *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge, MA: MIT Press.
- Vekker, L. M. (1976). *Psychic processes. Thinking and intelligence*. Leningrad, Russia: Leningrad State Univ. Publishing House.
- Volkova, E. V. (2011). *Psychology of special abilities: differentiation and integration approach*. Moscow: IP RAS.
- Volkova, E. V. (2013a). Differentiation-integration mechanism of development of conceptual structures as the central link of creativity. In *differentiation-integration theory of development: Philosophical interpretation and application to psychology, linguistics and education*. (pp. 30-32). M.: Publishing House "Institute of Psychology RAS".
- Volkova, E. V. (2013b). Triune aspect of the functional organization of the concept: Past, Present and Future. *World of Psychology*, 2, 29-41.