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Russian Psychological Journal

Russian Psychological Journal is a peer-reviewed open access journal that publishes original research papers on all aspects of psychology.

It was founded by the Russian Psychological Society in 2004.

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The journal aims to promote international scientific collaboration and exchange of new knowledge and recent developments in areas related to psychology. It seeks to familiarize specialists and all interested readers with the latest achievements of Russian scholars in resolving issues in present-day psychology.

The ultimate objective is to create a novel forum for: (a) providing novice and experienced scholars with high quality scientific information; (b) rapid communication of new findings, ideas, or perspectives; (c) facilitating international collaboration between researchers and practitioners in the field of psychology and education; and (d) increasing citations, visibility, credibility, and authority of Russian scholarly researches through indexing in international databases.

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Russian Psychological Journal, 2021, Vol. 18, No. 2
ISSN 2411-5789 (Online)

CONTENTS

Russian Psychological Journal, 2021, Vol. 18, No. 2
ISSN 2411-5789 (Online)

JURIDICAL PSYCHOLOGY

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

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Psychological Characteristics of Attitudes Towards Dangers Among Healthcare Professionals Working and Not Working with COVID-19 Patients

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Abstract

Introduction. The COVID-19 pandemic has posed many challenges for the present day healthcare system related to the quality of care of COVID-19 patients. Therefore, healthcare professionals must recognize dangers and adequately respond to them in time. This paper represents a first effort in identifying the psychological characteristics of attitudes towards dangers among healthcare professionals working and not working with COVID-19 patients.

Methods. A sample of 246 respondents varying in gender and age took part in this study, including 106 healthcare professionals from the city of Cherepovets (Vologda Region) and the city of Ivanovo (Ivanovo Region). The types of attitudes towards dangers, the need for experiencing a sense of danger, and the need for safety were identified using original questionnaires developed by the authors. The φ* criterion – Fisher's angular transformation (Fisher's criterion) was used for data processing.

Results. Gender-related differences in the level of threat sensitivity and in the types of responding to dangers were found in groups of healthcare and non-healthcare professionals. Among healthcare professionals, the number of those exaggerating the importance of threats decreased significantly (from 30 % to 14.15 %) and the number of those with an ambiguous type of responding increased (from 17.14 % to 30.19 %). Compared to healthcare professionals not working with COVID-19 patients, those treating and caring for COVID-19 patients showed a decrease in threat sensitivity (from 57.69 % to 27.78 %) and an increase in the need for safety (from 28.85 % to 64.81 %) and in the need for ensuring safety (from 57.69 % to 79.63 %). The differences were significant.

Discussion. The results can be readily used in the process of selecting physicians and nurses for working under conditions associated with the COVID-19 pandemic and under other epidemiological conditions.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

Keywords
danger, threat, safety, attitude towards dangers, threat sensitivity, responding to danger, need for safety, healthcare professionals, patients, coronavirus infection

Highlights
- The ability to adequately respond to dangers is an important personal trait of healthcare professionals required during the COVID-19 pandemic.
- Significant differences in attitudes towards dangers were found in the groups of healthcare professionals working and not working with COVID-19 patients.
- Healthcare professionals working with COVID-19 patients show a decrease in threat sensitivity and an increase in the need for safety.

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Introduction
Life and danger are two inseparable phenomena. No living creature can live its life in absolute safety. Starting from birth humans constantly face various kinds of threats at all levels of their individual and personal organization. Danger is anything that can harm a living creature. Threat is an assessment of danger probability. Researchers note that individuals' representations of danger and safety are 'intersubjective'; they are products of social construction, collective agreement, and socialization (Simpson, 1996). The objective environment provides only inconsistent and ambiguous information, leaving enough room for socially constructed beliefs and assessing objects, events, or conditions as dangerous or safe. Therefore, the development of a technology for assessing threats (Steinberg, 2005) and a scientific framework for differentiating them according to different types and levels (Stevens & Vaughan-Williams, 2019) becomes especially important.

Safety of living beings (and we are primarily interested in humans) undoubtedly depends on how they relate to dangers. According to the classical definition by V. N. Myasishchev, attitude is "an integral system of individual, selective, conscious personal associations with various aspects of objective reality. This system follows from the entire history of human development; it represents individual experience and determines individual actions and feelings" (Myasishchev, 2011, p. 7). From this perspective, the attitude towards dangers may be defined as individuals' ability to detect danger signals to make a choice of adequate or inadequate ways of responding to threats. In psychological literature such an ability to detect danger signals is defined as threat sensitivity.

Let us describe these two parameters of individuals' attitudes towards dangers.

Threat sensitivity is the susceptibility of living creatures, including humans, to danger signals; it is defined as a system of cognitive, affective, and behavioral responses to stimuli that may pose a danger to individuals (Denefrio & Dennis-Tiwary, 2020). Threat sensitivity actualizes a mechanism of vigilance (Warm, Finomore, Vidulich, & Funke, 2015). Threat sensitivity is a personal trait that mediates the influence of external conditions on individuals' feeling of security (Kharlamenkova,

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

2013). Threat sensitivity is organically incorporated into the structure of sentinel behavior (Ein-Dor, 2014).

As for the ways of responding to situations of danger, here the basis is the fight–flight–freeze system (Gray, 1978; Donahue, 2017). Both a human and any other living creature react to danger by fighting, flighting, or freezing (for example, by hiding or pretending to be dead). Individuals develop their own individual ways of responding to dangers in the process of socialization. In many ways, the choice of these types of responding depends on individuals' ideas of danger and safety, which are largely determined by age and gender (Kharlamenkova, 2015; Smirnova, 2020), as well as the negative valence (consequence) of an event and the assessment of the likelihood of its occurrence (Kotik, 1994).

In the broadest sense, three ways of individual responding to dangers and threats are as follows: (a) *adequate responding* as the ability to use defensive behaviors developed in society without either exaggerating or understating dangers, (b) *exaggeration of the importance of threats* (anxious responding), (c) and *understatement of the importance of threats* (ignoring) (Maralov, Sitarov, Kudaka, Maralova, & Koryagina, 2020).

Individuals' attitudes towards dangers are determined by needs for experiencing a sense of danger and needs for safety (Horney, 1993; Maslow, 2012) influenced by self-preservation instinct inherent in all living creatures, the environment, and life experience. Four types of such needs are related to danger, safety, thrill seeking, and ensuring safety. The individual structure of these needs determines the uniqueness of individuals' attitudes towards dangers. Among various dangers, diseases that can threaten both an individual's life and health, and his/her psychological and social well-being play a special role. Those that manifest themselves as epidemics or even pandemics have the greatest damage. Currently, the world community has faced with the COVID-19 pandemic, which has affected almost everyone and, one way or another, has changed people's lives and the traditional system of relationships. The number of research papers on various aspects of life and behavior of individuals during the COVID-19 pandemic has considerably increased. Numerous studies have focused on characteristics of individuals' attitudes towards COVID-19 (Zhong et al., 2020; Roy et al., 2020) and the influence of universal values and resilience on these attitudes (Wolf, Haddock, Manstead, & Maio, 2020; Odintsova, Radchikova, & Stepanova, 2020), developed detailed recommendations on how to behave during the pandemic and self-isolation (Drapkina et al., 2020), analyzed the conditions under which the COVID-19 pandemic may lead either to social order (observance of measures taken by the authorities to combat the pandemic) or social disorder (resistance to such measures and the emergence of overt conflict) (Reicher & Stott, 2020). Special attention is paid to frontline healthcare professionals fighting against COVID-19. First, researchers are interested in how well-prepared healthcare industry and healthcare professionals are to work with COVID-19 patients (Valsan, Thomas, Kuttichira, Valsan, & James, 2020; Elhadi et al., 2020). The impact of negative working conditions on healthcare professionals' psychological states, manifested in increased anxiety, fear, depression, and emotional burnout is of equal importance (Dolzhenkova, Kamneva, Safonov, & Dzappala, 2020; Wang et al., 2020). Thus, working with COVID-19 patients poses an increased danger for physicians, nurses, and all the medical staff. This explains the need for a special study of the characteristics of healthcare professionals' attitudes towards dangers in comparison with the characteristics of such attitudes towards dangers among healthcare professionals not working with COVID-19 patients. We should note that this issue has not been sufficiently studied by the present.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

These considerations prompted us to conduct a special study *aimed* at identifying psychological characteristics of attitudes towards dangers among healthcare professionals working and not working with COVID-19 patients, in comparison with attitudes towards dangers among non-healthcare professionals. In this case, we understand psychological characteristics of attitudes towards dangers as the level of threat sensitivity and the choice of a particular type of responding to dangers (adequate, exaggerating dangers, or understating dangers).

According to our *hypothesis*, there are differences in attitudes towards dangers between healthcare and non-healthcare professionals, as well as between healthcare professionals working and not working with COVID-19 patients. These differences may be found at the level of threat sensitivity and in the choice of types of responding to them.

Methods

A sample of 246 respondents varying in gender and age took part in this study, including 140 non-healthcare professionals (56 males; 84 females; mean age = 38.5 years) working at various enterprises and organizations in the city of Cherepovets (Vologda Region), 54 healthcare professionals (physicians and nurses) working with COVID-19 patients at two specialized institutions in the city of Cherepovets (Vologda Region) and the city of Ivanovo (Ivanovo Region) (20 males, 34 females, mean age = 34 years), 52 healthcare professionals from a number of medical institutions in Cherepovets and Ivanovo, who do not work with COVID-19 patients (21 males, 31 females, mean age = 35 years). The survey was conducted anonymously in 2020; the subjects specified only their gender, age, and specialty.

The original questionnaires developed by the authors were as follows: (a) the Inventory for Assessing Threat Sensitivity, (b) the Inventory for Assessing Types of Responding to Dangerous Situations, and (c) the Inventory for Assessing Needs for Safety and Danger.

The Inventory for Assessing Threat Sensitivity (Maralov, Malysheva, Nifontova, Perchenko, & Tabunov, 2012) consists of 12 items modeling real typical situations. Each task of the inventory includes the wording of a statement and four answer options (e.g., "Excessive vigilance is not characteristic of me", "I think that he that fears every bush must never go a-birding"). The subjects need to choose the option that best suits them. The scores received for all the items are summed up. A final score characterizes the level of individual threat sensitivity. The authors developed a scale for converting raw scores into stens.

The Inventory for Assessing Types of Responding to Dangerous Situations (Maralov, Malysheva, Smirnova, Perchenko, & Tabunov, 2012) consists of 17 items modeling human behavior in real standard situations that may pose a threat. For example, "Approaching an unregulated pedestrian crossing (zebra crossing), (a) I immediately cross the street, because I have an advantage for movement (i.e., danger ignoring); (b) I wait when there are no cars close to either the right or the left (i.e., danger exaggerating); (c) I cross the street only when I am sure that the drivers see me and start to slow down (i.e., adequate responding); and (d) I didn't think about it (i.e., ambiguous responding)". All the items are structured in a similar way. For each type of responding a total score was calculated. Raw scores were converted into stens.

The Inventory for Assessing Needs for Safety and Danger (Maralov, Kudaka, Smirnova, Perchenko, & Tabunov, 2016) consists of 15 items identifying the need for experiencing a sense of danger (5 items), the need for experiencing a sense of safety (5 items), and the need for ensuring safety (5 items). A total score for each need was calculated as the sum of scores for five

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

statements that diagnose it. Raw scores were converted into stens.

The methods of mathematical statistics and the φ* criterion – Fisher's angular transformation (Fisher's criterion) were used for data processing; 7–10 sten scores indicated high levels of the parameters.

Results

Let us turn directly to the analysis of the main results of the study. First, let us answer the question whether there are differences in the attitudes towards dangers between healthcare and non-healthcare professionals. Table 1 presents the results of the comparative analysis.

Table 1
Comparison of the parameters of attitudes towards dangers between healthcare and non-healthcare professionals

	Non-healthcare professionals			Healthcare professionals		
	Males n/%	Females n/%	Total n/%	Males n/%	Females n/%	Total n/%
Threat sensitivity						
High level	15/26.79	31/36.91	46/32.86	13/31.71	32/49.23	45/42.45
Types of responding to dangerous situations						
Adequate	34/60.71	27/32.14	61/43.57	21/51.22	24/36.92	45/42.45
Anxious (exaggeration of the importance of threats)	5/8.92	37/44.05	42/30.00	4/9.76	11/16.92	15/14.15
Ignoring (understatement of the importance of threats)	9/16.07	4/4.76	13/9.29	6/14.63	8/12.31	14/13.21
Ambiguous	8/14.30	16/19.05	24/17.14	10/24.39	22/33.85	32/30.19

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

Table 1
Comparison of the parameters of attitudes towards dangers between healthcare and non-healthcare professionals

	Non-healthcare professionals			Healthcare professionals		
	Males n/%	Females n/%	Total n/%	Males n/%	Females n/%	Total n/%
Total	56/100	84/100	140/100	41/100	65/100	106/100
Needs for danger, safety, and ensuring safety (high level)*						
Need for danger	3/5.36	4/4.76	7/5.00	6/14.63	12/18.46	18/16.98
Need for safety	30/53.57	49/58.33	79/56.43	18/43.90	32/49.23	50/47.17
Need for ensuring safety	49/87.50	71/84.52	120/85.71	30/73.17	43/66.15	73/68.87

Note: * The sum for all needs is not equal to 100 %, because the same individual may have different types of needs expressed; in addition, needs may be not clearly expressed in some individuals.

As can be seen in Table 1, 32.86 % of non-healthcare professionals and 42.45 % of healthcare professionals showed high threat sensitivity. The differences are statistically insignificant ($\varphi^* = 1.54$, insignificant). At the same time, in both groups the level of threat sensitivity is slightly higher among female respondents. In the group of non-healthcare professionals – 36.91 % of females and 26.79 % of males ($\varphi^* = 1.26$, insignificant); in the group of healthcare professionals – 49.23 % of females and 31.71 % of males ($\varphi^* = 1.8$, $p \leq 0.05$). Thus, in both groups of subjects, high threat sensitivity varies from 27 % to 49 %. Significant differences were found only in the group of healthcare professionals, where women showed a higher level of threat sensitivity compared to men.

As for the choice of types of responding in dangerous situations (Table 1), among non-healthcare professionals 43.57 % of respondents react adequately, 30 % of respondents tend to exaggerate dangers, 9.29 % of respondents tend to ignore dangers, and 17.14 % of respondents demonstrate an ambiguous type of responding. In the group of healthcare professionals, 42.45 % of respondents react adequately, 14.15 % of respondents exaggerate dangers, 13.21 % of respondents ignore dangers, and 30.19 % of respondents demonstrate an ambiguous type of

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

responding. A noteworthy fact is that in the group of non-healthcare professionals, women are more likely to exaggerate the dangers (44.05 %) than men (8.92 %); the differences are statistically significant ($\varphi^* = 4.91$, $p \leq 0.001$). Men ignore dangers more often (16.07 %) than women (4.76 %), which is also statistically significant ($\varphi^* = 2.22$, $p \leq 0.05$). Healthcare professionals differ significantly from non-healthcare professionals in the following two parameters: (a) exaggeration of dangers, which is significantly lower among healthcare professionals than among non-healthcare professionals (14.14 % and 30 %, $\varphi^* = 3.02$, $p \leq 0.01$), especially among women (16.92 % and 44.05 %; $\varphi^* = 4.42$, $p \leq 0.001$) and (b) ambiguous type of responding (30.19 % of healthcare professionals and 17.14 % of non-healthcare professionals, $\varphi^* = 2.42$, $p \leq 0.01$), which is typical for both men and women.

Let us consider the structure of danger and safety needs in both groups (Table 1). In general, we should state that it is quite optimal for adults. The need for ensuring safety dominates, ranging from 66 % to 87 %. The need for safety ranges from 43.9 % to 56.43 %. The need for danger is weakly expressed (from 4.76 % to 18.46 %). Nevertheless, some differences were found here as well. The need for danger is more often characteristic of healthcare professionals (16.98 %) than in representatives of other professions (5 %). The differences are statistically significant ($\varphi^* = 3.1$, $p \leq 0.01$), and it can be even more pronounced in female healthcare professionals (18.46 %) than in male healthcare professionals and female non-healthcare professionals ($\varphi^* = 2.30$, $p \leq 0.01$ and $\varphi^* = 2.79$, $p \leq 0.01$). The need for safety was somewhat more pronounced among non-healthcare professionals than among healthcare professionals (56.43 % and 47.17 %). However, the differences were insignificant. The same goes for the need for ensuring safety. It is pronounced among 85.71 % of non-healthcare professionals and 68.87 % of healthcare professionals. We obtained statistically significant differences here ($\varphi^* = 3.17$, $p \leq 0.001$).

Thus, the structure of the parameters of attitudes towards dangers is generally similar in the groups of healthcare and non-healthcare professionals. At the same time, healthcare professionals are much less likely to exaggerate the dangers, especially women, and more often choose an ambiguous type of responding to threats. In addition, healthcare professionals have a somewhat less pronounced needs for safety and ensuring safety in comparison to the group of non-healthcare professionals; there are more individuals with a pronounced need for danger. However, additional analysis showed that this need is more often combined with the need for ensuring safety. This indicates that such healthcare professionals can take dangers observing precautions.

Let us turn to the differences in the structure of attitudes towards dangers between healthcare professionals working and not working with COVID-19 patients. Table 2 shows the results.

First, there is a significant decrease in threat sensitivity in the group of healthcare professionals working with COVID-19 patients, compared to physicians and nurses who do not work with such patients. In general, the decrease is from 57.69 % to 27.78 % ($\varphi^* = 3.16$, $p \leq 0.001$), from 47.62 % to 15 % ($\varphi^* = 2.33$, $p \leq 0.01$) for men and from 64.53 % to 35.29 % for women ($\varphi^* = 2.39$, $p \leq 0.01$).

The analysis of the types of responding in danger situations showed that the structure of these types is largely identical in both groups – an adequate and ambiguous types of responding prevail. Both exaggeration and understatement (ignorance) are not characteristic of healthcare professionals. The main difference is observed in men. In the group of male healthcare professionals not working with COVID-19 patients, 61.9 % prefer adequate ways of responding to dangers. Only 40 % of male healthcare professionals working with COVID-19 patients demonstrated adequate

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

types of responding to dangers. In the first group, 14.29 % of the subjects demonstrated ambiguous types of responding to dangers; in the second group, ambiguous types of responding to dangers were characteristic of 35 % of the subjects. However, the statistical differences in both cases turned out to be insignificant (φ* = 1.41, insignificant and φ* = 1.57, insignificant). In this case, we only observe a certain tendency towards a decrease in adequate responding and an increase in ambiguous types of responding.

Table 2
Comparison of the parameters of attitudes towards dangers between healthcare professionals working and not working with COVID-19 patients

	Healthcare professionals not working with COVID-19 patients			Healthcare professionals working with COVID-19 patients		
	Males n/%	Females n/%	Total n/%	Males n/%	Females n/%	Total n/%
Threat sensitivity						
High level	10/47.62	20/64.52	30/57.69	3/15	12/35.29	15/27.78
Types of responding to dangerous situations						
Adequate	13/61.90	11/35.48	24/46.15	8/40.00	13/38.23	21/38.89
Anxious (exaggeration of the importance of threats)	1/4.76	6/19.36	7/13.46	3/15.00	5/14.71	8/14.82
Ignoring (understatement of the importance of threats)	4/19.05	3/9.68	7/13.46	2/10.00	5/14.71	7/12.96

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

Table 2
Comparison of the parameters of attitudes towards dangers between healthcare professionals working and not working with COVID-19 patients

	Healthcare professionals not working with COVID-19 patients			Healthcare professionals working with COVID-19 patients		
	Males n/%	Females n/%	Total n/%	Males n/%	Females n/%	Total n/%
Ambiguous	3/14.29	11/35.48	14/26.93	7/35.00	11/32.35	18/33.33
Total	21/100	31/100	52/100	20/100	34/100	54/100
Needs for danger, safety, and ensuring safety (high level)*						
Need for danger	4/19.04	8/25.81	12/23.08	2/10.00	4/11.76	6/11.11
Need for safety	7/33.33	8/25.81	15/28.85	11/55.00	24/70.59	35/64.81
Need for ensuring safety	13/61.90	17/54.84	30/57.69	17/85.00	26/76.47	43/79.63

Note: * The sum for all needs is not equal to 100 %, because the same individual may have different types of needs expressed; in addition, needs may be not clearly expressed in some individuals.

Differences were found in the structure of the needs for danger and safety. Compared to healthcare professionals not working with COVID-19 patients, those working with COVID-19 patients have a more pronounced need for ensuring safety (79.63 % versus 57.69 %, $\varphi^* = 3.72$, $p \leq 0.001$) and the need for safety (64.81 % versus 28.85 %, $\varphi^* = 5.72$, $p \leq 0.001$). The need for danger is expressed to a lesser extent (11.11 % versus 23.08 %, $\varphi^* = 2.22$, $p \leq 0.01$). These patterns are typical for both men and women.

Thus, we may conclude that the work of physicians and nurses with COVID-19 patients leads to a decrease in threat sensitivity among a number of specialists and, at the same time, as a compensatory mechanism, to an increase in the need for experiencing a sense of safety and security and the need for ensuring safety, and to a decrease in the need for experiencing a sense of danger.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

Discussion

Negative conditions of working with COVID-19 patients (protective suits, masks, etc.) require a high degree of proficiency and increased responsibility of healthcare professionals. Certainly, this affects the physical, psychological, and emotional well-being of healthcare professionals. According to Zerbini, Ebigbo, Reicherts, Kunz, & Messman (2020), nurses working in COVID-19 wards reported higher levels of stress, exhaustion, and depressive mood, as well as lower levels of job satisfaction, compared to their counterparts in ordinary wards. Physicians reported similar effects regardless of their contact with COVID-19 patients. Sun et al. (2020) observed dynamics related to negative and positive emotions among nurses working with COVID-19 patients. At the first stages, negative emotions prevail; they manifest themselves in a feeling of fatigue, discomfort, helplessness, which were caused by intense work, fear, anxiety, and concern for patients and their families. At subsequent stages, as the sense of professional responsibility and self-reflection grow, positive emotions start to dominate along with negative emotions.

There is conflicting evidence regarding the impact of working under negative conditions on emotional burnout. Azoulay et al. (2020) indicated a high level of emotional burnout in intensive care unit specialists facing the COVID-19 outbreak. Dinibutun (2020), on the contrary, indicated a decrease in the level of emotional burnout in physicians working during the COVID-19 outbreak. The author explains this by the fact that physicians experience meaningfulness in their work, which leads to high satisfaction with the work itself. They also had a stronger sense of personal success as they faced the immediate results of caring for COVID-19 patients.

The results obtained in our study significantly expand the existing understanding of the characteristics of emotional responding to situations associated with treating and caring for COVID-19 patients among healthcare professionals, as well as their attitudes to dangers.

Analyzing the structure of attitudes towards dangers in non-healthcare professionals, we observed a desire to exaggerate dangers in women and to understate (ignore) dangers in men, which is explained by higher emotional sensitivity of women and confirms the results obtained in other studies (Maralov, Gura, Tatlyev, Epanchintseva, & Karavaev, 2019). Among healthcare professionals, the number of those who exaggerate dangers significantly decreases, including women. This indicates a greater ability to objectively evaluate situations among healthcare professionals, when 'panic' and exaggeration of threats may have irreversible consequences.

Healthcare professionals working with COVID-19 patients demonstrated a decrease in threat sensitivity. This may be explained by the phenomenon of adaptation to threats. Adaptation may be defined as a survival mechanism for living beings (Woody & Szechtman, 2011; Mobbs, Hagan, Dalgleish, Silston, & Prévost, 2015; Duntley, 2005) and as a mechanism associated with habituation to a constantly threatening stimulus, i.e. adaptation to stress (Ababkov & Perre, 2004; Korotkova, Eremina, & Shchelkova, 2020). In our case, there is a situation of constant stress among healthcare professionals working with COVID-19 patients, when this work is accompanied by success and recovery of patients and by fatal outcomes as well. Certainly, this affects the decrease in threat sensitivity. At the same time, such a decrease in sensitivity does not lead to a decrease in the needs for safety and ensuring safety, which should be considered as a positive fact. In this study not a single physician working with COVID-19 patients had a low-level need for ensuring safety.

We should also pay special attention to the fact that healthcare professionals, regardless of whether they work with COVID-19 patients or not, are most often characterized by adequate

Russian Psychological Journal, 2021, Vol. 18, No. 2, 6–20. **doi**: 10.21702/rpj.2021.2.1

or ambiguous types of responding to dangers. No questions arise about adequate responding. However, ambiguous responding requires explanation. In this case, we may distinguish two subtypes of the ambiguous type of responding to dangers. In the first case, individuals do not know what to do in a particular dangerous situation; these types of responding have not yet been formed. This may be observed in adolescence and sometimes in youth. In the second case, there is a selective responding, which is just typical of adults. That is, depending on a situation individuals may use adequate, ignoring, or exaggerating types of responding. It all depends on the nature of a threat, the assessment of its negative consequences, a concrete situation, and the state of an individual.

Conclusion

Summing up the results of the study, the following conclusions can be drawn.

Attitudes towards dangers manifest themselves in threat sensitivity and in the choice of certain types of responding to them; they are determined by the structure of the needs for danger and safety.

About one third of adults are highly sensitive to threats. More than 40 % of respondents choose adequate types of responding to dangerous situations; 30 % of respondents exaggerate the importance of threats; 9 % of respondents ignore them; and 17 % of respondents have an ambiguous type of responding. Women are more likely to exaggerate threats, while men tend to ignore them. Among healthcare professionals, the number of those who exaggerate the importance of threats is significantly reduced (primarily among women) and the number of those with an ambiguous type of responding is significantly increased. In both groups, the need for safety and the need for ensuring safety dominate over the need for danger. At the same time, the need for danger is more pronounced among healthcare professionals, which, combined with the need for ensuring safety, indicates physicians' willingness to take reasonable dangers.

Physicians and nurses who work and do not work with COVID-19 patients differ in terms of threat sensitivity, as well as in the structure of the need for experiencing a sense of danger and the need for safety. The work with COVID-19 patients decreases threat sensitivity and, at the same time, actualizes the need for ensuring safety and the need for experiencing a sense of safety and security.

In conclusion, we should note that Russian physicians and nurses have a rather optimal structure of attitudes towards dangers. Unlike others they demonstrate the absence of the desire to 'panic', do not exaggerate the importance of threats, and are able to flexibly respond to situations, focusing on their knowledge and experience. At the same time, healthcare professionals working with COVID-19 patients reduce their sensitivity to threats (due to adaptation to stress) and compensate for these losses by increasing the need for ensuring safety and the need for experiencing a sense of safety and security.

The limitation of this study is related to the small sample size of the examined physicians and nurses in only two regions of Russia. Obviously, for further research in this area we need to expand the sample size. The results can be readily used in the process of selecting physicians and nurses for working under conditions associated with the COVID-19 pandemic and under other epidemiological conditions.

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Author Contributions

V. G. Maralov conceived and planned the study, developed the design and methodology, selected the diagnostic tools, analyzed the experimental data, and prepared the manuscript for publication.
M. A. Kudaka collected and processed the experimental data, worked with the relevant literature, and presented the generalizing findings.
A. M. Pogodin collected, processed, and analyzed the experimental data.
I. I. Koryagina collected and processed the experimental data, worked with the relevant literature, and prepared the summary tables of findings.

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The Role of Interference in Implicit Learning of the Stroop Stimuli Sequence

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Abstract
Introduction. The effect of interference can help identify essential characteristics of the process of acquiring new knowledge. This study is the first to provide empirical evidence on the use of the effect of interference to dissociate explicit and implicit learning. We tested the hypothesis that the effect of interference arising in response to the Stroop test stimuli reduces the efficiency of explicit sequence learning and does not significantly affect implicit sequence learning.
Methods. A sample of 80 respondents took part in this study (mean age = 22.7 years). In the experiment, we used the serial reaction time tasks, when subjects were instructed to respond quickly and accurately to the sequences of stimuli. Some subjects (n = 40) viewed series of colour names written in congruent (corresponding) font colours; others (n = 40) viewed series of colour names written in incongruent (non-corresponding) font colours (Stroop stimuli). The subjects were asked to respond to font colours, without reading words. To identify explicit sequence learning, we used the recognition test.
Results. We found a significant sequence learning effect among the subjects who performed the task under congruent and incongruent conditions. Meanwhile, all subjects demonstrated a low level of explicit sequence learning (less than 51.9 % of correct responses in the recognition test). We discovered that implicit sequence learning eliminates the effect of interference (a delay in response time to incongruent stimuli).
Discussion. The results confirmed the assumption that the effect of interference does not reduce the efficiency of implicit sequence learning. The absence of significant differences between the groups that responded to congruent and incongruent stimuli makes it impossible to fully evaluate the impact of interference on explicit sequence learning. In general, the findings from this study speak in favour of the fact that the effect of interference impedes the explication of the sequence structure.

Keywords
cognitive unconscious, unconscious processes, implicit learning, explicit learning, structured sequence, sequence learning, interference, incongruent stimuli, Stroop effect, learning efficiency

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Highlights

- The study considers the possibility of implicit sequence learning under conditions of interference.
- The experiment demonstrated the effects of implicit structured sequence learning.
- Implicit sequence learning may eliminate the effect of interference that arises when responding to the Stroop test stimuli.

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Introduction

The issue of sequence learning has gained considerable importance during recent decades. This is largely due to the growing interest of cognitive psychologists in implicit (unconscious) mental processes and, in particular, implicit learning. Implicit learning (IL) broadly refers to learning that occurs without intention to learn; the knowledge thus obtained is difficult to verbalize (Cleeremans, Allakhverdov, & Kuvaldina, 2019). The ability to implicitly learn regularities in sequences of stimuli and actions performed has long been discussed in scientific literature. Thus, back in the middle of the last century, K. S. Lashley noted that psychologists are mainly interested in the issue of whether the organizational processes that manifest themselves in serial actions are conscious (Lashley, 1951). However, significant advances have been made only when the experimental paradigm of the task sequence learning (TSL) was developed in the 1980s (Nissen & Bullemer, 1987). The TSL paradigm uses the method of serial reaction time (SRT), when subjects must respond to stimuli as quickly and accurately as possible; the order of the presentation of stimuli is established by a fixed and repetitive sequence (regularities) or a complex system of rules. Many authors have noted that SRT is best suited for detecting effects of implicit learning (e.g., Shanks & Johnstone, 1998; Clegg, DiGirolamo, & Keele, 1998; Frensch, Lin, & Buchner, 1998; Janacsek & Nemeth, 2012; Abrahamse, van der Lubbe, Verwey, Szumska, & Jaśkowski, 2012; Schwarb & Schumacher, 2012).

The increased interest in the SRT method is largely associated with the dual-task SRT, which explores the role of attention in learning, the impact of task complexity on learning, the neuroanatomical determinants of IL, and other aspects of learning (Hsiao & Reber, 2001). The study by Nissen & Bullemer (1987) represent a classic example of the use of the dual-task SRT, when subjects were instructed to press keys quickly and accurately in response to sequential stimuli (asterisks), while simultaneously counting low-pitched tones. Before presenting each stimulus, the subjects heard a low- or a high-pitched tone. The subjects were asked to count the number of times that low-pitched tones were presented and report the total amount after the end of the block. The results showed that additional problem-solving minimizes sequence learning. The authors explained such a result by the dependence of the implicit learning mechanism on the amount of available attention.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 21–34. **doi**: 10.21702/rpj.2021.2.2

Subsequently, researchers offered alternative explanations for a decrease in the productivity of implicit learning in the dual-task SRT. For example, Rah, Reber, & Hsiao (2000) suggested that a significant decrease in the productivity of implicit sequence learning in the dual-task SRT is not explained by distraction of attention; it is rather a result of conditions that require processing an additional set of stimuli (tones) not having predictive value. Other works have also presented different points of view on general and specific effects of interference that may arise in the SRT tasks under dual-task conditions (Cohen, Ivry, & Keele, 1990; Frensch, Buchner, & Lin, 1994; Stadler, 1995; Frensch & Miner, 1994; Heuer & Schmidtke, 1996; Schmidtke & Heuer, 1997; Frensch et al., 1998).

Interference (the effect of interference) is traditionally understood as a decrease in the productivity of learning associated with introducing an additional task. Despite the fact that the effect of interference is still poorly understood, it claims to be a phenomenon that reflects the specific processes underlying behavior under multitasking conditions or in the presence of conflicting requirements (Sozinov, Krylov, & Aleksandrov, 2013). In the study of IL, the effect of interference may help explore the role of consciousness in IL (e.g., Burmistrov, Agafonov, Kozlov, & Kryukova, 2016; Burmistrov, Kryukova, & Agafonova, 2017), the process of processing several information flows (e.g., Keele, Ivry, Mayr, Hazeltine, & Heuer, 2003; Agafonov, Burmistrov, Kozlov, & Kryukova, 2018), some functional characteristics of the mechanisms forming cognitive unconscious (e.g., Waldron & Ashby, 2001; Agafonov, 2007) and other issues.

In the double-dimension serial reaction task, interference reflects the mutual influence of simultaneously processed information flows (sequences). For example, a study by Huang, Zhang, Liu, Li, & Wang (2014) examined the effect of background sequencing on implicit learning of the regularity of alternating target stimuli. The stimulus materials consisted of black letters presented on a coloured or white background. The subjects were instructed to respond to letters regardless of the background colour. The sequence of background colours was determined by either of the following conditions: (1) changed according to a rule, (2) changed randomly, and (3) the background was always white (control condition). The results showed that a random change in the background colour interferes with the letter sequence learning. The implicit learning performance in subjects who performed the task under condition 2 was significantly lower than under conditions 1 and 3. Similar effects have been described in experiments with two uncorrelated sequences (e.g., Russeler, Münte, & Rösler, 2002; Cock & Meier, 2007; Weiermann, Cock, & Meier, 2010; Meier & Cock, 2010; Weiermann & Meier, 2012). The findings from these studies showed that sequence learning can be impeded by the accompanying random or uncorrelated flow of information.

When considering the effect of interference in IL, the experiments using Stroop stimuli (words written in colours incongruent with the meaning of these words, e.g., the word 'blue' written in yellow) are of particular interest. In the Stroop stimuli task, subjects need to process both characteristics of stimuli (font colours and colour names). In this case, the subjects, in fact, perform two tasks simultaneously. The main one is to respond to colour, and the additional one is not to read the words (Allakhverdov & Allakhverdov, 2014). Haider, Eichler, & Lange (2011) tested the hypothesis that a significant increase in the rate of responding in the SRT test may be an indicator of explicit learning of the sequence structure. The results of the experiments showed that the Stroop interference effect disappeared only in those subjects who demonstrated explicit sequence learning. Meanwhile, the authors themselves note that these findings cannot establish

Russian Psychological Journal, 2021, Vol. 18, No. 2, 21–34. **doi**: 10.21702/rpj.2021.2.2

the chronology between the emergence of conscious learning and a decrease in the reaction time to Stroop stimuli. In other words, the following question remains open: Which of the two effects is the cause and the result? The ability of the cognitive system to implicitly learn a sequence of incongruent stimuli is supported by the results of experiments by Deroost, Vandenbossche, Zeischka, Coomans, & Soetens (2012). The scientists have found that a delay in reaction time to Stroop stimuli disappears with implicitly acquired sequence learning. According to the authors, a decrease in reaction time to incongruent stimuli was achieved by using implicit sequence learning for implementing cognitive control functions.

Thus, in the study of IL the effect of interference can be represented as a) a factor that reduces (impedes) the efficiency of IL when performing two tasks in parallel or while processing two uncorrelated information flows and b) a means (tool) for studying various aspects of implicit learning. This study *aims* to identify the effects of implicit sequence learning under interference conditions. In particular, we are going to consider the impact of the effect of interference on implicit and explicit sequence learning. Since interference occurs in individual consciousness (Allakhverdov & Allakhverdov, 2014), we may assume that this factor will reduce the efficiency of explicit learning without significantly affecting implicit learning.

Methods

This study used the serial reaction time tasks.

Participants

The experiment involved 80 subjects, including 45 females. The subjects were randomly distributed into 4 groups – two experimental groups (EG1, n = 20; EG2, n = 20) and two control groups (CG1, n = 20; CG2, n = 20). The mean age was 22.7 years (SD = 2.94). All subjects had normal or corrected-to-normal visual acuity and colour vision.

Equipment and stimulus materials

Stimuli: 1) names of 4 colours (green, yellow, red, and blue) printed in congruent font colours; 2) names of the same 4 colours printed in incongruent font colours (the word 'yellow' printed in green, the word 'green' printed in yellow, the word 'blue' printed in red, and the word 'red' printed in blue). All stimuli had a height of 1.5 cm and a width from 8 to 11 cm (depending on the number of letters in words). The stimuli were displayed in the center of a screen against a gray background. At the bottom of the screen, 4 squares coloured green, yellow, red, and blue with a side length of 2 cm were presented. The squares showed the colour of keys for responding (A, Z, K, and M). In each task, the colour of the squares was randomly changed. The subjects used middle and index fingers of both hands for responding. The experiment was carried out using a laptop with a 13.3-inch screen and a standard keyboard. The distance from the subject's eyes to the computer screen was approximately 60 cm.

Procedure

The experiment started with instructions. The subjects from EG1 and CG1 were instructed that the names of 4 colours, written in fonts of different colours, would be alternately presented on the screen. The task was to press a key which colour would correspond to the font colour as quickly as possible, regardless of the name of the colour (incongruent condition). The subjects

Russian Psychological Journal, 2021, Vol. 18, No. 2, 21–34. **doi**: 10.21702/rpj.2021.2.2

from EG2 and CG2 were instructed to respond to the font colours but not ignoring the colour names (congruent condition).

First, the subjects were asked to respond to a training block of 25 trials, similar to those used in the main task. At the beginning of each task 4 coloured squares appeared at the bottom of the screen; they were displayed until the subject pressed a key. Then, 100 ms later a stimulus was presented for 100 ms. If the subject pressed a key that did not correspond to the colour of the stimulus, then the word 'error' appeared on the screen for 100 ms. The pause between trials was 300 ms. The main procedure consisted of 12 blocks of 73 trials (876 trials in total). There was a rest break between the blocks (15 seconds), during which the average reaction time and the number of mistakes in the block were shown on the screen. For all groups, the sequence of presentation of stimuli was random in the first three trials of each block. Starting from the fourth trial, in EG1 and EG2 the sequence of the target parameter of stimuli (font colour) in all blocks (except 9 and 12) was determined by the second order conditional structure, which included the following 10 elements: D–B–C–A–C–B–D–C–B–A (a sequence adapted from Nissen & Bullemer, 1987). Colour designations were as follows: A – yellow, B – green, C – blue, and D – red. In blocks 9 and 12, stimuli were presented in a pseudo-random sequence which was generated considering the following two constraints: (a) the same stimuli were not repeated twice in a row, and (b) the proportions of stimuli did not differ from those in the blocks which used the sequence. In CG1 and CG2, the sequence of presentation of stimuli was pseudo-random throughout the whole procedure.

Thus, we used a 2x2 factorial experiment design. The first factor was the sequence of presentation of stimuli – structured in EG1 and EG2 or pseudo-random in CG1 and CG2. The second factor was congruence between colour names and font colours – incongruent stimuli in EG1 and CG1 and congruent ones in EG2 and CG2. All subjects performed the task under one of four conditions.

After completing 12 blocks of the SRT task, all subjects were asked, "Do you think the font colours of the words changed randomly or were determined by a certain sequence?" They had to choose one of the following four answer options: (a) "The font colours of the words changed randomly"; (b) "Perhaps, the sequence of alternation of the font colours of the words was not random, but I am not sure about that"; (c) "I noticed a regularity in changing the font colours of the words, but did not use it when responded"; and (d) "I discovered a rule in changing the font colours of the words and can partially or completely describe it".

Then we informed the subjects that the sequence of presentation of stimuli was determined by a special rule. To examine the degree to which the subjects learned the regularity, we asked them to perform the recognition test for sequence fragments. This test of explicit learning is more sensitive to relevant knowledge than any version of a generation task (e.g., Perruchet & Amorim, 1992; Willingham, Greely, & Bardone, 1993; Stadler, 1995). The recognition test consisted of 40 series of 3 trials (120 trials in total), similar to those used in the main procedure. In 20 out of 40 series, the sequence of stimuli corresponded to the rule. The series alternated randomly. After each series of trials, the subjects were asked to choose whether it corresponded to the rule or not. The subjects did not receive feedback informing about the correctness of the answers.

Results

The RStudio environment (RStudio Team, 2016) and the R programming language (R Core Team, 2019) were used for statistical analysis. To process the results, we used analysis of variance.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 21–34. **doi**: 10.21702/rpj.2021.2.2

ANOVAs are useful when comparing more than two groups, exploring the impact of both intragroup and intergroup factors, and analyzing the data from a pretest–posttest design (repeated-measures analysis of variance).

The results of the subjects who made more than 20 % errors in task with incongruent stimuli (2 from EG1, 2 from CG1) and more than 10 % in task with congruent stimuli (1 from EG2) were excluded from further analysis. The first 10 responses in each block were excluded as well. From the remaining data, we excluded erroneous answers (M = 49.78, SD = 30.98) and responses deviating from the average response time for 3 standard deviations (1.99 %), which amounted to 8.4 % of the total responses. Accordingly, further we compared the average response time (RT) of correct answers among 75 subjects. The dependent variable (RT) was measured in milliseconds (ms).

Sequence learning

To analyze the effects of sequence learning we calculated changes in RT (a) in the learning phase (from 1 to 8 blocks) and (b) at each of the two segments when the structural sequence changed to a pseudo-random one (8 and 9, 11 and 12 blocks). The comparison was carried out separately for EG1 and EG2. One-way ANOVA showed significant differences in RT between the blocks for EG1 (F (4. 68) = 55.69, MSe = 2670, $p < 0.001$, $\eta_p^2 = 0.54$) and EG2 (F (4. 72) = 36,95, MSe = 1505, $p < 0.001$, $\eta_p^2 = 0.52$). RT comparisons between the blocks were carried out according to Tukey HSD test. When comparing blocks 1 vs. 8, we observed a decrease in RT in EG1 (by 223.9 ms, $p < 0.001$) and EG2 (by 133.7 ms, $p < 0.001$). When comparing blocks 8 vs. 9 and 11 vs. 12, there was an increase in RT. In EG1, RT in block 9 increased by 76.8 ms ($p = 0.027$) and in block 12 – by 105.6 ms ($p < 0.001$). In EG2, RT in block 9 increased by 48.3 ms ($p = 0.022$) and in block 12 – by 41.7 ms ($p = 0.067$).

Correlations between interference and sequence learning factors

To analyze correlations between sequence learning and interference, we compared the data from EG1 and EG2. Two-way repeated-measures (Block – intragroup factor) ANOVA was used (Group x Block) (Table 1). There was a significant influence of the 'Group' factor (F (1.35) = 9.441, MSe = 11880, $p = 0.004$, $\eta_p^2 = 0.52$), 'Block' factor (F (4. 140) = 91.643, MSe = 2071, $p < 0.001$, $\eta_p^2 = 0.14$), and factors interaction (F (4. 140) = 7.021, MSe = 2071, $p < 0.001$, $\eta_p^2 = 0.08$) on the response time. Multiple comparisons using Tukey HSD test showed significant differences between groups in block 1 ($p < 0.001$). At the same time, compared to EG2, EG1 showed higher RT scores (by 99.5 ms). In block 8, the difference between the groups decreased to 9.3 ms ($p = 0.99$). As a result of transition from the structural sequence to the pseudorandom one in blocks 9 and 12, RT in EG1 increased more than in EG2. In block 9, the difference between the groups was 28.5 ms ($p = 0.727$), in block 12 – 63.9 ms ($p = 0.005$). Figure 1 shows the average response time in blocks for the four groups.

To determine the impact of the independent variable (sequence learning) separately from the additional variable (practice in performing the task), we compared the dynamics of RT in the learning phase (from block 1 to block 8) in the experimental and control groups. The decrease in RT (from block 1 to block 8) was 223.9 ms in EG1, 121 ms in CG1, 133.7 ms in EG2, and 82.3 ms in CG2. The difference was 102.9 ms between (EG1 and CG1) and 51.4 ms (between EG2 and CG2). One-way ANOVA revealed significant differences between the groups (F (3. 71) = 10.81,

Russian Psychological Journal, 2021, Vol. 18, No. 2, 21–34. **doi**: 10.21702/rpj.2021.2.2

MSe = 6183, p < 0.001, η_p^2 = 0.31). According to Tukey HSD test, significant differences were found between EG1 and CG1 (p = 0.001).

Table 1
Two-way ANOVA for RT in blocks 1, 8, 9, 11, and 12 (EG1 and EG2)

Factors	SS	MS	df1	df2	F-criterion	p-value
Group	112162	112162	1	35	9.441	0.004
Block	759054	189763	4	140	91.643	< 0.001
Group x Block	58150	14538	4	140	7.021	< 0.001

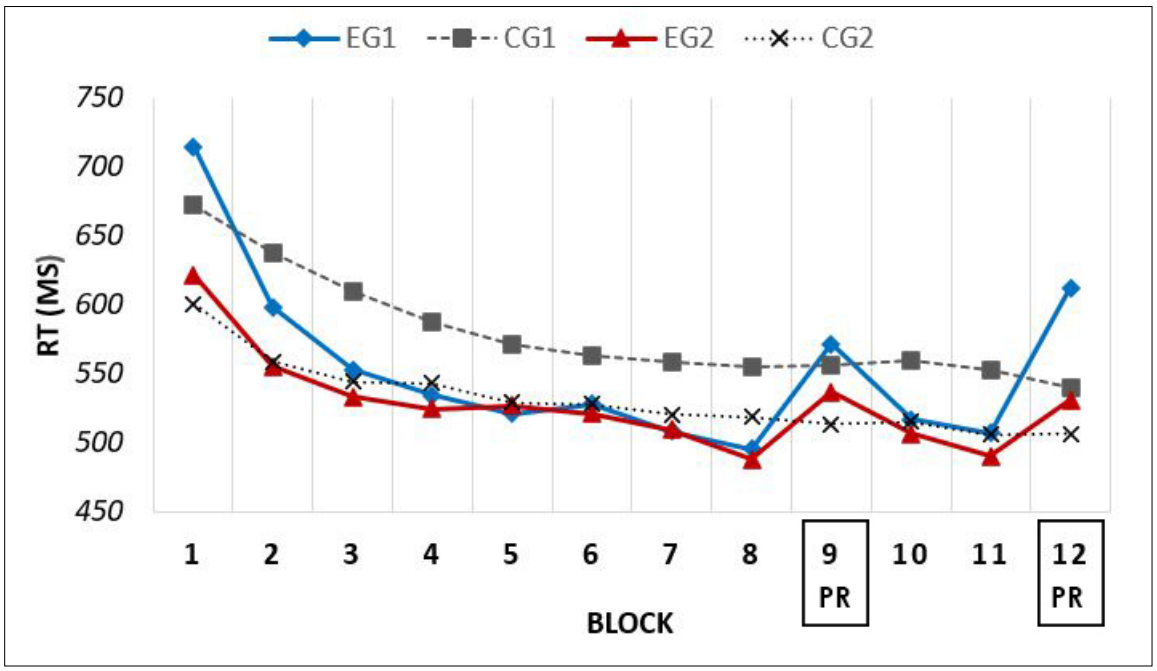

Figure 1. Average response time in the blocks calculated for all subjects

Legend: PR refers to the pseudorandom sequence.

Explicit and implicit sequence learning

Table 2 presents the number of subjects who chose one of the first three answers (no one chose the fourth option) to the question about the use of the rule that determined the alternation of the font colours of words and the rate of correct answers in the recognition test. The comparison

Russian Psychological Journal, 2021, Vol. 18, No. 2, 21–34. **doi**: 10.21702/rpj.2021.2.2

of the average number of correct answers for each of the experimental groups with pooled data from the control groups (CG) was carried out using one-way ANOVA and showed a significant influence of the 'Group' factor on the rate of correct answers (F (2. 72) = 3.618, MSe = 43.04, p = 0.032, η_p^2 = 0.091). Multiple comparisons according to Tukey HSD test showed significant differences between EG2 (M = 47.1 %) and CG (M = 51.7 %): p = 0.039. EG1 (M = 51.9 %) and EG2 (p = 0.07) differ at a level of significant tendencies. EG1 did not significantly differ from the control groups (p = 0.99).

Table 2
The number of subjects who chose answers 1, 2 or 3 and the results of the recognition test

Groups	Answers			Test
	1	2	3	
EG1	9 (50 %)	7 (38.9 %)	2 (11.1 %)	51.9 %
CG1	10 (55.6 %)	6 (33.3 %)	2 (11.1 %)	52.4 %
EG2	8 (42.1 %)	10 (52.6 %)	1 (5.3 %)	47.1 %
CG2	11 (55 %)	7 (35 %)	2 (10 %)	51.1 %

The next step in the analysis of explicit and implicit sequence learning was the comparison of RT in the main procedure among the subjects who showed the result up to 20 correct responses (50 %) in the recognition test (9 from EG1 and 14 from EG2), and subjects with the result of more than 20 correct responses (9 from EG1 and 5 from EG2) (Table 3). Two-way repeated-measures ('Block' – intragroup factor) ANOVA (Group x Block) revealed a significant impact of the 'Group' factor (F (3. 33) = 3.796, MSe = 11894, p = 0.019, η_p^2 = 0.17), 'Block' factor (F (4, 132) = 92.857, MSe = 2044, p < 0.001, η_p^2 = 0.53) and the interaction of factors (F (12, 132) = 3.192, MSe = 2044, p < 0.001, η_p^2 = 0.105) on RT. Multiple comparisons according to Tukey HSD test did not show significant differences in EG1 and EG2 between the subjects who gave up to 50 % of correct responses in the recognition test and those with the efficiency of more than 50 % of correct responses (p > 0.1).

Table 3
Average RT among the subjects from EG1 and EG2 who gave correct responses in the recognition test at the chance level (CL) and higher (> CL)

Blocks	EG1		EG2	
	9 (CL)	9 (> CL)	14 (CL)	5 (> CL)
1	751.8	691.2	607.7	662.1
8	502.3	492.9	485.8	495.1
9	594.2	554.6	528.6	558.7
11	510.3	507.2	490.9	490.8
12	612.9	615.7	523.1	559.1

Discussion

The experiment tested the following two hypotheses: (a) the interference factor does not have a significant impact on implicit sequence learning and (b) the interference factor impedes explicit sequence learning. To test the first hypothesis, we analyzed the data reflecting sequence learning, the impact of interference (before and after sequence learning) and the degree of awareness of the acquired knowledge. To test the second hypothesis, we compared the results of the recognition test for sequence fragments obtained in EG1 and EG2.

A decrease in RT (from block 1 to block 8) in EG1 and EG2 and an increase in RT in blocks 9 and 12 indicates the presence of sequence learning by the subjects of both groups. The difference in RT in block 1 between EG1 and EG2 indicates the impact of interference preceded sequence learning. The analysis of the results from the subsequent blocks showed that as the sequence was learned, the delay in RT caused by the impact of incongruent stimuli gradually decreased until it completely disappeared in the block 5 (Fig. 1). In turn, compared to EG2, a more significant increase in RT in blocks 9 and 12 in EG1 shows that the effect of interference returns with a change in the sequence. This explanation is consistent with the results of experiments by Deroost et al. (2012), who found a reduction in the Stroop effect at the learning phase and its complete return after changing the sequence.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 21–34. **doi**: 10.21702/rpj.2021.2.2

The acquisition of practical skills leads to a decrease in the effect of interference (e.g., Kline, 1921; Stroop, 1992). Therefore, we compared the results of the learning blocks performed by the subjects of the experimental and control groups. Differences in the dynamics of decrease in RT during the learning phase indicates that subjects from EG1 learned the sequence. In turn, sequence learning made it possible to significantly reduce the effect of interference when responding to incongruent stimuli.

The analysis of answers to the question about the existence of a regularity in the order of presentation of stimuli showed an extremely low subjective assessment of awareness of the sequence in all groups (Table 2). Only 7 subjects, including 4 from the control groups, chose the third answer – "I noticed a regularity in changing the font colours of the words, but did not use it when responded". No one chose the fourth answer – "I discovered a rule in changing the font colours of the words and can partially or completely describe it". This assessment coincides with the results of the recognition test – the average number of correct responses is at a level close to chance level in each group. The absence of significant differences in RT between the subjects who gave less than 50 % of correct responses and those who gave more than 50 % of correct responses in the recognition test indicates that explicit learning did not have a significant impact on the result of the main task. We admit that some subjects acquired explicit knowledge of separate fragments of the sequence. However, this knowledge did not affect RT.

The comparison of the results of the recognition test between EG1 and EG2 did not confirm the hypothesis that interference has a negative impact on the acquisition of explicit knowledge of the used rule. Both experimental groups showed no clear signs of sequence awareness. This may be explained by using random alternation of key colours for responses. As noted above, two uncorrelated sequences can give rise to the effect of interference. In this experiment, a random sequence of motor responses could reduce explicit sequence learning of perceptual stimuli. Moreover, some decrease in efficiency of explicit learning was probably caused by using a pseudorandom sequence of stimuli in the last block of the procedure. The subjects could memorize the combinations of stimuli from the last block (edge effect) and mistakenly indicate them as corresponding to the rule in the recognition test. Since EG1 did not show the presence of explicit sequence learning, the result obtained does not falsify the second hypothesis. Further research using different tests will provide a better understanding of the impact of interference on explicit and implicit learning.

Conclusion

This study aimed to examine the process of sequence learning under the conditions of interference. Our findings enabled us to draw the following conclusions: (a) firstly, Stroop interference does not have a significant impact on implicit sequence learning and (b) secondly, the acquisition of implicit knowledge helps eliminate the effect of interference. The first conclusion is consistent with the idea that cognitive unconscious can independently process different flows of information, in particular, semantic and perceptual ones. The second conclusion shows that implicit learning can be investigated not only in terms of the influence of various factors (e.g., resources of attention or working memory) on this process, but also as a factor that has a significant impact on other mental processes.

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Author Contributions

S. N. Burmistrov developed the experimental design and the computer program for conducting the experiment, carried out the experiments, and analyzed and interpreted the empirical results. **A. Yu. Agafonov** wrote the text of the article, analyzed the empirical results, directed the project, and provided funding.

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A. D. Fomicheva processed, analyzed, and presented the empirical results and edited the manuscript.
Yu. E. Shilov organized the experimental procedure, selected the subjects, and wrote the literature overview.

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Research article

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Formation of the Value-based Attitude Towards Health Among Lyceum Students

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Abstract
Introduction. This paper introduces the idea of three associated components of the value-based attitude towards health which is represented in individual consciousness at the level of meanings, senses, and sensory fabric. Specific psychological and pedagogical conditions aimed at the development of these components in students facilitate an increase in the level of importance of the value of health, an improvement in psychological well-being, and an increase in the level of self-actualization, which contributes to the fact that the value-based attitude towards health becomes an effective regulator of individual behavior and activities.
Methods. The study used the KVS-3 for diagnosing the value system (D. V. Kashirsky), the Self-Actualization Test (SAT), the Scale of Psychological Well-being (K. Riff), and the questionnaire for diagnosing the Value of Health in the Psychological Structure of Consciousness (N. A. Shmoylova).
Results and Discussion. In the ascertaining experiment, we observed no significant differences between the experimental and control groups of subjects. Meanwhile, the external ('nominal') level of meanings was predominant in the structure of the value of health. The degree of representation of the value of health in the form of subjective senses and sensory images was much less pronounced in students' consciousness. The respondents of the experimental group took part in the forming experiment, when we implemented a program to form their general ideas of maintaining a healthy lifestyle, to saturate the value of health with personal senses, and to enrich the inner value-based world with the sensory, emotional, and need-related content related to health.
We found that the harmonious presence of the value of health in students' consciousness at the level of objective meanings, subjective senses, and the sensory fabric of images contributes to the fact that the value of health becomes objectively important; it acquires a particular personal sense and is projected into everyday life as behavior focused on health maintaining. The value of health represents psychological means for personal self-development.

Keywords
value-based attitude, value of health, health, structure of consciousness, meaning, sense, sensory fabric, personal self-actualization, psychological well-being, personal self-development

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Highlights

- The formation of the value-based attitude towards health contributes to an increase in the importance of health in the value system of students and to an increase in indicators of psychological well-being and self-actualization. Therefore, individual attitudes towards health become more responsible.
- The value-based attitude towards health incorporates sensory images and subjective senses and regulates individual behavior and activities related to maintaining health.
- The formation of the value-based attitude towards health results in the fact that the value of health becomes objectively important. In addition, it becomes an interiorized value containing subjective senses and sensory images.

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Introduction

Today's reality is characterized by a global restructuring of almost all spheres of life. Accordingly, changes take place in the psychology of a particular individual. Today, social norms, human behaviors, and individual value orientations change. Transformations are characteristic of the structure of values and their content. Over a long period of time, health occupied a leading position in the system of personal values (Kashirsky, 2014). However, we should note that despite the declared value of health, there is an increase in incidence among the population at a fairly young age. In addition, bad habits spread among an increasingly younger population, which significantly reduces both the duration and the quality of life. All this suggests that the value proclaimed by the subject does not always represent an effective regulator of his/her behavior and activity.

Many researchers addressed the issues of the value-based attitude towards health. In our country, these studies originated from the works of V. M. Bekhterev and continued in the works of B. G. Ananyev, I. N. Gurvich, G. S. Nikiforov, V. P. Ozerov, etc. In global scientific research, these are works of A. Maslow, G. Allport, F. Perls, etc. In the works of psychologists, as a rule, health appears as an integrity acquired by individuals in the process of their development, which presupposes personal maturity (Allport, 1968; Perls, 1992; Rudkevich & Rybalko, 2009; etc.); integration of life experience (Abul'khanova-Slavskaya, 1991; Rogers, 1986; Medlock, 2012; etc.); and determinants of self-actualization (Abul'khanova-Slavskaya, 1991; Koval', 1997; Maslow, 1987; etc.). The issues of the value-based attitude towards health and psychological well-being are examined in the works of Belinskaya (2005), Bratus' (1988), Danilova & Rykman (2018), Kashirsky & Shmoylova (Kashirsky & Shmoylova, 2015; Shmoylova, 2009), Leont'ev (Leont'ev, Osin, Dosumova, Rzaeva, & Bobrov, 2018; Leont'ev, 2003), Nikiforova & Dudchenko (2019), Sukhomlinova (2012), Ivanova & Portnova (2006), etc.

According to our viewpoint, the value-based attitude towards health is an attribution of an absolute value of health to a subjective value, which is represented at the level of the psychology of individual consciousness (Shmoylova, 2019). We regard health as a personal value that underlies the realization of individual life goals. However, we should provide more detailed explanations of what we mean by the concept of 'value' and the idea of the structure of the value-based attitude towards health.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

Theoretical background

General psychological approach to the study of personal values. According to the approach that we develop (Kashirsky, 2014; Shmoylova & Kashirsky, 2020), personal values are represented in individual consciousness at the level of objective meanings, subjective senses, and sensory fabric. This provision is based on the ideas of Leont'ev (1977) about the basic psychological structure of consciousness, which includes these components. At the same time, values are most often studied from their external 'nominal' perspective, that is, from the perspective of consciousness representation in the form of meanings. However, the subjective content of individual values is understudied. In our opinion, this should be the aim of psychological studying in this field. Psychology that does not study values from their inner, deeply subjective ('passive') perspective, psychology that ignores consideration of values at the level of personal senses and sensory fabric (associated with emotions), loses its research subject in this research area. In fact, the studies of values carried out by psychologists are for the most part sociological rather than psychological. Instead of personal values researchers examine value orientations as the subjective orientations towards certain values, which, in fact, does not imply the study of the content of individual value preferences (Alekseeva, 1984; Kashirsky & Sabel'nikova, 2018; Koval', 1997; Leont'ev, 1996; Nikiforov & Dudchenko, 2019; Rokeach, 1973; Valde, 1996; etc.).

In our work we have relied on the fact that values become 'true' (essentially personal, subjective, and individual) if they are internalized by individuals, become the components of their consciousness, where they are presented not only at the level of objective meanings, but also as subjective senses and sensory images. Becoming an internal property of individuals, these values underlie their beliefs and have 'exits' into behavior and objective activity, regulating them.

The value of health in the psychological structure of consciousness. In accordance with the above ideas, we developed a model of the representation of the value of health in the psychological structure of consciousness (Fig. 1).

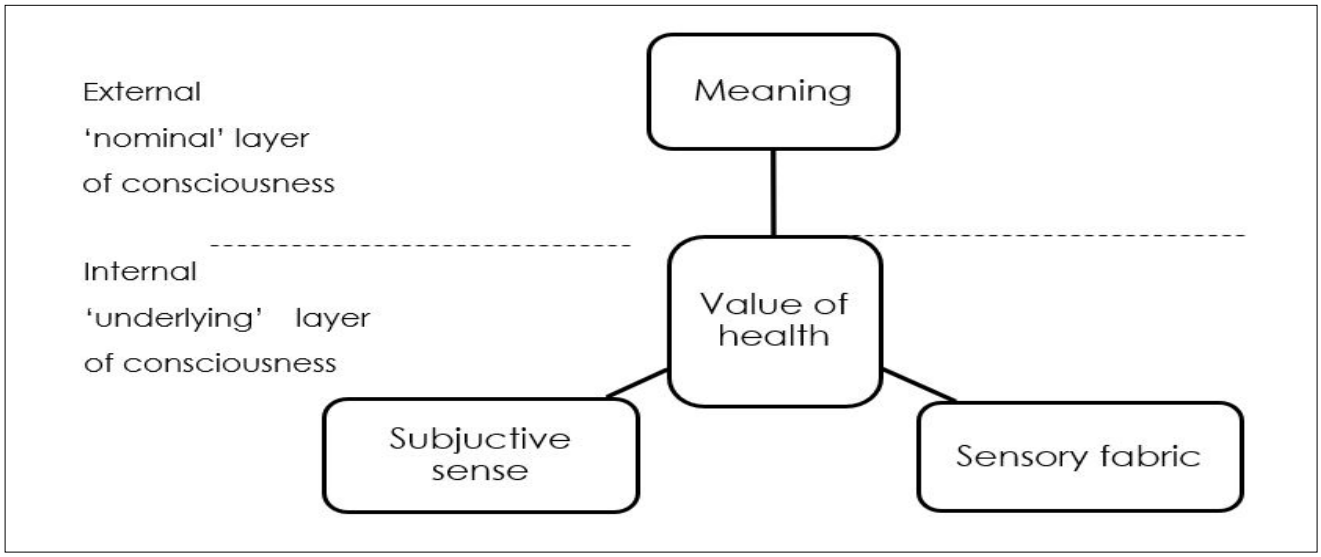

Figure 1. The value of health in the psychological structure of consciousness

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

Let us consider these components in more detail – first, in the general psychological sense, and then in the context of our study.

Sensory fabric. According to A. N. Leont'ev, "sensory fabric is the sensory composition of specific images of reality – currently perceived or arising in memory, relating to the future, or even merely imagined" (Leont'ev, 1975, p. 66). In the context of the value of health, sensory fabric represents specific images associated with good health that arise in the memory or imagination of students. Being enriched, sensory images acquire a new quality – their meaning.

Meaning. According to A. N. Leont'ev, meanings "refract the world in human consciousness...; meanings represent the ideal form of existence of the objective world transformed in the matter of language..." (Leont'ev, 1975, p. 68). In the context of our study, meanings represent general knowledge and experience of individuals in the field of health maintaining, which are developed in culture, regardless of personal attitudes towards them. Therefore, being represented in subjective consciousness at the level of meanings, health can be an important value for an individual. However, it might not have personal sense, and, therefore, cannot become an effective regulator of his/her behavior and activity. Consequently, health as a value should be incorporated in the structure of consciousness at the level of personal senses.

Personal sense. A. N. Leont'ev wrote that "personal sense reflects the subjective importance of certain events, phenomena of reality in relation to the interests, needs, and motives of an individual. It creates the predisposition of human consciousness" (Leont'ev, 1975, p. 74). In our study, we understand personal sense as a subjective meaning of health of an individual. Personal sense makes an individual's consciousness partial, which ultimately leads to the formation of the value-based attitude towards his/her health.

The overwhelming majority of works on the research problem (Belinskaya, 2005; Kashirsky & Shmoylova, 2015; Sukhomlinova, 2012; etc.) are aimed at forming a conscious attitude towards health through a variety of psychological and pedagogical methods and techniques, affecting, as a rule, the external 'nominal' layer of the value-based attitude. In other words, in this case the formation of the attitude towards health as a value remained mainly at the level of an external stimulus presented in consciousness in the form of objective meanings – the appropriation of others' knowledge and experience of strengthening health. Of course, the results of such educational work are of great importance for the formation of the value-based attitude towards health, since "there is nothing inside that would not be outside" (Vygotskii, 1995, p. 406). However, for many students, after such work, their health remained at the level of external 'nominal' values, which did not find its realization in activity. At the same time, there is a lack of studies aimed at the formation of the value-based attitude towards health by saturating the value of health with internal living content – the 'underlying' layer of personal senses and sensory images. Meanwhile, only this work can transform the value of health into an important and effective regulator of individual behavior and activity as psychological means of personal self-development (Vygotskii, 1983).

Methods

This study *aimed* to form the value-based attitude towards health among lyceum students.

The *objectives* of our study were as follows:

(a) To develop ideas of a healthy lifestyle of an individual who strives for self-development and self-improvement and considers health as a necessary resource for self-realization (transferring knowledge and experience of maintaining health by means of mastering the system of meanings).

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

(b) To form the knowledge of how to maintain and improve health and to develop individual skills in this field (saturating the knowledge acquired by students with personal senses).

(c) To form an active lifestyle aimed at maintaining and improving health (enriching students' sensory ideas related to health and a healthy lifestyle).

Thus, in our work we aimed to develop not only *'external'* but also *'internal'* structural components of the value-based attitude towards health (see Fig. 1).

Our *hypothesis* is that the development of structural components of the value-based attitude towards health contributes to an increase in the importance of health in the value system, to an increase in the indicators of psychological well-being and self-actualization, and to the transformation of the value-based attitude towards health into an effective regulator of individual behavior and activity.

Sample

The study involved 10th-grade schoolchildren (n = 56), 85.7 % of whom were boys (n = 48 boys) and 14.3 % of whom were girls (n = 8) aged 15–17 years (M = 16, SD = 1).

Procedure

The study was carried out among 56 students of the Altai Regional Pedagogical Boarding Lyceum and was organized by the psychological service of this educational institution as a part of additional classes in psychology. To implement the program of psychological and pedagogical experiment, the sample of students was randomly divided into two equal groups (28 subjects in each one) – the experimental group (EG) and the control one (CG). The groups underwent testing before and after the forming experiment, which lasted for 2 months. The psychological-pedagogical experiment was realized under conditions familiar to the participants from the EG – during lectures and practical classes in psychology. The diagnostic part of the study was carried out anonymously in a group format and was free. The lyceum students could refuse to participate in the study at any stage of work. The students were asked to complete their answer sheets. The duration of the ascertaining and control experiments (diagnostics of students) was about 1 hour.

Diagnostic tools

The study used the KVS-3 for diagnosing the value system (D. V. Kashirsky), the Self-Actualization Test (SAT), the Scale of Psychological Well-being by K. Riff, modified by T. D. Shevelenkova & T. P. Fesenko (Shevelenkova & Fesenko, 2005), and the questionnaire for diagnosing the Value of Health in the Psychological Structure of Consciousness (N. A. Shmoylova).

The study used the Shapiro–Wilk W-test, Pearson χ^2 test, and Spearman correlation analysis. IBM SPSS Statistics 23.0 software was used for data processing.

Results and Discussion

Before the forming experiment, we examined the degree of representation of the value of health at the level of sensory fabric, meaning, and personal sense in the consciousness of students from the EG and the CG using the questionnaire for diagnosing the Value of Health in the Psychological Structure of Consciousness (Shmoylova, 2019) (Table 1).

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

Table 1

Results of the ascertaining experiment

	Sensory fabric	Meaning	Sense	χ^2
EG	*21.4 %*	*60.7 %*	*28.6 %*	23.728***
CG	*14.3 %*	*68.0 %*	*32.1 %*	39.242***
χ^2	$1.042^{n.s.}$	$0.308^{n.s.}$	$0.202^{n.s.}$	–

Note: $^{n.s.}$ – no significant differences were found ($p > 0.10$), *** – $p \leq 0.001$.

The results of the study showed that in the ascertaining experiment the value of health is represented in individual consciousness at the level of objective meaning in 60.7 % of the subjects from the EG and 68 % of the subjects from the CG ($p > 0.10$), at the level of sensory fabric in 21.4 % and 14.3 % of subjects, respectively ($p > 0.10$) and, finally, at the level of personal sense – in 28.6 % and 32.1 % of subjects, respectively ($p > 0.10$). Thus, Pearson's χ^2 test did not reveal significant differences between the samples before the forming experiment – the EG and the CG turned out to be balanced in terms of the representation of the value of health in individual consciousness of students at the level of sensory fabric, meaning, and personal sense.

Along with this, the performed diagnostics showed that both in the EG ($p \leq 3 \cdot 10^{-5}$) and in the CG ($p \leq 10^{-5}$), the level of signs or meanings (i.e., the external, 'nominal' level) prevailed significantly in the representation of the value of health. Meanwhile, the degree of representation of the value of health in the form of subjective sense and sensory images turned out to be much less pronounced. Thus, at the preliminary stage of the study, we found that for the subjects from the EG and the CG the value of health was not provided with an internal 'underlying' layer of subjective senses and sensory images. Therefore, we may conclude that this value only partially (at the level of knowledge) enters the consciousness of adolescents.

Forming experiment

The students of the EG took part in the forming experiment. We implemented the program aimed at the formation of the value-based attitude towards health among the students. A distinctive characteristic of our psychological and pedagogical model (Fig. 2) is that its goal is not only to form general ideas of a healthy lifestyle, but also to enrich the inner value world with sensory, emotional, and need-related content related to health.

Thus, speaking about the formation of the value-based attitude towards health, we, according to the theoretical scheme described above, have chosen three forms of representation of the value of health in the structure of individual consciousness as the target guidelines of the

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

program – objective meanings, personal senses, and sensory fabric. Figure 2 shows possible strategies for the formation of the value-based attitude that we used in our work. Let us provide their more detailed descriptions.

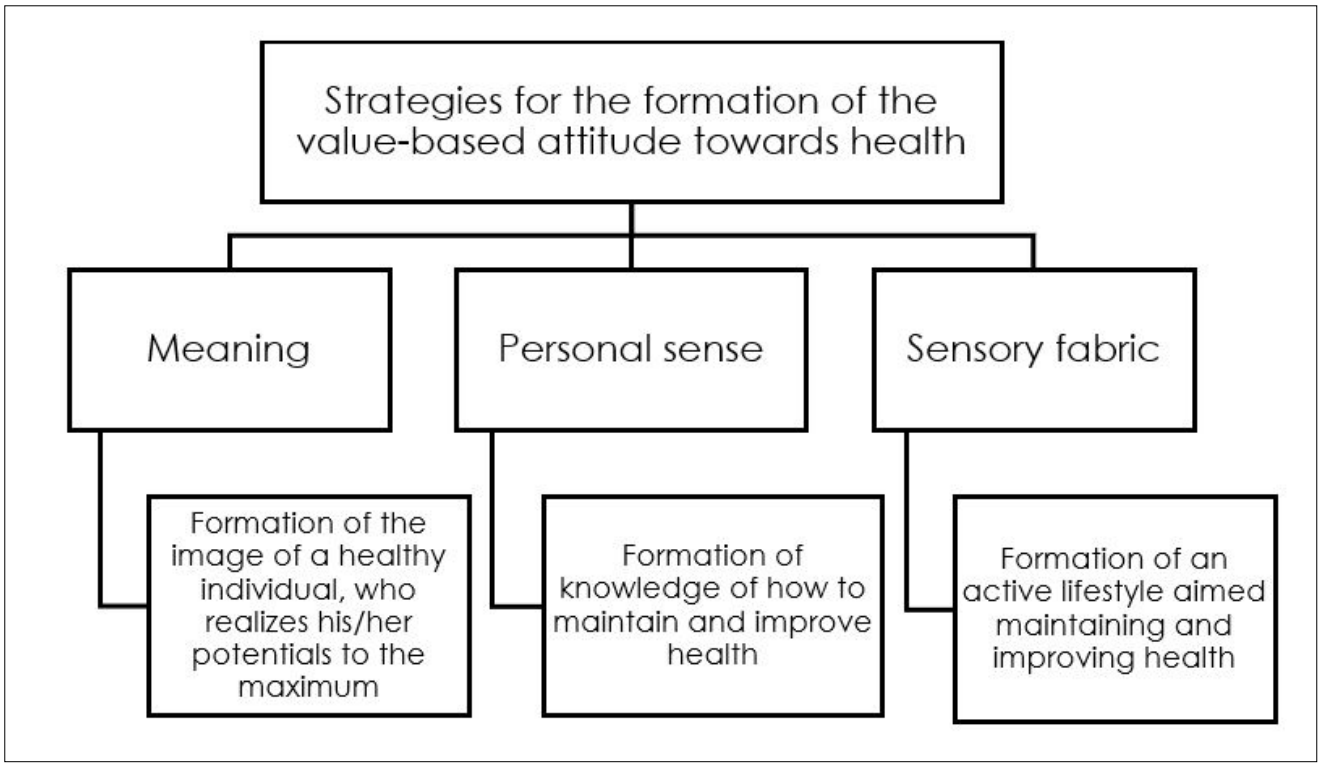

Figure 2. Psychological and pedagogical model of the formation of the value-based attitude towards health

Let us consider the model of the formation of the value-based attitude in more detail.

The importance of health in human life

To form students' ideas of behavior related to health maintaining, we delivered lectures to the participants of the experiment (20 study hours). The lectures were given in the form of conversations which raised the following issues: general approaches to understanding health, the concept of value, health as a value, the principles of maintaining and improving health, etc. In addition, the EG participants were familiarized with the results of empirical studies (Shmoylova, 2009), confirming the relationship between the value-based attitude towards health and the development of the inner potential of the individual. Therefore, the main purpose of the lectures was to render general knowledge and understanding of the issues of maintaining and improving health, the experience of others in this area and to confirm these provisions by empirical research. Acquiring this knowledge and ideas, an individual will undoubtedly strive to take care of his/her own health. However, this aspiration may remain in the form of intention and will not be realized in activity, since even the most complete and detailed ideas of a healthy lifestyle may not be incorporated into personality, that is, may not have subjective sense. Therefore, in addition to informing the

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

EG participants about the issues of a healthy lifestyle and health we also aimed to saturate these ideas with subjective coloring and emotional and need-related attitudes towards health.

Personal sense of the value of health

To achieve this goal, we conducted a series of practical classes with the EG participants, which included a discussion of the biographies of famous politicians, scientists, public figures, celebrities whose interests include maintaining their own health. Along with this, we discussed the statistics of morbidity among the individuals who are focused on strengthening their own health and maintaining a healthy lifestyle. At the same time, special emphasis was placed on the information about how famous persons understand the importance of playing sports, follow the recommendations for proper nutrition, and engage in active recreation, which leads them to great achievements in their professional activities. Next, we conducted a series of conversations with adolescents to form the subjective importance of the value of health among them. These conversations were conducted both frontally and individually, followed by discussions of individual cases.

Sensory fabric of the value of health

To saturate the value of health with sensory content, we performed "My Attitude Towards Health" and "Associations" exercises among the students from the EG.

During the "My Attitude Towards Health" exercise, the students were presented with situations that activated their imaginations. The participants were asked to provide the most detailed description of the associations with what they heard (sensory images). The examples of stimulus situations were as follows: *"success and happiness are inseparable from health", "a happy person is a healthy person", "health is our main piggy bank; as you sow, so shall you reap", "health is the most precious thing for a person"; "if there is health, then there will be everything else", "we need to maintain the strength of the body in order to maintain the strength of the spirit", "health is the only beauty that I know", "stay healthy from a young age", "if you are healthy, then you will get everything"*.

In the "Associations" exercise, the students had to put themselves in the place of a celebrity of our time and to characterize this person from the standpoint of his/her attitude towards his/her health. We asked students to 'get used' to this character as best as possible and reflect on their feelings, emotions, and ideas related to health, as well as his/her values 'for themselves' (getting into the image of this person).

Control experiment

At the final stage of the experiment, in the EG and the CG we carried out a repeated assessment of the representation of the value of health in the structure of students' consciousness and examined the place of health in the system of students' values. In addition, we performed a correlation study of the degree of representation of the three structural components of the value of health in students' consciousness and the indicators of their self-actualization and psychological well-being.

Value of health in the structure of consciousness

Using the questionnaire for diagnosing the Value of Health in the Psychological Structure of Consciousness (Shmoylova, 2019), we examined the representation of the value of health in the structure of consciousness among students from the EG and the CG (Table 2).

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

Table 2

Results of the control experiment

	Sensory fabric	Meaning	Sense	χ^2
EG	*77.7 %*	96.3 %	92.6 %	2.182$^{n.s.}$
CG	22.2 %	*71.4 %*	*51.9 %*	25.313***
χ^2	29.732***	3.406^{T}	11.464***	–

Note: $^{n.s.}$ – no significant differences were found ($p > 0.10$), ^{T} – differences at the level of significant tendencies ($p \leq 0.10$), *** – $p \leq 0.001$.

We found the value of health was mainly represented in individual consciousness at the level of objective meaning (96.3 % of the subjects from the EG and 71.4 % of the subjects from the CG; $p \leq 0.10$), at the level of sensory fabric (77.7 % and 22.2 %, respectively; $p \leq 0.001$), and at the level of personal sense (92.6 % and 51.9 %, respectively; $p \leq 0.001$). That is, Pearson's χ^2 test revealed statistical differences between the EG and the CG in terms of the degree of representation of the value of health in students' consciousness at the level of commonly used meanings, sensory fabric, and personal senses. We should note that in each of the three cases these parameters were higher in the EG. In the first case (health value), the differences were found at the level of significant tendencies; in the second (sensory fabric) and third (sense) cases, the differences were observed at a high confidence level. Therefore, the experimental influence considerably enriched the value world of the students from the EG with the internal content related to health and a healthy lifestyle.

In addition, the final diagnostics showed that the value of health was harmoniously represented in consciousness of the subjects from the EG at all three levels – objective meanings, subjective senses, and sensory fabric ($p > 0.05$). Meanwhile, in the CG ($p \leq 10^{-5}$) the external, 'nominal' level of the value-based attitude towards health remained significantly predominant, with a low degree of representation of personal sense and sensory fabric. The obtained result indicates the effectiveness of the experimental influence, which contributed to the fact the value-based attitude towards health has been saturated with subjective content and the structural components of the value-based attitude towards health were harmonized among the students from the EG.

We also found qualitative differences in ideas of health between the EG and the CG. Thus, for adolescents from the CG, good health is a chance *"not to go to pharmacies"*, *"not to spend money on medicines"*, etc. In this group of students, the image of health is predominantly coloured by general cultural values (96.3 %) and is associated with memories of previous illnesses, relevant literature, etc. At the same time, only several adolescents from the CG (22.2 %) experienced

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

positive emotions associated with good health; a little more than half of them (51,9 %) had personal senses of the value of health. At the same time, for the adolescents from the CG, the subjective sense of health was largely in the recognition of health as a resource for *'successful life'* or *'professional realization'*. However, this image can be considered as, rather, only emerging, nascent, since adolescents still lacked confidence in their own desires and life aspirations, meaningfulness of their lives, professional goals, and development prospects.

In the EG, when working with the "Associations" exercise, we observed more quantitatively (77.7 %) and qualitatively coloured images in the descriptions of health. The adolescents from the EG associated health with *"a feeling of joy filling the whole body"*, *"a tickling feeling in the chest from feeling a healthy body"*, *"emotions experienced from the fact that a healthy person is capable of maximum achievements"*, etc. For example, one of the adolescents even mentally described the following image associated with excellent health, *"every morning, waking up, I feel a surge of energy, I feel joy that I am able to do a lot... in the evening I feel that my day was intense and interesting... my well-being gives me colossal opportunities; I enjoy a fulfilling active life"*.

Despite the fact that in both groups the value of health is represented in students' consciousness at the level of meanings *("strong in the body means rich in deed"*, *"if there is health, there will be everything else"*, etc.), the study showed that in the CG, students often shifted responsibility for their own health to others or external circumstances; their associations contained negative connotations (*"my health depends not only on me"*, *"bad ecology"*, *"insufficient state policy in the field of health"*, etc.). Meanwhile, the students from the EG provided more positive descriptions and took responsibility for themselves and their own health (*"health gives me great well-being"*, *"a healthy life is filled with positive emotions to a greater extent"*, *"state policy is aimed at a healthy generation"*, *"in modern society, an individual must be healthy to maximize realization in his/her profession"*, etc.).

During the "Associations" exercise, the subjects were asked to characterize famous persons in terms of their attitudes towards health. As a rule, the adolescents from the CG noted that famous persons can afford to *"have good doctors, nutritionists, etc."*, *"engage in fashionable sports clubs"*, *"go on vacation at the sea"*, etc. At the same time, this exercise caused difficulties for some subjects form the CG. It was very difficult for these students to reflect their feelings during this exercise. The students of the EG emphasized the decisive importance of health for self-realization of an individual. The adolescents from the EG, on the contrary, noted that it was precisely *"because of maintaining their own health, famous persons were able to achieve success in their professional activities"*; famous persons are *"very cheerful"*, they *"feel inner freedom"*, *"desire to take care of their health"*, first of all, *"for excellent health"* and in order to *"achieve great success"*, etc. For many students from the EG, this exercise aroused great interest and a huge number of associations and sensory images. For example, a teenager said that when he read an interview with T. Robbins (Tony Robbins is an American writer, business coach, and promoter of a healthy lifestyle. Forbes magazine put him on their Celebrity 100 List for 2007), his view of the value of health has changed dramatically. Thus, after the words of T. Robbins, that by changing only the order of life values and putting health in the first place a person changes his/her life forever and his/her achievements become more real, the teenager said, *"Now I perceive the value of health in a new way; feeling myself healthy, I am capable of many things, like other successful persons"*.

Our findings indicate that the implementation of the program for the formation of the value-based attitude towards health contributed to the development of three associated forms of

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

existence of the value of health in students' consciousness – objective meanings, subjective senses, and the sensory fabric of images. As a result of this work, the value of health was saturated with inner living content – the 'underlying' layer of subjective senses and sensory images. This led to the fact that the value of health has become not only an important (which is understood by everyone), but also an effective (which not everyone has) regulator of their own behaviour and activities.

Psychological well-being

In the EG significant positive correlations were found between the components of the value-based attitude towards health in students' consciousness and the indicators of their psychological well-being (Table 3).

Table 3

Correlations between the components of the value-based attitude towards health in students' consciousness and the indicators of psychological well-being in the EG (n = 28)

Scales of Psychological Well-being	Components of the value-based attitude towards health in students' consciousness		
	Sensory fabric	Meaning	Sense
Personal growth	0.48***	0.63***	0.52***
Goals in life	0.61***	0.65***	0.48***
Self-acceptance	0.55***	0.58***	0.54***
Total score	0.63***	0.59***	0.54***

*Note: *** – $p \leq 0.001$.*

The results indicate that an individual whose value of health is represented at three levels of associated forms of existence – objective meanings, personal senses, and the sensory fabric of images – is focused on self-improvement and self-development, perceives each new experience

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

as a step towards further development, is active and autonomous in views and guidelines; learning something new, such an individual develops tactics for further behavior in achieving goals.

Thus, the development of three structural components of the value-based attitude towards health can be interpreted as the most important psychological means of personal self-development.

In the CG, we observed correlations of such structural components of the value-based attitude towards health as meaning and personal sense with such scales of psychological well-being as goals in life, self-acceptance, and the total score. This indicates that students with a moderate value-based attitude towards health are focused on value orientations inherent in self-actualizing individuals; they show independence in decision-making, but at the same time do not oppose their point of view to another one (Table 4).

Table 4

Correlations between the components of the value-based attitude towards health in students' consciousness and the indicators of psychological well-being in the CG (n = 28)

Scales of Psychological Well-being	Components of the value-based attitude towards health in students' consciousness		
	Sensory fabric	Meaning	Sense
Goals in life	0.21$^{n.s.}$	0.60***	0.45***
Self-acceptance	0.23$^{n.s.}$	0.65***	0.49***
Total index	0.25$^{n.s.}$	0.55***	0.48***

Note: $^{n.s.}$ – no significant differences were found ($p > 0.10$), *** – $p \leq 0.001$.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

Self-actualization

In the EG, we observed significant positive correlations between the components of the value-based attitude towards health in students' consciousness and the indicators of self-actualization (Table 5) (Shmoylova, 2019).

Table 5

Correlations between the components of the value-based attitude towards health in students' consciousness and the indicators of self-actualization in the EG (n = 28)

SAT scales	Components of the value-based attitude towards health in students' consciousness		
	Sensory fabric	Meaning	Sense
Orientation in time	0.61***	0.65***	0.48***
Support	0.53***	0.65***	0.49***
Value orientations	0.55***	0.59***	0.54***
Flexibility in behavior	0.40**	0.60***	0.62***
Spontaneity	0.36**	0.59***	0.62***
View of human nature	$0.26^{n.s.}$	0.60***	0.63***

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

Table 5

Correlations between the components of the value-based attitude towards health in students' consciousness and the indicators of self-actualization in the EG (n = 28)

SAT scales	Components of the value-based attitude towards health in students' consciousness		
	Sensory fabric	Meaning	Sense
Self-acceptance	0.53***	0.65***	0.58***
Sociability	0.40**	0.60***	0.40**
Cognitive needs	0.32**	0.60***	0.57***
Integral index	0.63***	0.68***	0.72***

Note: $^{n.s.}$ – coefficient is not statistically significant ($p > 0.10$), ** – $p \leq 0.01$, *** – $p \leq 0.001$.

We found positive correlations between the structural components of the value-based attitude towards health and the indicators of self-actualization. The findings suggests that students with a pronounced value-based attitude towards health are guided in life by their own goals and interests, have an internal locus of personal control, assess the advantages of the present moment of life to the maximum extent, consider the experience of the past to be important, and look towards the future with optimism. They are characterized by the values of self-actualizing individuals, and an orientation towards learning new knowledge about the surrounding reality.

In the CG, we found correlations among such structural components of the value-based attitude towards health as meaning and personal sense and the following indicators of self-actualization: the scale of value orientations and support. The established correlations indicate that students with a moderate value-based attitude towards health are focused on value orientations inherent in self-actualizing individuals, show independence in decision-making, and do not oppose their point of view to another one (Table 6).

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

Table 6

Correlations between the components of the value-based attitude towards health in students' consciousness and the indicators of self-actualization in the CG (n = 28)

SAT scales	Components of the value-based attitude towards health in students' consciousness		
	Sensory fabric	Meaning	Sense
Support	0.21 n.s.	0.65***	0.36***
Value orientations	0.25 n.s.	0.45***	0.54***

Note: n.s. – coefficient is not statistically significant ($p > 0.10$), ** – $p \leq 0.01$, *** – $p \leq 0.001$.

Thus, as a result of the experiment on the implementation of the program aimed at the formation of the value-based attitude towards health, adolescents from the EG note the value of health among the priority life values (objective importance of health), have deep knowledge of the issues of maintaining and improving health, strive to search for such information (subjective sense), and are also oriented towards health maintaining, which indicates that the value of health is included in the structure of consciousness at the level of objective meaning, subjective sense, and sensory fabric.

Conclusions

1. The *value-based attitude towards health* is a systemic formation that enters consciousness in the form of sensory fabric, meaning, and subjective sense. The *sensory component* of the value-based attitude towards health is represented in consciousness in the form of specific images related to good health that arise in the memory or imagination of students. The *meaning* of health as a component of the value-based attitude towards health is represented in consciousness in the form of a person's general knowledge of the experience of mankind and of the norms of behavior in the field of health maintaining. Meaning as a component is represented in consciousness regardless of personal attitudes towards the available knowledge. The *subjective sense* of health as a component of the value-based attitude towards health is represented in consciousness in the meaning that an individual attaches to it. Subjective sense determines the orientation of an individual, which, ultimately, determines the formation of the value-based attitude towards health. The formation of the subject's value-based attitude towards health should presuppose the practical work of a psychologist with each of the presented components.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 35–52. **doi**: 10.21702/rpj.2021.2.3

2. The program for the formation of the value-based attitude towards health, implemented in the work, was aimed at developing three structural components of the value of health represented in human consciousness – objective meanings (development of ideas about healthy lifestyle, about health as the most important condition for personal self-realization), subjective sense (formation of knowledge about the ways of maintaining and improving health and individual skills in this area), and enrichment of sensory ideas of students (formation of health-oriented behavior).

3. The formation of the structural components of the value-based attitude towards health – objective meaning, personal sense, and sensory ideas related to health and a healthy lifestyle – contributed to an increase in the importance of health in the value system of students, to their more responsible attitude towards their own health, and to an increase in psychological well-being and the level of self-actualization.

4. The main result of our practical work is that the formation of the structural components of the value of health in students' consciousness made health a more significant value for them. The value of health has been saturated with an inner living content – an 'underlying' layer of subjective senses and sensory images, which made it an effective regulator of the subjects' behaviors and activities related to taking care of their own health and maintaining a healthy lifestyle.

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N. A. Shmoylova carried out the experiments, analyzed the empirical results, and prepared the manuscript for publication.

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Do Preschool Teachers' Beliefs About Age-related Emotional Development Impact Preschoolers' Emotion Understanding?

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Abstract
Introduction. Beliefs of preschool teachers about specific characteristics of children's emotional development have been studied mainly in the context of the used methods for teaching children. However, the relationship with the development of emotion understanding in preschoolers remains underexplored. Children's emotion understanding includes such components as recognizing emotions, understanding the effect of external causes, the role of desires, beliefs, memories, and moral rules in the formation of emotions, and understanding that emotions may be hidden and mixed and that they may be regulated. This study aims to identify the influence that teachers' beliefs about the development of certain components of children's emotion understanding exerts on the actual level of emotion understanding in 5–6-year-olds.
Methods. The study involved 16 senior kindergarten groups; in total 16 preschool teachers we interviewed, and 324 children were assessed. To identify teachers' beliefs about children's emotion understanding, we used the method of structured interview. Children's emotion understanding was assessed using the Test of Emotion Comprehension.
Results. Preschool teachers were quite accurate in their estimation of the age when children master the majority of components of emotion understanding (except for understanding the role of beliefs, the role of moral rules in the formation of emotions, and mixed emotions). At the same time, in groups where teachers believed that understanding of these aspects was not yet available to children, preschoolers coped with the tasks testing these abilities more successfully than children in groups where teachers believed that these skills had already been formed.
Discussion. We can assume that preschool teachers who believed that children in their groups had not yet mastered these skills were more focused on teaching children these components of emotion understanding.

Keywords
developmental psychology, preschool age, children, kindergarten, preschool teachers, preschool teachers' beliefs, emotions, emotional development, emotion understanding, emotion recognition

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Highlights

- Preschool teachers' beliefs about the development of emotion understanding in 5–6-year-old children partially correspond to the actual level of the components of emotion understanding in children.
- If preschool teachers believe that 5–6-year-old children do not understand that emotions may be related to beliefs and moral meanings of their actions and that emotions may be mixed, children from their groups demonstrate higher scores in these aspects of emotion understanding.
- Presumably, preschool teachers' beliefs that certain aspects of emotion understanding are not yet available to children enable them to create the relevant zone of proximal development for children from their groups.

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Introduction

Emotion understanding is the ability to comprehend the causes and consequences of one's own emotions and emotions of others (Pons & Harris, 2000). Numerous studies have shown that emotion comprehension is a significant predictor of social adaptation (Camodeca & Coppola, 2016), socially approved behavior (Larsen, To, & Fireman, 2007; Gordeeva, 2019), cooperation with peers (Kholodova & Loginova, 2020), and academic performance (Denham & Brown, 2010). At the same time, insufficient development of emotion understanding in children leads to such problems as anxiety, social maladjustment, etc. (De Rosnay, Harris, & Pons, 2008).

The issues of preschoolers' emotion understanding are presented in theories developed by Russian and foreign researchers. In the context the cultural and historical concept of L. S. Vygotsky, formation of emotion understanding in preschoolers is associated with the "anticipation of emotions and consequences of one's actions" (Zaporozhets, 1986, p. 283). Studies of emotion understanding were influenced by J. Piaget's cognitive theory, in which the researcher identified the stages of emotional development, similar to intellectual ones, which lead to intellectualization of emotions (Piaget, 1997). In their five-stage model of understanding mixed emotions, Harter & Buddin formulated logical errors in children's explanations, when "children believe that two emotions can simultaneously co-occur. However, they do not yet have the cognitive skills to integrate their responses into a compelling story" (Harter & Buddin, 1987, p. 398). The development of mixed emotion understanding was among other things associated with the development of multiplication operation. In the context of the *theory of mind* paradigm, "understanding one's own mind and the mind of another becomes the basis of social cognition, social interaction, and predicting the behavior of other individuals and social groups" (Sergienko, 2015, p. 266).

In the model of children's emotion comprehension, Pons & Harris (2000) distinguish nine components of emotion understanding, which can be combined into three components depending

Russian Psychological Journal, 2021, Vol. 18, No. 2, 53–66. **doi**: 10.21702/rpj.2021.2.4

on their complexity – namely, External, Mental and Reflective. The External component is formed in preschool children aged from 3 to 5 years old. It is a set of components that includes emotion recognition and understanding the influence of external causes and desires on emotions. The Mental component is formed in preschoolers in the interval between 5 and 7 years old. It consists of three components – understanding the role of beliefs and memories as causes that affect emotions and understanding hidden emotions. The Reflective component is formed in the period from 7 to 9 years old. It includes the following components: understanding of mixed emotions, ability to regulate emotions, and the impact of socially approved (moral) or disapproved actions on emotions (Pons & Harris, 2000). To the present day, this is the most developed model in the field of studying children's emotion understanding. Hence, we used it as a foundation for our study.

Studies have shown that the development of emotion understanding depends not only on internal (De Stasio, Fiorilli, & Di Chiacchio, 2014) but also on a number of external factors, including relationships with parents, communication with peers, parental beliefs about children's emotion understanding (Garrett-Peters, Castro, & Halberstadt, 2017), and parents' emotional vocabulary (Ornaghi, Brockmeier, & Gavazzi, 2011; Iskhakov et al., 2019). Despite numerous studies on the influence of parents and peers on the development of children's emotion comprehension (Denham & Kochanoff, 2002; Karabanova, 2019), only several studies have examined the impact of kindergarten teachers' beliefs on the development of emotion understanding in preschoolers (Denham, Bassett, & Zinsser, 2012; Morris, Denham, Bassett, & Curby, 2013). Notably, preschool teachers attach great importance on their own and children's emotions in the learning process (Poulou, 2005). For example, a study by Denham & Kochanoff (2002) demonstrated that teachers who considered emotional learning important for children's development contributed to the formation of more adaptive patterns of emotion regulation in preschoolers. Teachers who discussed emotions in the classroom were more likely to help preschool children to identify causes of their negative emotions and teach them constructive ways to express them (Ahn, 2005a).

Some researchers identify emotional manifestations in preschool teachers as a type of emotional labour (Brown, Vesely, Mahatmya, & Visconti, 2018; Mahasneh & Gazo, 2019). This type of labor is associated with a certain level of emotional response, which depends on the expectations of the educational organization. For example, if the teacher is tired and irritated, he/she is expected to restrain these emotions and be calm when interacting with children. Eisenberg, Cumberland, & Spinrad (1998) emphasized the importance of a positive reaction to children's emotions, implying that negative responses ultimately lead to heightened emotional turmoil in children. Ashiabi (2000) formulated strategies for kindergarten teachers that promote childhood socialization. These strategies included labeling emotions, explaining emotions within a context meaningful to the child, and providing support in regulating negative and positive emotions. Thus, emotions play an important role in the pedagogical activity of a preschool teacher. On the one hand, teachers' emotions need to correspond to their role; on the other hand, the way teachers support children's emotions determines their subsequent development in children.

In the context of the cultural and historical approach developed by L. S. Vygotsky, an adult plays a key role in mental development of a child. It is the adult who guides development of the child and creates the zone of proximal development (ZPD) (Vygotsky, 1984) as a special form of interaction, due to which the child first solves the problem with the help of the adult and then proceeds independently. We assume that in the process of communicating with kindergarten

Russian Psychological Journal, 2021, Vol. 18, No. 2, 53–66. **doi**: 10.21702/rpj.2021.2.4

children, the teacher creates the zone of proximal development in terms of not only cognitive, but also emotional development of children.

Ahn & Stifter (2006) analyzed specific characteristics of interaction of kindergarten teachers with toddlers and preschoolers and identified that teachers expected preschool children to have more developed regulation of their behavior compared to toddlers; therefore, they were more likely to explain the causes of emotions to children and taught preschoolers constructive or alternative ways of expressing negative emotions. According to these researchers, the differences in relationships with toddlers and preschoolers are associated with teachers' beliefs that preschoolers have better cognitive abilities.

As observed by Ahn (2005b), in their day-to-day work, preschool teachers use a variety of ways to develop children's emotion understanding: (a) reading books and then holding post-reading discussions, which enable children to identify emotions, discuss their causes, and enrich their vocabulary with 'emotional' words; (b) holding situational conversations, in which teachers help children to identify positive and negative emotions, as well as emotions experienced by the peer or the child himself/herself; (c) teaching children to verbalize their emotions instead of screaming and crying; (d) helping to find constructive ways of emotion regulation; (e) modeling situations, such as role-playing and puppet theater, aimed at not only recognizing and labeling emotions, but also at their correct expression (Honig, 1999); (f) indicating causes and consequences of emotions; (g) interacting with children informally, which has a significant impact on children's understanding of emotions (Raver, 2003); and (h) organizing discussions about opposite emotions using open-ended questions.

At the same time, Ahn (2005a) discovered that in the process of interacting with preschoolers, teachers reacted differently to children's emotions: (a) evoked positive emotions in children during interaction and tried to respond positively as well; (b) expressed empathy for children's experiences and encouraged them to express empathy for each other; (c) reacted to children's negative emotions, emphasizing that it is normal to experience them; (d) provided children with physical comfort, when they were experiencing negative emotions; (e) switched child's attention to another situation; (f) taught children to verbalize the emotions they were experiencing instead of using physical force; (g) focused children's attention on the cause of the problem; (h) intentionally or unintentionally ignored children's emotions, if they did not consider it necessary to pay attention to negative behavior or were busy; (i) made negative and sarcastic remarks, mistrusted emotions, and punished children for expressing their emotions. This means that teachers had certain beliefs about the development of emotions in preschool children and interacted with them differently. However, in the study the author did not assess children's emotional development depending on teacher's experience.

Therefore, we assumed that teachers' beliefs about the development of the components of emotion understanding in preschool age would affect the way they cultivated children's emotions. Preschool teachers' beliefs about emotional development have been considered in the studies on the quality of education (Papadopoulou et al., 2014), organization of the educational process (Lara-Cinisomo, Fuligni, Daugherty, Howes, & Karoly, 2009), and importance of social and emotional functioning in child's development (Kowalski, Pretti-Frontczak, & Johnson, 2001). However, to our knowledge, there are no studies on the relationship between teachers' beliefs and the development of components of emotion understanding in preschool children. *The purpose* of our study was to identify the influence of preschool teachers' beliefs about the age when children start to

Russian Psychological Journal, 2021, Vol. 18, No. 2, 53–66. **doi**: 10.21702/rpj.2021.2.4

understand certain aspects of emotions on the efficacy of emotion understanding in 5–6-year-old children. *The first objective* was to determine the accuracy with which teachers estimated the abilities of 5–6-year-old children to understand emotions. *The second objective* was to study the differences in the efficacy of emotion understanding by 5–6-year-olds in groups where, according to the teachers, children either could or could not understand emotion components.

We formulated several *hypotheses*. First, we assumed that in general, preschool teachers were fairly accurate in determining the age when emotion understanding becomes available to children. Secondly, we expected that there were differences in the development of children's emotion understanding, depending on teachers' beliefs that 5–6-year-old children could understand emotions. Moreover, we assumed that in groups where teachers believed that children could understand emotion components, children would be more successful in completing the Test of Emotion Comprehension compared to children whose teachers thought they were not ready yet.

Methods

Sample

The study involved 324 children of late preschool age (M = 62.57 months, SD = 3.8). By the start of the study, all children have been attending kindergarten groups in Moscow (N = 16) for an average of 2–3 years. For the entire period, principal preschool teachers in these groups did not change and spent at least 35 hours a week with the children. All the teachers (N = 16) were women with higher professional education in the field of preschool pedagogy, aged from 27 to 61 years old (M = 44.68 years old, SD = 9.08 years old), with 6–38 years of work experience. The procedures for examination and obtaining participants' consent were approved by the Ethics Committee of the Faculty of Psychology at Lomonosov Moscow State University (statement No. 2020/61).

The children passed an individual assessment of emotion understanding using the Russian version of the Test of Emotion Comprehension (TEC) (Pons & Harris, 2000). This test assessed nine different components of emotion understanding: (a) recognizing emotions by facial expressions ('emotion recognition'); (b) understanding the external causes of emotions ('external causes'); (c) understanding the influence of desires ('desires') on emotional experiences; (d) understanding the influence of beliefs ('beliefs') on emotional experiences, (e) understanding the influence of memories ('reminder') on emotional experiences; (f) understanding the discrepancy between real and expressed emotions ('hiding emotions'); (g) strategies for regulating emotions ('regulation'); (h) understanding mixed or ambivalent emotions ('mixed emotions') and (i) moral emotions ('morality'). For each of the nine components, the scores were in the range from 0 to 1. Earlier, the Russian version of the TEC was successfully adapted on a Russian sample of children aged 5–6 and 6–7 years old (Veraksa, Veraksa, Gavrilova, Bukhalenkova, & Tarasova, 2021). A structured interview was conducted to obtain information on preschool teachers' beliefs about the age when, in their opinion, certain aspects of emotion understanding became available to children. The interviews were conducted on an individual basis with teachers from 16 kindergarten groups and contained questions about the same nine components of emotion understanding, described in the Test of Emotion Comprehension.

Teachers were asked questions about the age when children begin to understand emotions in terms of each component: *emotion recognition, external causes, desires, beliefs, reminder, hiding*

Russian Psychological Journal, 2021, Vol. 18, No. 2, 53–66. **doi**: 10.21702/rpj.2021.2.4

emotions, regulation, mixed emotions, and morality. The questions were the following: "At what age do children begin to understand: (a) emotions based on facial expressions; (b) that external circumstances may impact emotions; (c) that two people in the same situation can experience different emotions because they have different desires; (d) that an individuals' beliefs may impact his/her emotional response to a situation; (e) that memories may influence emotional experiences; (f) that emotions can be regulated using psychological strategies; (g) that there is a discrepancy between real and expressed emotions; (h) that people can have conflicting emotional reactions to a situation; (i) that morally unacceptable behavior can evoke negative emotions, whereas approved behavior – positive ones?"

Analysis of the data obtained enabled us to determine the accuracy of preschool teachers' estimation of the age when nine components of emotion understanding become available to children, relative to the periodization established by F. Pons. After that, the teachers' answers were binary encoded (yes/no) in accordance with the fact whether the teacher thought that 5–6-year-old children (age of the studied sample) could/could not understand each of the nine emotion components from the Test of Emotion Comprehension. '0' referred to that emotion components were not yet available for children's understanding, '1' referred to that, according to the teachers, 5–6-year-olds could understand these components. Cohen's kappa coefficient was used to measure the degree of agreement between teachers' beliefs about children's emotion understanding and children's results of completing the Test of Emotion Comprehension in terms of these components. Next, ANOVA Welch's statistic was applied to analyze the differences in the assessments of children's TEC results, depending on whether their teachers considered them ready/not ready for understanding each of the nine components. We used ANOVA Welch's test, since we took into account covariance and unequal sample sizes. Data analysis was performed in SPSS v. 26 software.

Results

As a result of statistical analysis, we observed that preschool teachers accurately estimated the age when children developed understanding of such components as Recognition, Desire, Hiding, and Mixed. Next, we identified the differences between preschool teachers' estimates of five components of emotion understanding and corresponding children's scores according to the Test of Emotion Comprehension (Table 1). The use of Cohen's kappa revealed a weak agreement between teachers' estimates of children's ability to understand the aspects of emotions and children's performance in terms of such components as Belief ($k = –0.33$, $p = 0.012$), Mixed ($k = –0.181$, $p = 0.001$), and Morality ($k = –0.143$, $p = 0.008$). That means that teachers' estimation of 5–6-year-old children's understanding of emotion components is inversely associated with their performance on completing the Test of Emotion Comprehension.

At the next stage, one-way ANOVA Welch's was used to analyze the differences between the results of children's emotion understanding, depending on whether a preschool teacher believed that 5–6-year-old children from her group could understand each of the nine emotion components or not. Significant differences were observed in children's results in terms of three components of emotion understanding: 'beliefs' ($F = 7.2$, $p = 0.008$), 'mixed emotions' ($F = 15.7$, $p < 0.001$), and 'morality' ($F = 7.30$, $p < 0.007$) (see Table 2).

Russian Psychological Journal, 2021, Vol. 18, No. 2, 53–66. **doi**: 10.21702/rpj.2021.2.4

Table 1

Preschool teachers' estimates of children's ability to understand emotion components (in %) and efficacy of children's emotion understanding (in %) (Cohen's Kappa, n = 324)

TEC components	Preschool teachers		Children			
	Children already understand the component	Children do not yet understand the component	Correct answer	Incorrect answer	Cohen, *k*	*P*
Recognition	100	0	97	3	–	–
External causes	95	5	74	26	0.014	0.713
Desires	70	30	68	32	–0.16	0.768
Beliefs	65	35	77	23	–0.133	0.012*
Reminder	85	15	52	48	0.064	0.115
Hiding	46	54	48	52	0.89	0.105
Regulation	55	45	63	37	0.21	0.701
Mixed	24	76	26	74	–0.181	0.001**
Morality	64	36	51	49	–0.143	0.008**

Note: children already understand or do not yet understand the component – teachers' belief about whether a certain component of emotion understanding is available to 5–6-year-old children; correct or incorrect answer – child's results of completing the test; * $p < 0.05$, ** $p < 0.01$.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 53–66. **doi**: 10.21702/rpj.2021.2.4

Table 2

Mean values and standard deviations depending on teachers' beliefs about 5–6-year-old children's understanding of emotion components (one-way ANOVA, n = 324)

TEC components	Children understand the component	Children do not understand the component	One-Way ANOVA Welch's		
	M (SD)	M (SD)	F	df1(df2)	p
Recognition	0.96 (0.17)	–	–	–	–
External causes	0.75 (0.43)	0.71 (0.47)	0.11	1(17.6)	0.735
Desires	0.67 (0.47)	0.69 (0.46)	0.09	1(183)	0.786
Beliefs	0.73 (0.44)	0.85 (0.35)	7.23	1(277)	0.008**
Reminder	0.54 (0.49)	0.42 (0.49)	2.50	1(64.5)	0.119
Hiding	0.67 (0.47)	0.59 (0.49)	0.15	1(314)	0.702
Regulation	0.49 (0.50)	0.47 (0.50)	2.61	1(305)	0.107
Mixed	0.12 (0.32)	0.30 (0.46)	15.7	1(180)	0.001***
Morality	0.46 (0.49)	0.61(0.49)	7.30	1(248)	0.007**

*Note: ** $p < 0.01$, *** $p < 0.001$.*

Thus, children from the groups where teachers consider that 5–6-year-old preschoolers are not ready to understand the influence of beliefs perform significantly better on the task, aimed at assessing this indicator in the Test of Emotion Comprehension, compared to children whose teachers assume that this aspect of emotion understanding is already available to children at this age (M = 0.851 and M = 0.73, respectively) (Fig. 1a). Children whose teachers consider that they are not ready to understand mixed emotions perform significantly better on the task, aimed at

Russian Psychological Journal, 2021, Vol. 18, No. 2, 53–66. **doi**: 10.21702/rpj.2021.2.4

assessing the 'mixed' component (Test of Emotion Comprehension), compared to children whose teachers assume that this aspect of emotion understanding is already available to children at this age (M = 0.304 and M = 0.12, respectively) (Fig. 1b). Children whose teachers consider that they are not ready to understand that moral rules can affect emotions perform significantly better on the task, aimed at assessing the indicator 'morality' (Test of Emotion Comprehension), compared to children whose teachers assume that this aspect of emotion understanding is already available to children at this age (M = 0.61 and M = 0.461, respectively) (Fig. 1c).

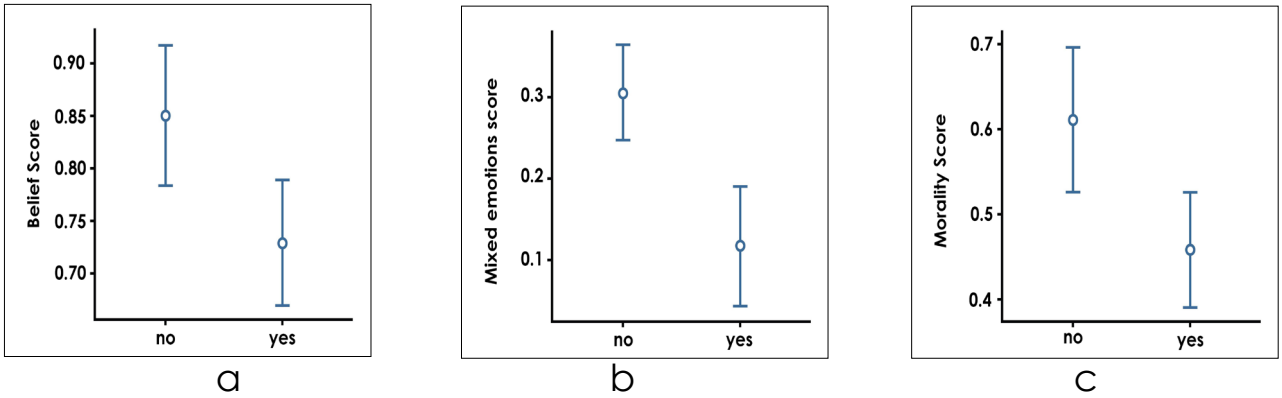

Figure 1. Mean values for the components: (a) beliefs; (b) mixed; and (c) morality in children depending on their teachers' beliefs about emotion understanding in 5–6-year-olds (yes and no, respectively)

Discussion

This study examined preschool teachers' beliefs about age-related specific characteristics of emotion understanding in children and possible effect of these beliefs on the development of children's emotion comprehension. We formulated the main objectives of our research: (a) to determine the accuracy with which preschool teachers estimate the abilities of 5–6-year-olds to understand emotions; (b) to analyze the differences in the efficacy of children's emotion understanding in groups where, according to their teachers, children either could or could not understand certain emotions.

The analysis of data obtained in the interviews with preschool teachers showed that they were sure that 5–6-year-olds could recognize emotions based on facial expressions, understand their external causes and that desires can influence emotions. At the same time, teachers believed that 5–6-year-olds could understand the influence of moral rules on emotions (morality). However, according to diagnostic results, this aspect of emotions was not yet available to 5–6-year-old children. This result differs from the data obtained earlier in the study by Kårstad, Kvello, Wichstrøm, & Berg-Nielsen (2014) when authors examined how accurately parents estimated the age when children start to understand certain emotion components. As opposed to preschool teachers, parents overestimated children's ability to understand external causes of emotions, as well as their ability to understand that emotions can be regulated using psychological strategies or the fact that emotions can be mixed. Therefore, preschool teachers' beliefs about children's ability to understand emotions are less generalized; they indicate gradually increasing difficulty to master

Russian Psychological Journal, 2021, Vol. 18, No. 2, 53–66. **doi**: 10.21702/rpj.2021.2.4

components of emotion understanding. This temporal distribution of the ability to understand emotions can be correlated with the assumption in the context of F. Pons's theoretical position about the development of emotion understanding in children (Pons & Harris, 2000). The model suggested by F. Pons describes step-by-step improvement of children's understanding of various emotion aspects – from the ability to recognize external signs of emotions to the skill of emotion regulation, from understanding external causes of emotions to understanding mixed and hidden emotions. We can assume that when preschool teachers assess children's abilities to understand emotions, they rely on their beliefs about the complexity of intellectual and emotional development, which increases, as children grow older. This assumption requires further empirical testing, aimed at assessing how a preschool teacher organizes his/her work relating to children's emotional development. Hence, our study partially confirms the hypothesis that preschool teachers accurately determine the age when children start to understand certain emotion components.

We found that if preschool teachers believe that 5–6-year-old children do not understand that emotions may be related to beliefs and moral meanings of their actions and that emotions may be mixed, children from their groups demonstrate higher scores in these aspects of emotion understanding. By contrast, we assumed that the best results in emotion comprehension would be demonstrated by children whose teachers considered them capable of understanding certain emotion components. A possible explanation of these results is that preschool teachers who believe that 5–6-year-old kindergarten children are not yet capable of understanding certain emotion components will be likely to pay more attention to the situation when such emotions arise, and they will try to explain and discuss the causes of these emotions with children. On the other hand, in groups where the teacher thinks that children can already understand certain emotion components, the situations where the teacher pays attention to such training will occur less often. This assumption is based on the principle of creating the zone of proximal development (Vygotsky, 1984), according to which mental – in particular, emotional – development is to a great extent associated with environment conditions that an adult establishes when communicating with a child. Thus, we can assume that preschool teachers who wish to help children understand emotions enrich children's ZPD.

The limitations of this study include, primarily, a small number of groups involved. Secondly, in the interviews we asked preschool teachers to assess whether 5–6-year-old children could understand certain aspects of emotions, whereas it would clearly be more accurate to ask them about individual development of every child. However, due to high workload of preschool teachers, the collection of individual data was not possible under present conditions. Thirdly, the results could be affected by individual characteristics of teachers that were not taken into account in the study – e.g., personal traits, emotional vocabulary, emotional expressiveness of teachers, their own skills of emotion understanding.

A promising direction for future research is a more detailed study on the specific characteristics of children's emotional socialization in the kindergarten by means of observing their everyday behavior in groups and considering factors associated with individual characteristics and behavior of preschool teachers. In the future, we also plan to analyze a relationship between teachers' beliefs about emotion understanding in preschoolers and results of observations how teachers support development of emotion components in children.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 53–66. **doi**: 10.21702/rpj.2021.2.4

Conclusion

The study shows that preschool teachers accurately determine age-specific abilities of 5–6-year-old children to understand emotions. However, we identified components of emotion understanding, in terms of which teachers' beliefs contradicted the results of children's performance on the Test of Emotion Comprehension. According to the data obtained, preschool teachers think that 5–6-year-old children do not yet understand that an individual's beliefs can affect his/her emotional reaction, an individual may experience mixed emotions, or that negative emotions may be caused by an individual's moral appraisal of his/her own actions. During the study, we identified the differences in children's development of the components of emotion understanding, depending on teachers' beliefs about children's ability to understand certain emotions. In the groups where teachers assume that 5–6-year-old preschoolers are not yet capable of understanding that moral rules affect emotions, children successfully demonstrate their understanding of these emotion components by completing the Test of Emotion Comprehension. Probably, teachers focus a lot on the development of these emotion components and create the relevant conditions for the zone of proximal development. The study results may be readily used to make recommendations for kindergarten teachers on the development of emotion understanding in preschool age.

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D. A. Bukhalenkova supervised the study and edited the manuscript.
M. S. Aslanova performed data analysis.
Z. V. Airapetyan prepared the original draft of the manuscript.
M. N. Gavrilova developed the concept, selected diagnostic tools, carried out analysis and editing, and prepared the figures.

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Scientific review

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Psychogenetics of Human Spatial Abilities

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Abstract

Introduction. This scientific review aims to understand the etiology of human spatial abilities. Spatial thinking is a complex combination of cognitive abilities related to recognizing, transforming, and storing information about objects and predicting the transformation of interactions among them under the influence of other factors. In this work we tend to provide the most complete description of spatial abilities as a specific type of mental activity that underlies practical and theoretical problem-solving in the framework of psychology and genetics to emphasize the importance of synthesizing the experimental data and psychological foundations of spatial intelligence.

Theoretical Basis. This review presents the results of genetically informative studies of human spatial abilities. Since the ability to orientate in space is an integral characteristic of all living organisms, spatial abilities are of evolutionary and adaptive importance. In cognitive psychology, spatial skills are understood as the ability to operate with mental spatial images, schemes, and models of reality. Moreover, these abilities vary widely among individuals. The analysis of the etiology of these individual differences showed a significant contribution (69 %) of hereditary factors in the formation of spatial abilities. The results of twin studies indicate the need for searching specific polymorphic variants in genes involved in the development of spatial skills. Large-scale longitudinal studies have shown that spatial abilities are a reliable predictor of individuals' achievements in science, technology, engineering, and mathematics (STEM). Therefore, studying their molecular-genetic mechanisms merits special attention.

Results and Discussion. Various experimental studies on the psychogenetics of human spatial abilities first reported very interesting findings confirming their hereditary nature. Thus, spatial intelligence is a moderately heritable trait, which development involves a wide range of genetic

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

factors causing the activation of various signaling pathways of the metabolism of the human organism.

Keywords
intelligence, spatial abilities, behavioral genetics, cognitive traits, gene, polymorphic variant, individual differences, predictor, correlation, heritability

Highlights
▸ Spatial abilities represent a complex combination of cognitive components that ensure the integrity of the intellectual development of an individual.
▸ Spatial abilities are of evolutionary and adaptive importance for all individuals, as they provide a more productive interaction with the environment.
▸ Spatial intelligence is a moderately heritable cognitive trait (30–50 %). Various genetic factors contribute to 69 % of individual differences in spatial abilities.
▸ Spatial thinking is an effective predictor of individuals' academic success in advanced scientific areas – STEM disciplines (Science, Technology, Engineering, and Mathematics).

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Introduction
Large-scale longitudinal studies involving both normative and gifted samples have shown that spatial ability is a reliable predictor of success in STEM disciplines (Super & Bachrach, 1957; Shea, Lubinski, & Benbow, 2001; Webb, Lubinski, & Benbow, 2007; Wai, Lubinski, & Benbow, 2009; Lubinski, 2016). It is not surprising that the study of these abilities has recently gained considerable attention of researchers in the field of cognitive psychology. Spatial abilities are of evolutionary and adaptive importance because any living organism must be able to navigate in its surrounding environment to survive (Newcombe & Frick, 2010).

Spatial abilities represent a combination of several cognitive components, including *spatial visualization* (complex multi-stage manipulations of spatial information), *mental rotation* (mentally rotating spatial forms), *spatial relationships* (perception of relationships among objects), *closing speed* (understanding a spatial form in the presence of distracting content, e.g., integration of visual stimuli into a meaningful whole), *flexibility of closure* (search for a visual field to find a specific spatial form), and also *spatial scanning, motion detection, mechanical reasoning, length estimation, directional thinking, spatial memory,* etc. (Carroll, 1993; Colom, Contreras, Shih, &

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

Santacreu, 2003; Uttal, Miller, & Newcombe, 2013; Weisberg, Schinazi, Newcombe, Shipley, & Epstein, 2014; Rimfeld et al., 2017).

In cognitive psychology, spatial intelligence is regarded as an important characteristic of the general intellectual development of an individual. Linear theories of multiple intelligences and their structural-hierarchical models pay special attention to the phenomenon of human spatial thinking (Ananyev & Rybalko, 1964).

Several studies have analyzed the impact of spatial abilities on individuals' mathematical skills (Snow, 1999; Stanley, 2000; Colangelo, Assouline, & Gross, 2004). Currently, global cognitive psychology recognizes the critical role of the development of spatial thinking as a predictor of an individual's academic success in advanced scientific areas – STEM disciplines (Science, Technology, Engineering, and Mathematics) (Lobanov, Radchikova, & Semenova, 2013; Wai et al., 2009; Khine, 2017). Results from large-scale studies of spatial abilities demonstrate that they play a key role in structuring educational and professional outcomes among both the general population and talented individuals (Shea et al., 2001; Webb et al., 2007; Wai et al., 2009).

Russian studies also recognize the role of spatial abilities in cognitive development of a child. Thus, it is noted that insufficient degree of spatial orientation affects school performance of students (Semago & Semago, 2005). Subsequent studies on the ability of students to operate with mental images showed that adolescence is a sensitive period for the development of spatial intelligence (Panfilov & Panfilova, 2015).

The results of the studies carried out by I. S. Yakimanskaya also provide evidence for the role of spatial intelligence in determining the success of academic training in natural sciences and mathematics, associated with graphic arts and engineering design activities (Yakimanskaya, 2008).

Theoretical Basis

The role of hereditary factors in the development of spatial abilities

The cognitive abilities vary in the degree of expression in the population. Despite the high heritability of these traits (30–80 %), the involvement of genetic factors in cognitive functioning remains poorly understood (Kovas, Haworth, Dale, & Plomin, 2007; Lee, Henry, Trollor, & Sachdev, 2010; Deary, 2012; Malykh et al., 2019). Perhaps the insufficient information content of the research data is explained by the fact that a high percentage of the contribution of hereditary factors to the development of traits is provided through a cumulative genetic effect. This makes it very difficult to obtain a more detailed picture of the processes of heritability of intellectual abilities. The discovery of the genes involved in the formation of a particular cognitive function is of particular interest (Deary, Johnson, & Houlihan, 2009; Knowles et al., 2014; Knowles, Viar-Paxton, Riemann, Jacobi, & Olatunji, 2016). Therefore, the identification of genetic markers associated with human mental health in combination with psychological aspects is one of the primary objectives of the interdisciplinary academic field – psychogenetics.

Today, there are only few genetically informative studies of human spatial abilities, which increases the degree of their relevance for researchers. The genetically informative studies of spatial abilities by using various diagnostic techniques, have shown that spatial intelligence is moderately heritable (30–50 %) (Kan, Wicherts, Dolan, & van der Maas, 2013; Knopik, Neiderhiser, De Fries, & Plomin, 2017).

Similar results were obtained in a large-scale twin study of spatial abilities (Shakeshaft et al., 2016; Rimfeld et al., 2017). The results of analysis showed that genetic factors explain 69 % of

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

individual differences in spatial abilities (Rimfeld et al., 2017). These same genetic factors partially coincide with genetic factors involved in the formation of individual differences in general intelligence (Rimfeld et al., 2017).

Another study showed that the presence of a moderate correlation between mathematical and spatial abilities is largely determined by the contribution of heredity. However, we should note that the analysis was carried out using a relatively small sample size (n = 278 pairs of twins) with a wide age range (6–12 years), which somewhat reduces its statistical power (Thompson, Detterman, & Plomin, 1991). Nevertheless, the stated hypothesis was confirmed in other works. Thus, the study of spatial skills in their correlation with mathematical abilities on the sample of 4174 pairs of 12-year-old twins showed that genetic factors explained ~60 % of the observed correlations between spatial and mathematical abilities, while a significant part of these correlations was characterized by environmental influences (Tosto et al., 2014). The results of another experimental study (involving 1250 pairs of twins and 413 twins without pairs at the age of 20) assessing spatial intelligence also demonstrated a significant contribution of hereditary factors (~56 %) to individual differences (Shakeshaft et al., 2016).

In addition, according to the literature, there is evidence of a partial genetic correlation between spatial abilities and general intelligence ("g") (Robinson et al., 2015). As a rule, general intelligence ("g") accounts for more than half of individual differences in cognitive abilities. However, there are also domain-specific areas responsible for the manifestation of various types of intellectual traits (Plomin & Spinath, 2002). This view is largely consistent with findings from cognitive neuroscience, which suggest that certain domains are associated with relatively different brain circuits (Lenartowicz, Kalar, Congdon, & Poldrack, 2010). The identification of genes involved in specific cognitive domains may be more effective than the search for genetic markers associated with the development of general intelligence, especially since the specifically focused approach is, in fact, multivariate and statistically more powerful than one-dimensional analysis of general neuropsychological tasks (Bearden & Freimer, 2006; van der Sluis, Verhage, Posthuma, & Dolan, 2010).

Thus, the results of twin studies offer a challenge for finding specific polymorphic variants in genes involved in the development of spatial abilities.

Results and Discussion

Molecular-genetic aspects of the mechanism of the development of human spatial abilities

The first results of molecular-genetic studies on spatial thinking were obtained in research projects devoted to studying the morphology/physiology of the human nervous system. The development of methods of biomedicine (GWAS – Genome-wide association studies), the analysis of transcryptome, exome, and proteome) has significantly improved the quality of analysis of endogenous correlates involved in the development and functioning of tissues and divisions of the central nervous system (CNS). These studies showed the impact of genetic factors on various kinds of complex neurological diseases and psychiatric disorders (temporal lobe epilepsy, vascular dementia, Alzheimer's disease, depressive pathologies, bipolar disorder, autism spectrum diseases, etc.) (Thompson et al., 2004; Kim et al., 2015; Hibar et al., 2016). However, along with work on the pathophysiology/pathogenetics of the central nervous system, research groups are currently interested in the study of normal brain functioning.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

Thus, several studies noted that the formation of the hippocampus, optimal synaptic plasticity in the cells of the cerebral cortex play an important role in the development and formation of spatial intelligence. The hippocampus is a part of the limbic system of the brain and hippocampal formation, involved in the development of mechanisms for memory consolidation, spatial navigation, and the manifestation of emotions. The navigation in the environment can be achieved by using either of two systems of memory, each with a different strategy (Hartley & Burgess, 2005). The 'spatial' strategy involves the establishment of associations among guiding lines in the environment to develop a cognitive map and is associated with increased gray matter and activity in the hippocampus. The 'response' strategy involves the analysis of stimulus-response relationships such as a series of turns from certain points in space. The response strategy is associated with increased gray matter levels and increased brain activity in the caudate nucleus of the striatum (Iaria, Petrides, Dagher, Pike, & Bohbot, 2003; Bohbot, Lerch, Thorndycraft, Iaria, & Zijdenbos, 2007). The studies showed that humans spontaneously use one of these two alternative navigation strategies with almost equal frequency to solve a navigation task. This choice correlates with activity of functional magnetic resonance imaging (fMRI) and density of gray matter (Banner, Bhat, Etchamendy, Joober, & Bohbot, 2011).

The study of structural changes of the gene of brain-derived neurotrophic factor (*BDNF*) has also demonstrated the importance of the hippocampal system in the formation of human spatial intelligence. The polymorphic variant *rs6265 (c.196G>A)*, which leads to the replacement of valine (Val) by methionine (Met) at codon 66 of the *BDNF* gene, causes a decrease in the level of secretion of the brain-derived neurotrophic factor involved in the survival and differentiation of nerve cells during their development (Bath & Lee, 2006). Subsequently, the low expression of BDNF protein can lead to the impairment of hippocampal-dependent cognitive functions, such as episodic and spatial memory and recognition. Individuals with one or two copies of the allele of Met have a decrease in fMRI of the hippocampus and gray matter, compared to individuals homozygous for Val (Hariri et al., 2003; Bueller et al., 2006). In addition, as discovered in further analysis by Banner et al., the polymorphic variant *rs6265* is associated with the choice of the spontaneous navigation strategy by an individual. Thus, Met carriers showed a reduced likelihood of using the hippocampus-dependent spatial strategy. The obtained data enable us to conclude that the *BDNF* gene can be considered as a candidate gene involved in the spontaneous strategy of navigation choice (Banner et al., 2011).

A subsequent study of genetic determinants and products that provide normal synaptic plasticity of cells of the limbic system of the brain and its basal nuclei of the hemispheres, coupled with the study of the above navigation paradigm of virtual reality in groups of young/elderly people, showed the presence of an association of the polymorphic variant *rs17070145* (*c.1185-3222C>T*) of the *KIBRA* gene with the degree of manifestation of spatial thinking in individuals, depending on age differences (Schuck et al., 2013; Piras et al., 2017). We should note that Piras et al. (2017) also analyzed the association of the polymorphic variant *rs17070145* of *KIBRA* with both an improvement in episodic memory in the elderly and a reduced risk of late-onset Alzheimer's disease. However, the mechanism of this protective effect is still not fully understood.

The study by Mueller et al. (2014) demonstrates the involvement of the gene of monoamine oxidase A (*MAOA*) localized at X chromosome in the development of spatial skills. The *MAOA* gene have a repeat of 30 bp in the promoter region (*MAOA-LPR*), which affected efficiency of transcription *in vitro*. Individuals with long alleles (3.5 repeats and 4 repeats) demonstrated

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

greater transcriptional activity than carriers of short alleles (3 repeats) (Sabol, Hu, & Hamer, 1998). According to the literature, the differences in the variable of number of tandem repeats of the *MAOA* gene are associated with the development of a variety of mental disorders, including anxiety, depression, and schizophrenia, due to cognitive impairments such as spatial learning and memory dysfunction (Dannlowski et al., 2009; Mueller et al., 2009). Neurobiological studies also support the involvement of MAOA protein in the normal functioning of spatial intelligence, but mainly by measuring the levels of MAOA enzyme activity in mice (Steckler et al., 2001).

A study carried out by S. C. Mueller and colleagues to assess the levels of transcription of the *MAOA* gene in the formation of spatial thinking in 69 adolescents, preferably males, showed that high activity of the enzyme monoamine oxidase A contributes to more effective spatial learning and better memory of an individual. It is noteworthy that after the identification of the gene of brain-derived neurotrophic factor (*BDNF*) as a possible marker of normal development and functioning of episodic memory and spatial navigation, the obtained data on the *MAOA* gene significantly expand the understanding of the mechanisms of deamination of neurotransmitters involved in the activity in the prefrontal cortex, such as dopamine, serotonin, and norepinephrine. Perhaps, BDNF can modulate spatial navigation through the hippocampus, whereas MAOA can modulate spatial navigation at the prefrontal level (Spiers, 2008). Presumably, the level of production of MAOA protein may indirectly influence spatial cognition by affecting the function of catecholamines in the prefrontal cortex/striatum. The higher transcription of the highly active *MAOA* gene in men provides greater production of the enzyme, followed by increased deamination of catecholamines and, in turn, faster clearance of neurotransmitters, which provides a faster turnover of available monoamines. This is consistent with the idea that individuals with a low-activity variant may have higher level of homovanillic acid, the main metabolite of catecholamines in the CNS, but exhibit poorer performance on executive tasks (Ducci et al., 2006). However, these results should be clarified at the behavioral level, given the conflicting evidence that individuals with the low level of expression of *MAOA* make better financial decisions and achieve higher educational attainment at a similar IQ and given the small sample size of respondents as well (Mueller et al., 2014).

In addition to the involvement of the limbic system of the brain, the functioning of spatial thinking, as it turned out, involves the parahippocampal regions, the transverse occipital sulcus, and the retrosplenial cortex (RSC) localized in the parietal-occipital sulcus, which cells process and store information about objects (Maguire, 2001; Grill-Spector, 2003; Dilks, Julian, Paunov, & Kanwisher, 2013). Neuroimaging studies showed that these areas of the brain respond more strongly when viewing navigation-relevant 'events' compared to responses to stimuli that are not related to navigation (e.g., objects), and play a key role in the development of human spatial skills (Aguirre, Zarahn, & D'Esposito, 1998; Epstein & Kanwisher, 1998; Nakamura et al., 2000; Hasson, Harel, Levy, & Malach, 2003; Epstein, 2008). The electrophysiological studies *in vivo* in the rats prove this fact, demonstrating that spatial learning enhances stimulation of the RSC cells (Smith, Barredo, & Mizumori, 2012). The study of architectonics of the retrosplenial cortex *in vivo* in mice by using two-photon imaging showed that spatial navigation in objects is largely determined by the optimal level of the expression of the *c-Fos* gene, mediated by the activation of the factor of *CREB* transcription (*cAMP-responsive element-binding protein*) (Czajkowski et al., 2014). The nature of this transcriptional response depends on the type and strength of stimulation of the nerve cells. The CREB-dependent expression of genes has been previously shown to

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

be involved in many different aspects of nervous system function, from embryonic development to neuronal survival, as well as synaptic, structural, and intrinsic plasticity (Barco & Marie, 2011; Barry & Commins, 2011).

The genetic factor *c-Fos* itself is a member of the *Fos* family (leucine zipper proteins, regulators of cell proliferation, differentiation, and transformation), belonging to the vast group of early response genes (*Immediate Early Genes, IEG*), which also includes the *Zif268* and *Arc* genes. All these immediate early response genes act as markers of the consolidation of the mechanisms of neural activity during the restoration of spatial memory. The consolidation of systems is a process involving the stabilization of memory traces in the neocortex over time. The medial prefrontal cortex becomes increasingly important over time in retrieving old memories, but the timing of its involvement is unclear, and little attention has been paid to the contribution of other areas of the neocortal brain to distant memory. Studies of the levels of Zif268, Arc, and c-Fos transcripts in the hippocampus, medial prefrontal and entorhinal, perirenal, retrosplenial and parietal cortex of the brain of Wistar rats during navigation in the Morris water maze showed that the systemic interaction of all the above factors provides normal cognitive function in animals (Barry, Coogan, & Commins, 2016).

Several studies assessing the expression of levels of Fos proteins in neurons demonstrate their interaction with SATB2 protein. SATB2 is a highly conserved nuclear protein that is expressed in embryonic brain cells – namely, in the superficial cortical layers – and determines the identity of the corpus callosum and subcortical projection neurons (FitzPatrick et al., 2003). During the ontogenesis of the CNS, the expression of SATB2 protein shifts towards the deep cortical layers, and, ultimately, the most significant levels of SATB2 production in the adult brain are observed in the pyramidal cells of the brain and in the *CA1* region of the hippocampus, which indicates its involvement in cognition (Huang et al., 2013). Patients with defects in the gene *SATB2* usually suffer from moderate to severe mental retardation, but the mechanism of intellectual disability in individuals remains understudied. However, in the study by Li et al. with the use of model animals showed that in heterozygous mice and mice with *SATB2* conditional KO (*SATB2 cKO*) spatial and working memory were considerably disrupted. The low expression of immediate early genes (IEG), including *Fos, FosB,* and *Egr1*, was also noted, especially in animals with a deleted gene. In addition, it was found that the product of the *SATB2* gene can regulate the expression of FosB protein by directly binding to its promoter. Thus, we may conclude that *SATB2* plays an important role in the development of spatial/working memory mechanisms, regulating the indirect activation of IEG and synaptic plasticity of the hippocampus (Li et al., 2017; Cera et al., 2019).

Other experimental studies on the analysis of spatial navigation in animals described the importance of polymorphic variants of the *S100B* gene located on chromosome 21 and encoding a protein of member family of the S100 Ca^{2+} – binding signal proteins which are actively produced in cells of the immune system, astrocytes, Schwann cells, melanocytes, chondrocytes, and adipocytes (Donato et al., 2009; Donato et al., 2013). It was noted that increased levels of expression of S100B in mouse cells contributed to the deterioration of the mechanisms of orientation in rodents and their behavior in general, by reducing post-tetanic excitatory postsynaptic potentials in the hippocampus and impairing spatial learning. This may be explained by the fact that S100B protein secreted by astrocytes has different (trophic, toxic) effects on neurons and microglia, which depends on the level of production (Van Eldik & Wainwright, 2003; Donato et al., 2009; Sorci et al., 2010). Moreover, several studies emphasize that transgenic mice at S100B exhibit an

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

increased susceptibility to perinatal hypoxia-ischemia, and overexpression of S100B accelerates pathology similar to Alzheimer's disease, with increased astrogliosis and microgliosis (Wainwright et al., 2004; Mori et al., 2010). In contrast, S100B knockout mice show enhanced spatial skills, fear stimulus memorization, and increased long-term potentiation in the CA1 region of the hippocampus (Nishiyama, Knöpfel, Endo, & Itohara, 2002). This indicates that the extracellular expression of S100B protein may be a regulator of synaptic plasticity, although the mechanism underlying this activity is not yet clear (Donato et al., 2013).

Subsequent molecular-genetic analysis of *S100B* gene in a cohort of respondents from China and an assessment of the levels of expression of its product in human post-mortal brain tissue showed an association of polymorphic variants *rs3788266* and *rs11542311* with the development of spatial intelligence in an individual, and also indicated that the degree of production of S100B protein does not correlate only with pathological conditions of the brain, but also with its normal functioning in healthy individuals, ensuring the stability of neuronal plasticity and conduction (Epstein & Vass, 2014; Kong, Song, Zhen, & Liu, 2017). Previously, it was found that *rs3788266* is a marker of the risk for bipolar affective disorder, and *rs11542311* is a marker of the risk for schizophrenia (Liu et al., 2005; Roche et al., 2007). Additionally, it was noted that overexpression of S100B in blood serum negatively influenced the course of these types of neurological diseases (Andreazza et al., 2007; Schroeter & Steiner, 2009).

There is evidence that the product of the *DCDC2* gene, a member of the doublecortin family (*DCX*), can also be involved in the mechanism of the development of the spatial type of thinking (Wang et al., 2011). The *DCX* gene is required for normal neuronal migration in the cerebral cortex. To date, structural abnormalities in DCX have been found to cause abnormal neuronal migration, leading to the development of human pathologies – lissencephaly and double cortex syndrome (Gleeson, Lin, Flanagan, & Walsh, 1999). Regarding the impact of the product of the *DCDC2* gene on the development of cognitive abilities, the functions of protein DCDC2 were first described in studies on dyslexia in children, a reading disorder characterized by retardation in academic performance and everyday life (American Psychiatric Association, 1999; Gabel, Gibson, Gruen, & LoTurco, 2010).

In the context of studying the etiology of speech retardation, several theories have been put forward considering the reasons for this defect, including impaired visual perception of objects, spatial orientation in the text among them, and attention mechanisms in general (Hari & Renvall, 2001; Smith-Spark & Fisk, 2007; Ruffino et al., 2010; Vidyasagar & Pammer, 2010). Assessment of visual attention, visuospatial learning and memory in *DCDC2* knock-out mice showed that deletion of the gene impairs the visual perception of an object and reduces task performance in visuospatial learning and memorization, while not affecting the learning ability of the animal. We should note that mice with genotypes $dcdc2^{wt\,/\,del2}$, $dcdc2^{del2\,/\,del2}$ lost the ability to retain visual information for a long period of time, which considerably impaired the Hebb–Williams maze performance. The constant deficit in task performance (average speed and accuracy) made it possible to conclude that mice are not able to improve their performance over time due to the knockout of *DCDC2* (Gabel et al., 2011).

Experimental studies on the genetics of human spatial skills have expanded the range of analysis of neurogenetic factors involved in the development of cognitive processes, and, as a result, identified several other organ systems. The cerebellum is known to control movement coordination, fine motor skills, and motor learning. However, there is growing evidence for its contribution to

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

cognitive and motivational processes in the central nervous system (Ito, 2006). Dysfunction of the cerebellum is associated not only with motor conditions, but also with disorders such as autism spectrum disorders, attention deficit hyperactivity disorder (ADHD), and the fragile X syndrome, phenotypes ranging from motor to higher brain functions (including cognitive processes and social behavior) (Rogers et al., 2013; Wang, Kloth, & Badura, 2014). In most studies the analysis of the malfunction of cerebellar cells and neural development focused on the Purkinje cells. However, in the present, the study of Golgi cells is currently of great interest, because inhibitory GABAergic/glyceric interneurons in the cerebellar cortex may mediate a number of signalings of granular cell with subsequent innervation of Purkinje fiber (Kalmbach, Voicu, Ohyama, & Mauk, 2011; Rössert, Dean, & Porrill, 2015).

Tantra et al. (2018) suggested that the expression of the *CDH13* gene in Golgi cells affects the motor/cognitive behavior of mice. The *CDH13* gene *(16q23.3)* encodes atypical cadherin lacking transmembrane and cytoplasmic domains, attached to the cell membrane via a glycosylphosphatidylinositol anchor that regulates cell migration and neurite outgrowth (Ranscht & Dours-Zimmermann, 1991). Many members of the cadherin superfamily are produced in the nervous system with various spatial and temporal expression patterns and are associated with neurological disorders. The results of GWAS, exome sequencing, indicate the presence of association of polymorphic variants of *CDH13* with the development of ADHD, dependence on the use of psychotropic drugs, depression, aggressive behavior, bipolar disorder, autism, and schizophrenia (Treutlein et al., 2009; Terracciano et al., 2010; Lionel et al., 2011; Sanders et al., 2015). In addition, a number of polymorphic variants of the *CDH13* gene have shown associations with the cognitive skills – namely, with working memory in patients with ADHD (Arias-Vasquez et al., 2011). Both excitatory and inhibitory synaptic functions in the hippocampus depend on the expression of CDH13, and its complete deletion leads to impairments of spatial learning and conditional place preference. In addition to synaptic formation, CDH13 controls neuronal migration and axon specificity targeting the developing cortex of the brain and spinal cord (Redies, Hertel, & Hübner, 2012; Rivero et al., 2015). Tantra et al. found that mice with deleted of the *CDH13* gene show reduced cognitive flexibility and loss of preference for contacts, which is accompanied by increased reciprocal social interactions. At the behavioral level, the loss of function of *CDH13* in the cerebellum, piriform cortex, and endopyriform claustrum does not affect overall locomotor coordination, but leads to a deficit in the animal's cognitive and social abilities (Tantra et al., 2018).

Subsequent literature data also demonstrate an important role of the gene of cadherin 13 in the regulation of social behavior, learning mechanisms, and visual-spatial memory in animals. The obtained results are very useful, since they are of fundamental importance in the study of cognitive function in violation of the development of the nervous system (Forero et al., 2020).

Subsequently, the GWAS were carried out to identify genetic factors involved in the genesis of the human nervous system, optimal synaptic plasticity, survival, neuronal proliferation, which revealed several additional genes: *CADM2; SLC4A10; DPP450; DPP4; AKAP6; APOE/TOMM40; NPAS3; FNBP1L* involved in the development of intelligence (Thomas, Akins, & Biederer, 2008; Davies et al., 2011; Davies et al., 2015; Davies et al., 2016; Davies et al., 2018). It is noteworthy that certain of the above genetic factors are involved in the genesis of human spatial thinking (visualization of objects, analysis of relationship among them, etc.).

Thus, researchers have emphasized the impact of the polymorphic variant *rs17518584* of the *CADM2* gene on the speed of information processing in groups of individuals of various

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

ages (Ibrahim et al., 2018). The *CADM2* gene encodes a protein of the SynCAM group, molecules of adhesion of synaptic cells, also known as nectin-like molecules (*NECL*) or molecules of cell adhesion (*CADM*), which represent a subgroup of the immunoglobulin superfamily (*IgSF-CAM*) (Biederer et al., 2002). Publications devoted to the analysis of the functional activity of the *CADM2* gene demonstrate that its polymorphic variants and mutations are associated with the formation of human intellectual and behavioral traits, development of metabolic mechanisms, physical activity, obesity, the level of the consumption of alcohol and cannabinoid derivatives (Davies et al., 2016; Amare, Schubert, Klingler-Hoffmann, Cohen-Woods, & Baune, 2017; Clarke et al., 2017; Ouakinin, Barreira, & Gois, 2018). In particular, *CADM2*-knockout mice have a reduced degree of obesity, significantly low systemic glucose levels, hypersensitivity to insulin, and increased motor activity, which indicates an important role of CADM2 protein in the energy homeostasis (Yan et al., 2018). The analysis of endogenous factors involved in the development of physical activity in a group of subjects from the United States aged 45–64 years showed the presence of associations of polymorphic variants of *CADM2* with this trait (Klimentidis et al., 2018).

In addition, as previously reported, molecules of cell adhesion (CADM) are involved in the regulation of synaptic plasticity in relation to spatial learning of the object (Robbins et al., 2010). In psychogenetics, some works are mentioned that assess the levels of expression of the product of the *CADM2* gene in the onset and formation of attention deficit/hyperactivity disorder and various types of mental disorders (neuroticism, bipolar disorder, mood instability, depression, and risky behavior) in correlation with metabolic syndrome, due to the use of psychotropic drugs (Morris et al., 2019).

The functional importance of the region of *APOE/TOMM40* genes in cognitive genomics was originally studied in patients with Alzheimer's disease. Later, it was shown that the region of *APOE/TOMM40* is closely associated with general cognitive function in middle-aged and elderly people (Davies et al., 2015). It is well known that apolipoprotein E is a genetic marker for sporadic forms of late-onset Alzheimer's disease. The type of the inherited allele may determine the time of disease onset, the severity of its course, and the degree of decline in cognitive function (Caselli et al., 2009). Recent studies have shown that the *poly-T* of polymorphic variant *rs10524523* (*'523'*) of the *TOMM40* gene can accelerate the course of Alzheimer's pathology. A functional analysis of the genetic factors *APOE* and *TOMM40* showed that multiple cis-regulatory elements of *APOE* affect the activity of both the promoter of apolipoprotein E itself and translocase 40. The study of *rs10524523* in individuals with homozygous apolipoprotein E genotype *ε3/ε3* with amnestic mild cognitive impairments, which are considered the most common and 'neutral' in relation to the progression of the disease, showed the presence of an association of *'523'* with a deterioration in allocentric spatial navigation and a decrease in cortical thickness in certain brain areas in elderly subjects (Laczó et al., 2015). The data of brain pathology of individuals with APOE *ε3/ε3* indicate that *'523'* long allele (poly-T repeats ≥ 20) may increase the burden of disease (Yu et al., 2017).

Luoma & Berry (2018) presented interesting data on the analysis of the function of *NPAS3* (*Neuronal PAS (period-ARNT-single minded) domain containing 3*) in model animals. The authors have demonstrated that the loss of the function of this gene in the cells of mice leads to a change in behavioral responses due to dysfunction of the hippocampus and a deterioration in task performance. It was previously established that *NPAS3* encodes a transcription factor, which is mainly involved in the regulation of the mechanisms of ontogenesis of the nervous system, since it activates the processes of cell proliferation and apoptosis (Kamnasaran, Muir, Ferguson-Smith, &

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

Cox, 2003; Pickard, Malloy, Porteous, Blackwood, & Muir, 2005). Interestingly, *NPAS3* has been originally identified as a candidate gene in patients with bipolar disorder and schizophrenia from Scotland (Piccione et al., 2012; Erbel-Sieler et al., 2004).

Several experimental studies demonstrate the involvement of nicotinamide mononucleotide adenylyltransferase 2 (*NMNAT2*) in the mechanisms of the development of intelligence and spatial abilities in human. The NMNAT2 is a key factor in maintaining stability and neuronal activity and in protecting the nervous system from stressful influences, which has been demonstrated in numerous preclinical models of neurological disorders. NMNAT2 protein itself is a member of the family of enzymes of nicotinamide mononucleotide adenylyltransferases (NMNAT), which synthesize nicotinamideadeninedinucleotide (NAD), an important cofactor of many cellular processes, as well as acting as chaperones (D'Angelo et al., 2000; Ali, Li-Kroeger, Bellen, Zhai, & Lu, 2013). Thus, it was found that in humans the levels of the transcript of NMNAT2 positively correlate with the cognitive function of the brain, while low expression of nicotinamide mononucleotide adenylyltransferase 2 is noted in Alzheimer's, Huntington's, and Parkinson's diseases (Lin & Koleske, 2010; Ali et al., 2016).

In pharmacogenetics, several studies examine the stabilization of multiple clusters of cell signalings with the participation of the gene of nicotinamide mononucleotide adenylyltransferase 2 (*NMNAT2*) with using chemical modulators at certain concentrations (ziprasidone, cantharidin, wortmannin, retinoic acid, and caffeine), which have different effects on the viability of the cortical layers of the brain in a mouse model of tauopathy. These associations suggest that the levels of NMNAT2 protein can be regulated by an increase in cAMP or by a mechanism of excitatory neurotransmission. As a result, caffeine compounds had a beneficial effect on the production of NMNAT2 enzyme. Here with, systemic injection of caffeine restored expression of NMNAT2 to control levels in a mouse model of tauopaty (Ali, Bradley, & Lu, 2017). Previously, Laurent et al. (2014) showed that chronic caffeine treatment in a mouse model of tauopaty reduces hyperphosphorylation of Tau protein (Tubulin binding protein) and improves memory function. While ziprasidone, cantharidin, wortmannin, and retinoic acid reduce the synaptic conductivity of neurons by decreasing their survival. Interestingly, the use of these negative modulators in therapy with vincristine further reduces nerve cell viability by dramatically decreasing the expression of NMNAT2 (Ali et al., 2017). These experimental studies have prognostic value in health care, as they make it possible to assess the therapeutic effect of various chemicals on cognitive skills in defects in the functioning of the nervous system and to consider them in health and disease.

An associative study assessing psychiatric and cognitive characteristics associated with a hereditary component carried out by Bi et al. (2017) demonstrated the association of the polymorphic variant *rs10494561* of *NMNAT2* with manifestations of the severity of an individual's professional functioning as a prodrome of psychosis. The same work also assessed the association of genetic factor *IFT122*, encodes intraflagellar transport 122 protein which is important for the formation of a neuronal pattern, with spatial abilities. Namely, the association of the polymorphic variant *rs2285351* of *IFT122* with the formation of such a cognitive skill as orientation in space. Interestingly, structural impairments in the *IFT122* gene contribute to the emergence of a rare hereditary disease – cranioectodermal dysplasia (Walczak-Sztulpa et al., 2010; Bi et al., 2017). The GWAS analysis of cognitive functions in 7600 middle-aged and elderly Hispanic Americans (≥ 45 years) similarly confirmed the possible involvement of protein IFT122 in the normal function of cognition (Jian et al., 2020).

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

The identification of genetic determinants associated with the development of intellectual and spatial abilities made it possible to discover other possible participants in the cognition process: *SIRT1, CNTNAP2, FOXP2, ZNF711, KIAA0319,* and *DYX1C1*. All the above genetic factors are involved in the mechanisms of nerve cell migration, ensuring the growth of axons and neurites (Michán et al., 2010; Mascheretti et al., 2017; van der Werf et al., 2017). Animal studies have shown that RNA-interference of the expression of patterns of these genes *in utero* is associated with deficits in spatial memory, learning ability, impaired visual discrimination, visual and auditory information processing, and long-term memory (Kurt, Fisher, & Ehret, 2012; Centanni et al., 2014; Rodenas-Cuadrado, Ho, & Vernes, 2014; Rendall, Tarkar, Contreras-Mora, LoTurco, & Fitch, 2017).

In neurogenetics, researchers pay attention to the change in the internal parameters of an individual depending on the lifestyle and nutrition. For example, Bahrami et al. assessed the impact of the dosage degree of vitamin D on intelligence in adolescents and investigated associations of polymorphic variant *rs10766197* of the *CYP2R1* gene with the effectiveness of high doses of vitamin D3. The authors note that the dosage of cholecalciferol improves cognitive skills and varies greatly depending on the mental activity of the individual. The role of vitamin D derivatives, functional gene variants involved in signaling pathways of activation, has previously been characterized in correlation with the development of neurodegenerative diseases (Bahrami et al., 2019). In addition to the results described above, studies of the effects of vitamin D on normal spatial function have been reported in the literature. For example, Taghizadeh, Talaei, & Salami (2013) noted that impaired vitamin D intake resulted in significantly lower spatial orientation of rats. Kueider et al. (2016) described the critical role of a decrease in vitamin D levels in elderly people with a high level of education in correlation with impaired speech and visual-spatial abilities, as well as psychomotor development.

We should emphasize that the study of the development of human spatial abilities in the framework of psychogenetics seems to be one of the most interesting areas in experimental science today. It is well known that physiological capabilities and cognitive abilities are individual and not very predictable. This explains an increasing interest in the issues of their internal regulation, and individual spatial features are no exception. The search for candidate genes which products are involved in spatial intelligence, neuroimaging of the mechanisms of generation of this type of thinking in the nervous tissue, modeling the activation of endogenous factors in the cognitive function of space in animals, and analysis of the characteristics of the body metabolism associated with the manifestation of this type of mental activity contribute to the accumulation of useful knowledge about the formation and development of spatial skills, which makes it possible to more fully characterize the very concept of 'human spatial abilities', to look at them from the inside, to provide a clear comprehensive description of the foundations for the development of these cognitive traits.

Conclusion

Spatial abilities play an important role in cognitive development and represent a reliable predictor of success in STEM disciplines. At the same time, genetic factors contribute to the formation of individual differences in spatial abilities. It is not surprising, since spatial abilities are of evolutionary and adaptive importance for living organisms, including humans. This review provides a brief description of the phenomenon of human spatial intelligence. The analysis of experimental studies indicates the important role of genetic factors in its development. Thus, we found that spatial skills are moderately inherited, and works on functional genetics describe

Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

in more detail genetic determinants, which structural changes cause a variation in the level of generation of spatial thinking.

This obtained scientific groundwork can be used in fundamental research carried out in cognitive psychology, neurogenetics, and evolutionary biology, and also as an applied component in the development of educational and training programs to improve and effectively use spatial skills by individuals of different ages in various spheres of life.

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Russian Psychological Journal, 2021, Vol. 18, No. 2, 67–93. **doi**: 10.21702/rpj.2021.2.5

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Relationship Among the Tendency to Cyber-Aggression, Aggressiveness, and Empathy in Adolescence

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Abstract

Introduction. This study aims to examine the relationship among the tendency to various forms of cyber-aggression, aggressiveness, and empathy in adolescence. Cyber-aggression is understood as the deliberate infliction of harm on other Internet users. The forms of cyber-aggression are distinguished on the basis of a typological model of cyber-aggression proposed by K. Runions, which was first used to analyze the online behavior of Russian adolescents.

Methods. The study involved 196 adolescents aged between 12 and 15 years. Empirical data were collected using the Cyber-Aggression Typology Questionnaire modified for Russian-speaking respondents, the Buss–Perry Aggression Questionnaire modified by S. N. Enikolopov, and the Balanced Emotional Empathy Scale by Mehrabian (modified by N. Epstein).

Results. There was no relationship among the tendency to cyber-aggression, aggressiveness, and empathy, which would be universal throughout the entire adolescence. The tendency to cyber-aggression significantly correlates with aggressiveness after 14 years of age and with empathy after 15 years of age. Aggressiveness is not a significant predictor of adolescent cyber-aggression; empathy determines the tendency to cyber-aggression (with a negative sign) only among 15-year-old adolescents.

Discussion. We assumed that cyber-aggression has different psychological meanings at various stages of adolescence – cyber-aggression as a form of 'social tests' in early adolescence, which is not related to personality traits of an individual, and cyber-aggression as a manifestation of stable personality traits (primarily, lack of empathy) in late adolescence.

Conclusion. We can draw a conclusion that there is a need for a differentiated approach to prevention and correction of adolescent cyber-aggression that takes into account its psychological meanings at various stages of adolescence.

Keywords

cyber-aggression, adolescents, aggressiveness, physical aggression, verbal aggression, empathy, motives of cyber-aggression, cyber-aggression predictors, age dynamics, gender differences

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

Highlights

- The relationship among the tendency to cyber-aggression, aggressiveness, and empathy differ depending on the age of adolescents.
- In the samples of 12- and 13-year-old adolescents, we observed no relationship among the tendency to cyber-aggression, aggressiveness, and empathy.
- In the sample of 14-year-old adolescents, the tendency to cyber-aggression positively correlates with verbal aggressiveness; in the sample of 15-year-olds there is a positive correlation with verbal aggressiveness and the total score of aggressiveness, as well as a negative correlation with empathy.
- Empathy is a negative predictor of the tendency to cyber-aggression only in the sample of 15-year-old adolescents; aggressiveness does not show any significant contribution to cyber-aggression in adolescents regardless of their age.

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Introduction

A rapid development of Internet communications affects all spheres of human life today. The Internet has long ceased to be merely an information space and turned into a space for online interaction. TNS Russia, one of the leading Russian media research companies, draws attention to the fact that the community of Internet users is getting younger every year, and today's adolescents and young adults predominate among those who use the Internet for communication purposes (Moskvichev, 2018), often perceiving online communication to be simpler and more convenient than offline one. At the same time, this category of Internet users is characterized by significant risks associated with a special Internet phenomenon of cyber-aggression, which can manifest itself both in various forms of cyber-victimization of adolescents and young adults (e.g., trolling, hating, etc.) and in development of a tendency to show aggression towards Internet communication partners. The importance of the cyber-aggression problem among adolescents and young adults is emphasized by a widespread occurrence of this phenomenon, which is confirmed both by Russian (Soldatova, Rasskazova, & Chigar'kova, 2020) and global studies (Gámez-Guadix, Orue, Smith, & Calvete, 2013; Wright et al., 2015). Thus, according to the report by the World Health Organization (WHO), in the age group of 11 years, Russia ranks first in cyber-aggression ahead of Greenland, Lithuania, Bulgaria, Ukraine, and Latvia; it also ranks third in the prevalence of cyberbullying among 13- and 15-year-olds (Soldatova, L'vova, & Permyakova, 2018). More than half of Russian adolescents face various forms of cyber-aggression, while acting in different roles – as a witness, victim, or aggressor (Soldatova, Chigar'kova, & L'vova, 2017).

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

Cyber-aggression is a deliberate infliction of harm on other Internet users in order to assert one's own personal value (Gini, Card, & Pozzoli, 2018), which can be performed through various forms of online behavior, such as sending humiliating messages, public insults, distribution of derogatory materials, damage to personal photos, etc. (Corcoran, Mc Guckin, & Prentice, 2015). The usual goal of a cyber-aggressor is to harm a victim, and the psychological meaning of his/her actions is to feel strength, to take revenge on offenders, or to demonstrate superiority (Wright, 2017). Obviously, the indicated characteristics of cyber-aggression are to a certain extent consistent with age-related goals of development that are relevant in adolescence, which increases the risk of developing a tendency to cyber-aggression at this age.

Another reason that determines the high risk of developing a tendency to cyber-aggression in adolescence is associated with special characteristics of the Internet space, which determine the fundamental differences between cyber-aggression and offline violence. They include the absence of spatial and temporal limitations on Internet communication, expanded audience, anonymity of the cyber-aggressor, his/her remoteness from the victim and, as a consequence, aggressor's 'online disinhibition' (Suler, 2004), accompanied by a decrease of self-control over his/her own aggressive manifestations (Espelage, Low, Polanin, & Brown, 2013) and feedback distortion (Bochaver & Khlomov, 2014), which can be expressed in finding additional reasons for showing aggression. In addition to the deficit of self-control, the adults have difficulties in controlling adolescents' online behavior, due to which adolescent cyber-aggression is much less regulated by adults than offline violence (Goldstein, 2015; Soldatova et al., 2020).

Increased vulnerability of adolescents to the risk of developing a tendency to cyber-aggression determines the relevance of research on protective factors that could prevent reinforcement of corresponding behavior patterns. It seems that one of the ways to solve this problem is associated with determination of personal correlates of the tendency to cyber-aggression. Research on the relationship between adolescents' personality traits and their tendency to cyber-aggression has been quite active over the last decade and a half. The most frequently discussed correlates of the tendency to cyber-aggression include, among others, aggressiveness and empathy, which have been established as reliable predictors of cyberbullying (Eisenberg, Eggum, & Di Giunta, 2010; Ang, Li, & Seah, 2017) – a form of cyber-aggression (Corcoran et al., 2015) – as well as evidence of persistent negative relationship between aggressiveness and empathy (e.g., Suvorova, Sorokoumova, & Frundina, 2017).

The most obvious conclusions about the nature of the relationship among the tendency to cyber-aggression, empathy, and aggressiveness imply that aggressiveness as a stable personality trait of an adolescent acts as a predictor of the tendency to cyber-aggression, whereas empathy, on the contrary, acts as a protective factor. Indeed, the latest publications present empirical data, which demonstrate that cyber-aggression is associated with a high level of aggressiveness (Sharov, 2020), and describe back-and-forth transitions (inversions) of cyber-aggression and offline violence (Len'kov, 2020), among other things using the model of cyberbullying as a form of cyber-aggression. At the same time, it was observed that adolescents perceive cyber-aggression in a fundamentally different way compared to offline violence, which they treat as a much less dangerous phenomenon (Pornari & Wood, 2010). This may be a factor that affects aggressiveness in online communication by strengthening the relationship between violence and cyber-aggression or significantly transforming it. Another important fact is that there are no level differences in cyber-aggression between adolescent girls and boys (Álvarez-García, Barreiro-Collazo, & Núñez, 2017),

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

which contradicts the conventional idea about the differences in offline aggressiveness between men and women (e.g., Enikolopov & Tsibul'skii, 2007). This is also true for the negative relationship between cyber-aggression and empathy, which is confirmed by some studies (Rodríguez-Hidalgo, Mero, Solera, Herrera-López, & Calmaestra, 2020) and refuted by the others, according to which empathy cannot be considered as a significant correlate of cyber-aggression (on the example of cyberbullying: Athanasiades, Baldry, Kamariotis, Kostouli, & Psalti, 2016).

These contradictions in the analysis of the relationship among the tendency to cyber-aggression, aggressiveness, and empathy, can probably be explained by different ways of conceptualizing the phenomenon of cyber-aggression, in particular, the tendency to equate the concepts of 'cyber-aggression' and 'cyberbullying', which in fact describe two separate phenomena that differ in the degree of regularity and deliberation of the aggressor's behavior, as well as the victim's ability to resist the aggressor. In contrast to cyberbullying, which represents repeated intentional acts of aggressive behavior by an individual or a group, carried out on the Internet against a victim who does not have the resources to stop this behavior (Smith et al., 2008), the phenomenon of cyber-aggression encompasses a much wider range of behaviors. In particular, manifestations of cyber-aggression vary significantly in terms of motives that induce aggression on the Internet.

In this regard, more than a decade ago it was proposed to draw a distinction between reactive and proactive cyber-aggression, depending on the fact whether aggressive behavior was a reaction to provocation from other Internet users or it was initiated by the subject himself/herself. In 2013, K. Runions proposed a typology of cyber-aggression, in which the motives of aggressive online behavior were considered from the perspective of two orthogonal factors: the source of motivation (one's own initiative or actions of the communication partner, provoking an aggressive response) and the level of self-control (impulsive or controlled cyber-aggressive reaction).

Therefore, a classification was proposed to identify the following four main motives for adolescent cyber-aggression: rage, revenge, recreation, and reward (Runions, 2013). Aversive (in other words, reactive) cyber-aggression can be an impulsive reaction to provocations from other users ('rage'), or it can be carried out voluntarily, as a deliberate act aimed at punishing the offender, which is based on self-control ('revenge'). Appetitive (proactive) cyber-aggression can also take impulsive and controlled forms. Impulsive appetitive cyber-aggression manifests itself in spontaneous actions, carried out without regard to long-term consequences ('recreation'); controlled appetitive cyber-aggression manifests itself in controlled actions, aimed at achieving positive effects in the long term, e.g., receiving benefits in relationships with important persons ('reward'). Unlike reactive cyber-aggression, which is determined by negative emotions of the cyber-aggressor, resulting from interaction with online communication partners, manifestations of proactive cyber-aggression are dictated by positive emotions from current aggressive acts (Runions, Bak, & Shaw, 2017).

The authors of the model described above suggest that these types of motives for cyber-aggression differ in their psychological nature. However, empirical data that would help substantively specify and verify this hypothesis are rather fragmentary. This determined *the aim of our research*, which was to study the relationship between the tendency of adolescents to various forms of cyber-aggression and their personal characteristics, which may be considered as predictors of cyber-aggression – aggressiveness and empathy. The main research question was how the tendency to various types of cyber-aggression, aggressiveness, and empathy correlate with each other in adolescents. Moreover, given the results of our previous studies, which indicated that the tendency to cyber-aggression was affected by age and gender (Antipina, Bakhvalova, &

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

Miklyaeva, 2019), we were interested whether the nature of the relationship among the tendency to cyber-aggression, aggressiveness, and empathy changed as adolescents grew older and whether there were differences between the samples of adolescent boys and girls.

Methods

The study involved 196 adolescent school students from St. Petersburg aged between 12 and 15 years (55.1 % females, 46.9 % males), including 50 respondents aged 12, 58 respondents aged 13, 44 respondents aged 14, and 44 respondents aged 15. The adolescents took part in the study voluntarily in out-of-school hours. We obtained informed consent for participation in the study from each adolescent, as well as from his/her parents/legal representatives.

Empirical data was collected by means of questionnaire survey and testing. The questionnaire contained items on socio-demographic characteristics; the testing aimed at assessing the tendency to cyber-aggression and its potential personal predictors – aggressiveness and empathy. The tendency to cyber-aggression was evaluated using the Cyber-Aggression Typology Questionnaire (Runions et al., 2017), modified for Russian-speaking respondents. The questionnaire assessed the tendency to various types of cyber-aggression: (a) impulsive-appetitive, (b) impulsive-aversive, (c) controlled-appetitive, and (d) controlled-aversive (the first three scales include 6 items, the last one – 5, the total number of questions is 23; each item is evaluated on a scale from 1 to 4). Aggressiveness was assessed using the Buss-Perry Aggression Questionnaire modified by S. N. Enikolopov (a version with 29 items that contains four scales: physical aggression, anger, hostility, and verbal aggression) (Enikolopov & Tsibul'skii, 2007). Empathy was assessed using the Balanced Emotional Empathy Scale by Mehrabian, modified by N. Epstein (Il'in, 2011).

Statistical processing of the data was performed using Statistica 10.0 software package and implemented in two stages. The first stage involved calculating descriptive statistics ($M \pm S$) and determining the type of parameter distribution using the Shapiro–Wilk test. The results showed that data distribution was close to normal with a confidence level of 0.95–0.99 (for different parameters). Taking into account information about the type of data distribution, at the second stage we estimated the differences between the subgroups formed by age and gender using one-way ANOVA (F), as well as the relationship among the characteristics by means of correlation analysis (Pearson correlation coefficient, r), regression analysis (B), and cluster analysis.

Results

The results of the study demonstrate that in the process of data analysis, performed on the full sample, only one rather weak correlation was observed among the scores of cyber-aggression, aggressiveness, and empathy – namely, between the scores of impulsive-aversive and verbal aggression ($r = 0.14$ at $p = 0.05$). At the same time, various types of cyber-aggression are characterized by a strong positive correlation with each other ($0.62 \le r \le 0.92$ at $p < 0.001$). It is also true for aggressiveness ($0.15 \le r \le 0.80$ at $p \le 0.05$), whereas empathy has a positive correlation with anger and hostility ($0.18 \le r \le 0.22$ at $p < 0.01$) and negatively correlates with physical aggression ($r = –0.22$ at $p = 0.01$). We also observed negative correlation between cyber-aggression and the age of respondents ($–0.23 \le r \le –0.17$ at $p < 0.05$) (Table 1). Regression analysis, performed on the full sample, did not yield a statistically significant regression model. Hence, we assumed that cyber-aggression could differ in terms of its personal determination, i.e., it could be supported by different personality traits.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

Table 1
Descriptive statistics and correlation coefficients (for the full sample)

Characteristics	M	S	2	3	4	5	6	7	8	9	10	11	12
1. Age	13.37	1.16	–0.17*	–0.21**	–0.22**	–0.23**	–0.23**	0.01	0.05	0.04	0.18**	0.04	0.17*
2. Impulsive-aversive CA	16.87	5.71	1.00	0.71***	0.84***	0.73***	0.92***	0.07	0.09	0.04	0.14*	0.09	–0.02
3. Controlled-aversive CA	16.76	4.57		1.00	0.74***	0.62***	0.84***	0.10	0.08	–0.03	0.06	0.07	–0.10
4. Controlled-appetitive CA	18.08	6.39			1.00	0.84***	0.96***	0.02	0.11	0.05	0.09	0.08	–0.04
5. Impulsive-appetitive CA	14.44	4.94				1.00	0.89***	0.05	0.04	0.01	0.04	0.05	–0.10
6. Cyber-aggression (total)	66.26	19.47					1.00	0.06	0.09	0.02	0.09	0.08	–0.07
7. Physical aggression	19.22	6.82						1.00	0.32***	0.22**	0.36***	0.72***	–0.22**
8. Anger	18.20	5.78							1.00	0.53***	0.46***	0.80***	0.18**

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

Table 1
Descriptive statistics and correlation coefficients (for the full sample)

Characteristics	M	S	2	3	4	5	6	7	8	9	10	11	12
9. Hostility	18.20	5.61								1.00	0.15*	0.75***	0.28**
10. Verbal aggression	13.45	3.51									1.00	0.43***	–0.03
11. Aggressiveness (total)	55.61	13.57										1.00	0.08
12. Empathy	67.52	11.43											1.00

Note: CA – cyber-aggression; * – $p \le 0.05$; ** – $p \le 0.01$; *** – $p \le 0.01$.

In order to test this hypothesis, the respondents were divided into groups by means of cluster analysis (Ward's method, by cases) (Table 2). The first group consisted of 58 adolescents with a slight predominance of girls (65.5 %). In this sample, distinct manifestations of cyber-aggression were combined with high scores of anger, hostility, and empathy. The second group consisted of 76 respondents with a relative predominance of boys (55.3 %). This group was also characterized by high scores of cyber-aggression combined with high scores on the scale of physical aggression. The third group comprised 62 people (59.7 % of girls and 40.3 % of boys) and was distinguished by low values of all cyber-aggression parameters. In addition to these differences, cluster analysis revealed that age was another significant characteristic. The 'youngest' sample was group 2, where high scores of cyber-aggression were associated with distinct manifestations of physical aggression as a component of aggressiveness. The most 'adult' sample was group 3,

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

characterized by the lowest scores of cyber-aggression. Meanwhile, the differences in the number of boys and girls in each group were not statistically significant.

Table 2
Descriptive statistics (M ± S) for subgroups derived by cluster analysis

Characteristics	Group 1 (n = 58)	Group 2 (n = 76)	Group 3 (n = 62)	F
Age	13.51 ± 1.14	13.18 ± 1.09	13.73 ± 1.28	5.05*
Impulsive-aversive CA	19.74 ± 3.73	18.67 ± 4.22	8.90 ± 3.40	210.5***
Controlled-aversive CA	18.72 ± 3.24	17.88 ± 3.48	11.54 ± 4.72	102.6***
Controlled-appetitive CA	21.17 ± 3.79	20.18 ± 4.23	8.71 ± 4.76	249.7***
Impulsive-appetitive CA	15.87 ± 3.66	15.94 ± 3.92	8.71 ± 4.44	108.3 ***
Cyber-aggression (total)	75.51 ± 11.60	72.66 ± 13.20	37.85 ± 14.60	239.4***
Physical aggression	16.06 ± 4.21	21.16 ± 7.19	17.20 ± 5.99	4.47*
Anger	19.79 ± 4.84	18.24 ± 6.03	15.76 ± 5.34	8.78**
Hostility	20.49 ± 5.92	17.42 ± 5.29	17.24 ± 5.46	5.57**
Verbal aggression	13.23 ± 3.76	13.73 ± 3.63	12.61 ± 2.67	–
Aggressiveness (total)	53.34 ± 10.21	56.79 ± 14.73	50.20 ± 12.37	–
Empathy	76.91 ± 6.65	64.09 ± 9.92	65.83 ± 13.24	7.70**

Note: CA – cyber-aggression; * – $p \le 0.05$; ** – $p \le 0.01$; *** – $p \le 0.01$.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

The results obtained demonstrate that it is necessary to take into account the factors of adolescents' age and gender when searching for predictors of adolescent cyber-aggression. The analysis of descriptive statistics, calculated taking into account age and gender of the respondents (Table 3), shows that cyber-aggression scores stand at a relatively high level in the samples of 12–14-year-old adolescents and significantly decrease by the age of 15; notably, this trend is typical of both boys and girls ($5.19 \le F \le 7.81$ at $p < 0.01$). The scores of aggressiveness and empathy remain more or less constant throughout adolescence; the scores of empathy, anger, and hostility are significantly higher in the sample of girls ($6.77 \le F \le 38.18$ at $p < 0.01$), whereas the score of physical aggression is much higher in the sample of boys ($F = 37.86$ at $p < 0.001$).

Table 3
Descriptive statistics characterizing subgroups of adolescents taking into account age and gender

Characteristics	Age				F	Gender		F
	12 years	13 years	14 years	15 years		G	B	
Impulsive-aversive CA	17,54 ± 5,05	16,95 ± 5,91	18,75 ± 4,08	14,11 ± 6,64	5,19**	17,16 ± 5,80	16,51 ± 5,62	–
Controlled-aversive CA	17,60 ± 3,47	16,69 ± 4,51	18,50 ± 3,39	14,16 ± 5,62	7,81***	16,50 ± 4,71	17,08 ± 4,39	–
Controlled-appetitive CA	19,62 ± 5,53	18,05 ± 6,64	20,07 ± 4,11	14,36 ± 7,35	7,31***	18,37 ± 6,56	17,72 ± 6,19	–
Impulsive-appetitive CA	15,60 ± 4,54	14,53 ± 5,05	15,82 ± 3,24	11,61 ± 5,57	7,10***	14,60 ± 5,02	14,24 ± 4,86	–
Cyber-aggression (total)	70,36 ± 15,43	66,22 ± 20,63	73,14 ± 11,90	54,25 ± 23,35	5,62***	66,93 ± 16,99	65,93 ± 19,93	–
Physical aggression	18,02 ± 5,99	19,90 ± 7,81	21,23 ± 6,42	17,70 ± 6,26	–	16,68 ± 5,45	22,35 ± 7,05	37,68***

Table 3
Descriptive statistics characterizing subgroups of adolescents taking into account age and gender

Characteristics	Age				F	Gender		F
	12 years	13 years	14 years	15 years		G	B	
Anger	17,36 ± 5,62	18,71 ± 5,73	19,57 ± 6,09	17,14 ± 5,51	–	19,29 ± 5,38	16,88 ± 5,99	9,30**
Hostility	17,72 ± 5,30	19,19 ± 6,22	17,30 ± 5,64	18,34 ± 5,03	–	19,18 ± 5,88	17,00 ± 5,05	6,77**
Verbal aggression	12,56 ± 3,68	13,41 ± 3,49	13,89 ± 3,29	14,07 ± 3,46	–	13,45 ± 3,99	13,44 ± 2,83	–
Aggressiveness (total)	53,20 ± 13,15	57,79 ± 14,79	58,05 ± 13,18	53,05 ± 12,19	–	55,14 ± 12,74	56,19 ± 14,58	–
Empathy	64,74 ± 13,08	67,93 ± 10,58	66,57 ± 11,46	71,07 ± 9,74	–	71,69 ± 11,58	62,40 ± 8,93	38,19***

Note: CA – cyber-aggression; G – subgroup of girls; B – subgroup of boys; ** – $p \le 0.01$; *** – $p \le 0.01$.

The comparison of the scores that characterize various types of aggression enabled us to state that both in the full sample and in the subgroups formed by age and gender the predominant type is controlled-appetitive cyber-aggression. However, these differences do not reach statistically significant values.

Correlation analysis, carried out separately for each age and gender group, did not reveal any specific relationship among the tendency to cyber-aggression, aggressiveness, and empathy in the samples of boys and girls. However, it showed an increase in the number of correlations among these scores as the adolescents grew older. In the samples of 12- and 13-year-old respondents, no such correlations were found, whereas in the sample of 14-year-olds, there was a significant correlation between the tendency to cyber-aggression and verbal aggression ($r = 0.31$ at $p = 0.05$). In the sample of 15-year-olds, we found three correlation – with verbal aggression, with the total score of aggressiveness, and with empathy ($r = 0.32$, $r = 0.36$, and $r = –0.30$ at $p = 0.05$, respectively). At the same time, using regression analysis we obtained a single statistically reliable regression model, according to which the predictor of impulsive-aversive cyber-aggression among 15-year-old adolescents is verbal aggression, which explains 18.5 % of its variance (Table 4).

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

Table 4
Results of regression analysis (sample of 15-year-old adolescents), $R^2 = 0.19$

Predictors of cyber-aggression	b*	Std. Err. of b*	b	Std. Err. of b	t	p
Verbal aggression	0.44	0.21	0.84	0.41	2.06	0.05

Discussion

The results of our study do not confirm that aggressiveness and empathy are stable correlates and especially reliable predictors of adolescent cyber-aggression. These findings agree with the information on the absence of the linear relationship among the tendency to cyber-aggression, aggressiveness, and empathy, obtained by other authors (Athanasiades et al., 2016; Pornari & Wood, 2010) and established in our previous studies (in particular, regarding the relationship between cyber-aggression and aggressiveness), carried out using projective methods for examining personality traits of adolescents (Antipina et al., 2019). Although the identified correlations among the tendency to cyber-aggression, aggressiveness, and empathy reflect an expected positive correlation between the tendency to cyber-aggression and aggressiveness (primarily, verbal one), they are extremely fragmented and rather weak. In our opinion, these results support an assumption that cyber-aggression, which is understood as a wide range of behavioral reactions on the Internet that are determined by qualitatively different motives, is not identical to the manifestations of aggression in the offline environment and has variable associations with personality traits of adolescents.

Using cluster analysis we identified that, in some cases, high scores of the tendency to cyber-aggression may be associated with a higher level of physical aggression, which indicates the possibility of transferring aggressive tendencies from offline interaction to the Internet space, where due to the impossibility of physical influence on the communication partner the usual ways of showing aggression probably become transformed. In other cases, high scores of cyber-aggression demonstrate a correlation with high empathy scores, coupled with high values of such aggressiveness parameters as anger and hostility, which, in all likelihood, indicate potential emotion-generating capacity of cyber-aggression situations for adolescents, combined with a fundamentally different (compared to offline interaction) interpretation of occurring events and, particularly, estimation of harm that one's actions inflict on the victim of aggression. Researchers demonstrated that online interaction is different from offline communication, particularly in terms of underestimating the consequences of one's own morally loaded actions (Bouhnik & Mor, 2014). It probably enables adolescents to use empathy resources to understand possible reactions of the victim, but it does not make them stop aggressive actions, since the aggressor does not see their consequences as serious enough. It should be noted that, apparently, the

Russian Psychological Journal, 2021, Vol. 18, No. 2, 94–108. **doi**: 10.21702/rpj.2021.2.6

described relationship between the tendency to cyber-aggression and empathy are more typical for younger adolescents, whose empathy is in the process of development. When the respondents approach late adolescence, empathy acquires the status of a negative predictor of the tendency to cyber-aggression, i.e. becomes a protective factor against manifestations of aggression in the Internet environment.

According to the results obtained, the relationship among the tendency to cyber-aggression, aggressiveness, and empathy in adolescence is more affected by age than by gender. In our study, no differences were observed between the intensity of different types of cyber-aggression in girls and boys, which is consistent with the data presented by other authors (Álvarez-García et al., 2017). We also found no gender-specific correlates and predictors of the tendency to cyber-aggression, despite the statement of expected differences in aggressiveness and empathy scores (according to the data available in the literature, e.g., Enikolopov & Tsibul'skii, 2007; Yusupov, 1995). At the same time, the results demonstrated age-related dynamics of the tendency to cyber-aggression of various types, which is characterized by statistically significant decrease of respective indicators by the age of 15. Samples of 12-, 13-, and 14-year-old adolescents show similar trends, which include (a) a wider spread of the rates, characterizing the tendency to cyber-aggression of various types, with some predominance of controlled-appetitive cyber-aggression ang (b) almost complete absence of significant correlations among the tendency to cyber-aggression, aggressiveness, and empathy. In the sample of 15-year-olds, the scores of various types of cyber-aggression are almost equal, and their correlation with personality traits is much stronger.

Based on the results, characterizing age-related dynamics of the tendency to cyber-aggression in relation to aggressiveness and empathy, we may assume that in the early stages of adolescence, cyber-aggression is not a personality-determined behavior but a kind of 'social test', in which adolescents explore various opportunities of interacting with others in the Internet environment, which they perceive as a more secure environment. Therefore, they tend to underestimate the risks that follow from their aggressive actions, supported by various motives and aimed at inflicting harm on their online communication partner. Notably, these assumptions are to some extent consistent with the results of our previous studies, according to which cyber-aggression in the early stages of adolescence is significantly less correlated with problem behavior compared to the samples of late adolescents (Antipina et al., 2019). By late adolescence, the situation changes. 'Social tests' gradually lose their relevance, and stable personality traits of adolescents begin to play an increasingly important role in online interaction. The age of 15 seems to be critical, but this conclusion needs to be specified by recruiting older respondents, which is the direction of our future research.

Conclusion

Therefore, our study demonstrated that the tendency to cyber-aggression, aggressiveness, and empathy do not exhibit any strong linear relationships, which would be universal throughout adolescence. Aggressiveness (primarily, verbal one) and empathy become significant correlates of cyber-aggression only at the ages of 14 and 15, respectively. At the previous stages of adolescence, no relationship is observed between the tendency to cyber-aggression and personality traits. At the same time, regardless of age, aggressiveness is not a significant predictor of the tendency to cyber-aggression. Empathy acquires this status only in a sample of 15-year-old adolescents.

The results obtained in our study indicate the need for a differentiated approach to the prevention and correction of adolescent cyber-aggression, taking into account age-related characteristics of aggressive behavior in the Internet environment. In the early stages of adolescence, prevention and intervention programs can concentrate on tasks, associated with creating the conditions for adolescents to become aware of the motives behind their 'social tests' in online interaction, as well as their consequences for communication partners and future relationships with them. In late adolescence, such work involves creation of favorable conditions for the development of empathy, the deficit of which becomes a significant predictor of the tendency to cyber-aggression at this stage of personal development.

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Author Contributions

S. S. Antipina developed of the research program, modified the Cyber-Aggression Typology Questionnaire, collected and processed the empirical data, formulated conclusions, and prepared the manuscript.

A. V. Miklyaeva supervised the study, wrote the theoretical overview, prepared the manuscript, and edited the manuscript according to the journal requirements.

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Cognitive Aspects of Students' Attitudes Towards COVID-19 Vaccination

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Abstract

Introduction. In the context of a large-scale transmission of the new coronavirus infection, it seems very important, relevant, and useful to examine and identify psychological factors affecting the refusal to vaccinate, caused by mistrust or uncertainty about the safety and effectiveness of the vaccine, doubts about its benefits and concerns about uncontrolled consequences. This study is the first report of the cognitive aspects of students' attitudes towards COVID-19 vaccination that lead to their refusal to vaccinate.

Methods. The study involved 76 university students (M = 20.63; SD = 2.38; 56 females and 20 males). For data collection, the author used the original questionnaire, aimed at identifying subjective attitudes towards the vaccine and vaccination against COVID-19, and the Fear of COVID-19 Scale by D. K. Ahorsu et al.; data was interpreted using frequency, correlation, and P. Verges' prototypical analyses.

Results and Discussion. Against the background of a predominantly low level of COVID-19 fear, it was revealed that the majority of study participants had a negative attitude towards vaccination, expressed in their refusal of potential vaccination (63 respondents). The most frequent reasons for refusal were mistrust, fear of consequences, unreliability of the vaccine, and the presence of antibodies. It was identified that the central core of representations of the vaccine reflected formally neutral associations, lack of axiological and emotionally charged notions, absence of relevant personal meanings, whereas the periphery included important descriptors indicating ambivalent attitude towards possible consequences of vaccination. The results obtained were interpreted in the context of cognitive aberrations actualized in situations of uncertainty, including exaggeration of one's own awareness, illusion of competence, imposed delusions, egocentric bias, illusion of control, illusory correlation, and cognitive dissonance.

Keywords

COVID-19 pandemic, vaccination, refusal to vaccinate, representation structure, mistrust, false awareness, illusion of competence, imposed delusions, cognitive dissonance, egocentric bias

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Highlights

- Being a global challenge, the pandemic actualizes the problems associated with all spheres of human and society existence.
- An individual's decision to vaccinate is determined by numerous reasons and is a responsible person's choice in the context of 'factuality/prospects'.
- The negative attitude of university students towards COVID-19 vaccination results from ambivalent assessment of its possible consequences, cognitive aberrations, actualized in response to a complex and uncertain situation of the pandemic, as well as from formal neutrality of core semantic structure of vaccine representation, which sets a safe context and makes an individual take a cautious approach to COVID-19 vaccination.

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Introduction

The global pandemic and restrictive measures caused by transmission of the new coronavirus infection have led to the situation, where practically the whole world found itself in the conditions of self-isolation, forced social distancing and reflection on the real threat to its own existence. Undoubtedly, this challenge to civilization affected all functioning spheres of the society and stimulated overall increase in research in various scientific fields. A sufficient number of published psychological papers convincingly prove that the pandemic affects the human psyche in at least three ways, influencing our sense of security, changing our needs, and transforming our value sphere (Kruglanski, 2020).

Psychological studies revealed natural mental reactions to the pandemic situation: narrowing and negativization of the time perspective (Nurkova & Gofman, 2020); construction of a new everyday life with altered life priorities, habits and behavioral patterns (Yarmak, Panova, Maranchak, & Savina, 2020); formation of the 'collective pattern of the disease' and the effect of 'understanding' COVID-19 (Pervichko, Mitina, Stepanova, Konyukhovskaya, & Dorokhov, 2020); decrease in the level of positive emotions (Rasskazova, Leont'ev, & Lebedeva, 2020); impaired constructive thinking and increase in psychopathological symptoms (Enikolopov, Boiko, Medvedeva, Vorontsova, & Kazmina, 2020); increased fear of COVID-19 (Gritsenko et al., 2020); changes in moral and ethical standards (Enikolopov, Medvedeva, Boiko, Vorontsova, & Kazmina, 2020); reduced life satisfaction at different stages of the pandemic (Zacher & Rudolph, 2020; Bono, Reil, & Hescox, 2020; Kanekar & Sharma, 2020; Marmarosh, Forsyth, Strauss, & Burlingame, 2020).

An important contribution to the understanding of how an individual, a group, a society function in the context of the new virus transmission is made by the studies, which identify personal traits that determine perception specifics of the coronavirus infection and degree of its threat (Egorova, Parshikova, Zyryanova, & Staroverov, 2020; Modersitzki, Phan, Kuper, & Rauthmann, 2020), problematize and predict socio-economic and socio-psychological risks and consequences of the pandemic and infodemic (Nestik, 2020; Ushakov, Yurevich, Nestik, & Yurevich, 2020; Yurevich, Ushakov, & Yurevich, 2020; Tkhostov & Rasskazova, 2020; Zhuravlev & Kitova, 2020).

At the same time, it can be stated that the first shock from the encounter with the COVID-19

Russian Psychological Journal, 2021, Vol. 18, No. 2, 109–121. **doi**: 10.21702/rpj.2021.2.7

virus has already passed; there are diagnostic tools and prevention means, treatment protocols and regimens, new data on the nature of the virus and its modifications. All this certainly does not lessen immediacy and severity of the problem, but rather raises new questions that require serious scientific research. In our opinion, one of such issues is an individual's decision regarding COVID-19 vaccination, which is currently taking place in all civilized countries and making some people express fear, mistrust, resistance, and overt protest (Giubilini, Savulescu, & Wilkinson, 2020; Peretti-Watel et al., 2020; Paul, Steptoe, & Fancourt, 2021).

Thus, we developed a research project aimed at identifying psychological predictors of students' attitudes towards COVID-19 vaccination. The choice of the student community was dictated by a rather high educational level of this social group, its specific status and orientation towards the future, since there is scientific evidence that non-educated individuals, with low social status and income, as well as representatives of minorities and unemployed are the ones who most often resist vaccination (Malik, McFadden, Elharake, & Omer, 2020). However, the most important argument for choosing students as an empirical object of research was the following scientifically proven fact. Under the influence of dedicated educational and professional activity, as well as their inclusion into new social communities and transition into different living conditions, on the intellectual level students develop new mental formations that enable them to resolve problem situations actively and effectively and to make independent and responsible predictions about their consequences (Zimnyaya, Serova, & Stegnii, 2009).

However, the results obtained were unexpected and demonstrated that the vast majority of study participants did not even have the intention to get vaccinated, which shifted the focus of our scientific interest to the very problem of vaccination.

Concerns about the benefits and necessity of vaccination, doubts about its safety and consequences for the human body, justifiability of the risk and speculations about the profits of pharmaceutical companies date back to the invention of vaccines and certainly still exist to this day. Despite the fact that the advantages of vaccination, its role and importance in reducing the growth of dangerous diseases, improving the quality and expectancy of life are recognized by medical experts of the World Health Organization, the attitude towards the vaccine and the very policy of vaccination (especially, childhood vaccination) is ambiguous and controversial in many countries (Hornsey, Harris, & Fielding, 2018; Kukhtevich et al., 2018).

Our review of studies that examine the attitudes towards an individual's decision to get vaccinated allows to identify four attitudes and four behavioral strategies (Yaqub, Castle-Clarke, Sevdalis, & Chataway, 2014; Ward, Alleaume, & Peretti-Watel, 2020). They include active acceptance based on a conscious choice, awareness, understanding of the necessity and benefits of vaccination, readiness for vaccination; passive acceptance due to conformal behavior of an individual, his/her concessions to power, authorities or the group, delegation of responsibility for possible consequences; active denial of the benefit and advantages of vaccination, associated with a categorical refusal and open protest of an individual against the vaccine; indecisive hesitation, determined, on the one hand, by an individual's involvement and concern about his/her own health or the health of family members and, on the other hand, by fears about the results and potential adverse side effects, doubts about the value and safety of the vaccine.

The conventionality of the given typology is explained by the multitude of different factors that affect the choice of a particular strategy, including (a) the scale of the threat and its novelty, transmission speed and contagiousness of the virus, case fatality and mortality rates; (b) economic,

Russian Psychological Journal, 2021, Vol. 18, No. 2, 109–121. **doi**: 10.21702/rpj.2021.2.7

political, socio-cultural characteristics of the society, indicators of living standards and the progress of herd immunity; (c) public and personal awareness of not only the symptoms of the disease, possible complications and dangers of vaccination, but also of the risks associated with the consequences of vaccine refusal; (d) the level of social trust – how reliable, safe and effective the vaccine is, what is known about the practice of its use and the reputation of the manufacturer and medical institutions that administer the vaccination, what overall institutional trust people have in science, healthcare, government, politics, information sources; (e) the measure and vector of responsibility – whether an individual decides to get vaccinated himself or it concerns another person, e.g., a child or elderly parents, who are forced to cope with an overload of the immune system; (f) an individual's belonging to a certain cultural, religious, and professional group; and (g) a certain configuration of individual-typological, personal, and cognitive characteristics (high individual susceptibility to disease, sensitivity to pain, intolerance to injections, stress resistance and vitality, anxiety and tolerance to uncertainty, trust and responsibility, specifics of cognitive patterns and attributional styles, insecurity and anxiety).

Given the limited scope of this article, we will focus only on the characteristics of the individual's cognitive sphere, which determine the decision regarding COVID-19 vaccination. In particular, we will pay special attention to mental aberrations as subjective beliefs, prejudices and stereotypes, which arise in response to the unexpectedness and uncertainty of the pandemic, integrate into cognitive patterns of an individual and distort the perception and understanding of the current problem situation, as well as planning and development of an adequate rational behavioral response. A detailed classification of cognitive biases by such grounds as overabundance of information, difficulty of understanding meanings, response rate, and relationship among mnemonic processes is presented by Heick (n.d.).

The aim of this research is to study the cognitive aspects of students' attitudes towards COVID-19 vaccination.

Our hypothesis assumes that the cognitive aspects of students' attitudes towards COVID-19 vaccination, caused by mental aberrations, ambivalent assessment of possible results of vaccination and the meaningful content of the core meaning structure of representations of the vaccine, determine an individual's decision to get vaccinated against COVID-19 as a conscious pandemic response.

Methods

The study, carried out in late February – early March 2021, was based on the methodology of social constructivism. It involved students of different years of study from a university of the Volga Federal District (N = 76; M = 20.63; SD = 2.38; 56 females and 20 males).

The research methods included psychodiagnostic testing and survey using an original questionnaire comprised of the following blocks: (a) data on socio-demographic status of the respondents and their experience of direct encounter with the coronavirus infection; (b) assessment of subjective attitude towards vaccination and the intention to get or not to get vaccinated against COVID-19, specifying the reasons for that decision; and (c) subjective representations of the vaccine and vaccination against COVID-19 (associations to the 'vaccine' stimulus and definitions of the term). The study also used the Fear of COVID-19 Scale (Ahorsu et al., 2020), which was tested on Russian and Belarusian samples (Gritsenko et al., 2020).

The results were analyzed and interpreted by means of frequency, correlation, and P. Verges' prototypical analyses (Verges, 1992), in which median frequency of association occurrence in the

Russian Psychological Journal, 2021, Vol. 18, No. 2, 109–121. **doi**: 10.21702/rpj.2021.2.7

sample and its average rank were used as criteria for including the obtained associations into different structural elements of the representation – the central core or the periphery.

Results and Discussion

According to the survey, 26 % of the respondents have had a coronavirus infection themselves, more than half of the study participants (51 %) have a close family member who contracted the virus, which indicates that they are aware of the actual threat of COVID-19, have gone through it and accumulated some experience. At the same time, the majority (74 %) of respondents are characterized by a low level of COVID-19 fear, despite the fact that infection is spreading in real time, 'here and now' (Fig. 1).

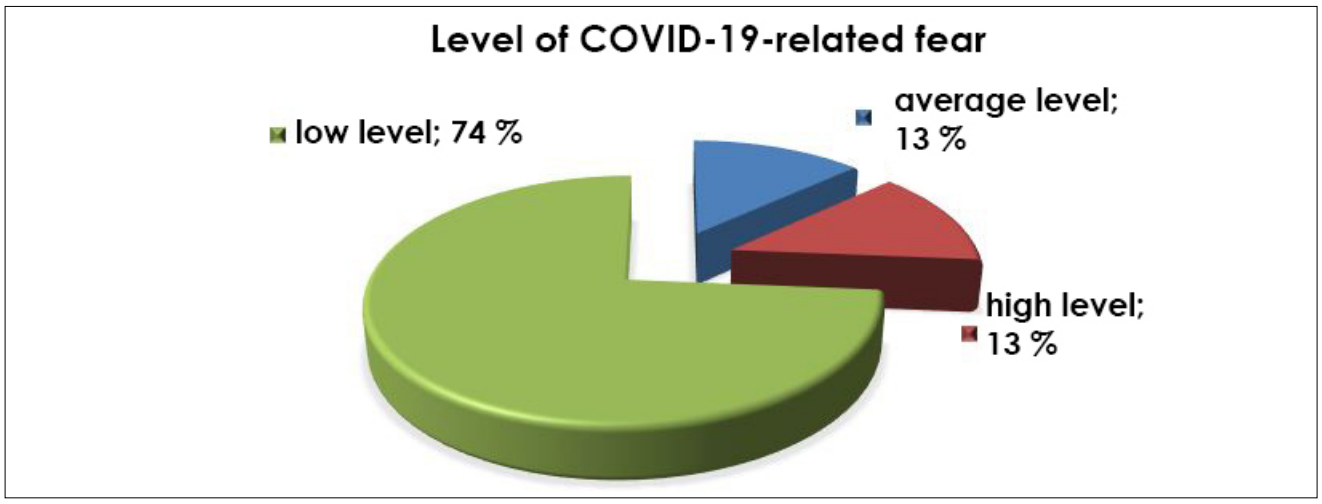

Figure 1. Level of experienced COVID-19-related fear

The result obtained can be explained by the respondents' young age, since it has been observed that the intensity of experienced COVID-19-related fear increases with age (Gritsenko et al., 2020). Another explanation rests on the fact that young people are less likely to suffer from severe consequences after COVID-19 (Pastorino et al., 2021). At the same time, we emphasize that the level of experienced COVID-19-related fear is not associated with personal experience of the respondents, since no statistically significant associations were found between the presence of personal or family history of coronavirus infection and the level of experienced COVID-19-related fear ($p > 0.05$). This may result from the light course of the disease among the respondents and their close ones, absence of serious complications, effectiveness of taken measures, personal characteristics, and the fact that the global nature of the pandemic turns a personal issue of resolving a health problem into a social one, which has been emphasized by some researchers (Pogue et al., 2020).

A significant majority (88 %) of respondents comply with protective measures (mask requirements, social distance, and sanitary procedures), which also indicates that study participants are aware of the danger and wish to avoid infection; however, in our sample 63 students (more than 80 %) have not been vaccinated against COVID-19 and are not planning to. The data obtained

Russian Psychological Journal, 2021, Vol. 18, No. 2, 109–121. **doi**: 10.21702/rpj.2021.2.7

show a discrepancy between subjective interpretation of the current situation caused by the pandemic and behavioral intentions of an individual. That being said, the results are consistent with a study of college students' attitudes towards the H1N1 virus vaccine, which indicated a small percentage of respondents wishing to be immunized (Ramsey & Marczinski, 2011), but differ significantly from the data on COVID-19 vaccination: 94.73 % of Italian students are ready to get vaccinated against COVID-19 (Pastorino et al., 2021), 68.57 % of American respondents agree to be immunized and only 15.89 % refuse a potential vaccine (Pogue et al., 2020). A survey conducted in June 2020 with representatives from 19 countries indicated that 71.5 % of participants reported their intention to vaccinate (assuming the vaccine was tested and recommended by their employer); notably, an interesting heterogeneity was observed in these indicators – in China they reached 83.7 %, whereas in Russia they were only 59.1 % (Lazarus et al., 2021).

The range of reasons for vaccine refusal, specified by study participants, is quite extensive and diverse – from the categorical "I do not want to!", "I have no time", and the alarmist "This is microchip implantation!" to the selfish "I will see what consequences the others have" and the defensive "For ethical reasons".

The main reasons indicated by the respondents include *insufficient amount of research regarding the vaccine, mistrust, fear of adverse side effects, negative experience of others, allergy, unreliability, doubts about the necessity of vaccination, reliance on natural immunity* (Fig. 2).

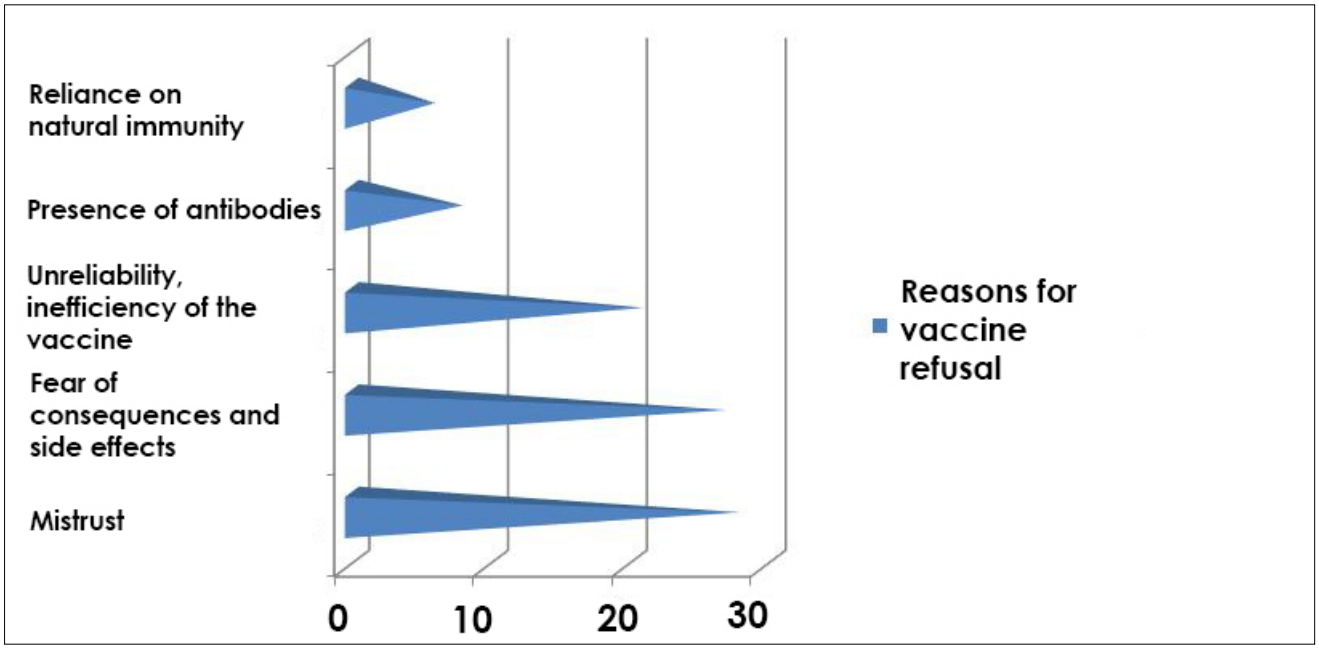

Figure 2. The most frequent reasons for vaccine refusal

The reasons for vaccine refusal obtained in our study are consistent with those analyzed in a large-scale European survey conducted in April 2020 (Neumann-Böhme et al., 2020). Reasons like a lack of trust or legitimacy of the vaccine certainly deserve a separate study and will be addressed in our further research.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 109–121. **doi**: 10.21702/rpj.2021.2.7

Due to the limited sample size and a small number of respondents who expressed their intention to get vaccinated, we could not use statistical criteria to compare the reasons that induced an individual to make a particular decision. The qualitative analysis demonstrated the presence of cognitive aberrations in the judgments of those who refused the vaccine. They included egocentric bias and egocentric error, manifested in the overestimation of one's own opinion (*"I think vaccination is an unreliable method of protection", "It was developed too quickly", and "I see no point in it"*); illusion of control, based on the belief that one can influence the external events (*"This will aggravate the situation with the virus", "My body will cope on its own"*); the empathy gap, which is related to the orientation of an individual towards functioning "here and now" and the inability to predict his/her own behavior in another situation (*"Everything is fine as it is", "Neither I nor my close ones were sick"*); illusory correlation ("*There are many examples of vaccine deaths", "Statistics of infections and their consequences"*).

Those respondents who plan to get vaccinated against COVID-19 specify such reasons for their decision as *safety for themselves and others*, *preventive care*, *psychological comfort,* and *recommendations of their close ones*.

We should note the presence of a contradictory result obtained in the course of the survey: despite the reluctance of most study participants to get vaccinated, almost half of the respondents consider vaccination as an opportunity to stop the infection (51.3 %), to protect oneself (29 %) and to perform a social duty (9.2 %). In our opinion, this indicates a clear cognitive dissonance, which may lead to motivational conflicts and contradictions, cognitive biases in the perception and assessment of the situation. It needs to be specified that although the categorical framework was set by the researcher, the respondents had an opportunity to offer their own response, but only 10.5 % used this option, of which 6.6 % neither chose any existing option nor offered any answer of their own.

To identify the meaning structure of social representations of the vaccine, we analyzed associations to the 'vaccine' stimulus. A total of 356 associations were obtained, the conceptual thesaurus of vaccine representation – its core and periphery – included 259 associations (72.7 % of the total number of associations obtained) (Table 1).

Table 1
The structure of social representations of the vaccine

Frequency	Rank	
	< 2.8	≥ 2.8
> 13	Inoculation (1.73; 33) Medicine (2.17; 18) Injection (2.26; 27) Virus (2.54; 26) Healing, recovery (2.7; 14)	Syringe (3.29; 17) Disease (3.33; 15) Health (3.42; 13) Medical worker (3.36; 14)

Russian Psychological Journal, 2021, Vol. 18, No. 2, 109–121. **doi**: 10.21702/rpj.2021.2.7

Table 1
The structure of social representations of the vaccine

Frequency	Rank	
	< 2.8	≥ 2.8
≤ 13	Protection (2.45; 11) Infection (2.3; 8) Pandemic (2.4; 5) Antibodies (2.63; 8) Pain (2.78; 9) Immunity (2.76; 13)	Healthcare (3; 9) Medical treatment (3.33; 7) Compulsion (3.7; 6) Death (2.67; 6)

The data above indicate that the central core of representations of the vaccine (its most stable part) is characterized by descriptors associated with the specifics of the vaccination procedure ('inoculation, 'injection'), the reason for vaccination ('virus') and perception of the vaccine as medicine. At the same time, the study reveals distorted ideas about its purpose, since the goal of vaccination is not recovery or healing, but preventive care, protection and activation of the reserves and resources of the individual's immune system. It can be stated that the core of vaccine representation is characterized by formal neutrality of associations, verbalized and fixed in collective memory, lack of axiological and emotionally charged notions, associated with the reflection on the global threat and the use of vaccine as an effective coping strategy, absence of relevant personal meanings.

The periphery of representation reflects possible changes and transformations of its content; in addition to associations related to the external setting of the vaccination procedure ('medical worker', 'syringe'), it includes extremely important descriptors that indicate alternative results of vaccination, or rather their subjective perception. On the one hand, the study reveals associative relationship of the vaccine to health, protection, immunity, and antibodies, which indicates positive perception of the vaccine as a preventive measure in the context of current difficult situation and responsible attitude towards one's own health and the health of others. On the other hand, through the negative connotations the vaccine is associated with disease, pandemic, infection, pain, and even death. Such dichotomous content also generates cognitive dissonance, internal conflict, tension of the personality and determines the behavioral pattern regarding vaccination.

Let us analyze other cognitive aspects identified in our study, which influence the attitudes towards vaccination and significantly determine the behavioral strategy of study participants, namely, their intention to refuse potential vaccination (63 respondents, more than 80 %).

The first aspect that needs to be considered is the awareness level of students. On the one hand, the respondents put forward absolutely fair and reasonable demands for careful development and reliable testing of the vaccine, identification of side effects, and possible contraindications.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 109–121. **doi**: 10.21702/rpj.2021.2.7

On the other hand, in the context of exaggerated notion of their own awareness, the study reveals cognitive aberrations caused by subjective beliefs (egocentric bias and egocentric error). This is proved by both survey data and the results of prototypical analysis, which reveal stereotypical, non-interiorized descriptors of the central core of vaccine social representation, as well as the presence of associations that distort the meaning and purpose of vaccination. Overconfidence, overestimation of one's own awareness and the illusion of competence as manifestations of the Dunning-Kruger metacognitive effect have previously been considered as an explanatory principle for vaccine refusal due to autism (Motta, Callaghan, & Sylvester, 2018).

Another block of cognitive biases is associated with imposed delusions, caused by large amounts of misinformation regarding the COVID-19 vaccination and specific vaccines on the Internet, social media, and television. Obviously, such messages are very often politicized and have a clear ideological background, but nevertheless they always increase or even fabricate doubts and significantly reduce people's intention to get vaccinated. And although the ideological context can hardly be adjusted, even despite the global scale of the threat to the whole of humanity, the distribution and persistence of COVID-19 misinformation as a network phenomenon requires network intervention (Young et al., 2021).

A cognitive dissonance, which arises in response to a complex, unexpected and uncertain situation of the pandemic, is explained by an individual's lack of clear cognitive patterns and proven adequate algorithms of actions. It can be reduced either by selective perception of incoming information related to COVID-19, or by constructing a simple and subjectively relatable situation in the framework of 'we – they' dichotomy ('conspiracy', 'microchip implantation', 'compulsion', 'artificial selection') and categorization of certain causality in the given context (illusion of control, illusory correlation). In this case, causal attribution facilitates a non-conflict inclusion of uncertain situation into mental space of an individual, formation of explanatory personality patterns, justification of one's choice and stimulation of confidence in its exclusivity and legitimacy.

Interestingly, Kahneman, Slovic, & Tversky (2005) in their study of an 'irrational human' conducted an experiment using an assumed situation of vaccination as a form of protection and demonstrated the importance of contrast between reducing the risk of the decision and its complete elimination. They convincingly proved that the influence of the context ('framing effect') determined the nature of the decision made as follows: in a positive context of benefits and gains, an individual inclined towards a cautious and safer decision, whereas the context of penalties and obvious losses encouraged more risky actions. Apparently, the majority of study participants perceived and assessed the given positive context of the term of 'vaccine' – self-protection, ability to stop transmission of the infection, and social duty – as congruent with a cautious decision not to get vaccinated, and they easily fell into the 'trap' set by the researcher, making it possible to identify another cognitive bias.

Conclusion

The pandemic caused by the COVID-19 virus has been recognized by the World Health Organization as a real threat to the existence of humanity. A possible response to this civilizational challenge is large-scale immunization of the population, facilitated by the world's leading companies that carry out research and implement innovations, which can stop transmission of the infection, achieve the desired level of herd immunity, and restore the economic, political, and socio-cultural order. However, it is important to not only create an effective and safe remedy

Russian Psychological Journal, 2021, Vol. 18, No. 2, 109–121. **doi**: 10.21702/rpj.2021.2.7

and make it as affordable as possible for all social groups, but also to convince people of the necessity to get vaccinated, since indecisive attitude or overt protest against the vaccine pose a serious threat to global health.

This study, aimed at identifying the cognitive aspects of students' attitudes towards COVID-19 vaccination, confirms that an individual's refusal of the vaccine as a conscious pandemic response is caused by ambivalent assessment of its possible consequences, and cognitive aberrations (overestimation of one's own competence, imposed beliefs, egocentric error, illusion of control over the situation, illusory correlation, and cognitive dissonance). The analysis of the meaning structure of representations of the vaccine shows that the central core of representations contains formally neutral associations, which set a relatively safe context and encourage an individual to make cautious decisions about COVID-19 vaccination.

At the same time, the results obtained require further refinement, since the study has certain limitations, associated with empirical sampling (small sample size, gender imbalance, and geographical homogeneity), overdetermined and complex structure of attitudes towards an individual's decision to vaccinate, including cognitive, emotional and behavioral components, ongoing status of the pandemic, its different waves, outbreaks and remissions, each stage of which is sensitive to current information and attitudes towards the vaccine.

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Cognitive Component in the Structure of Students' Legal Consciousness in the Analysis of Economic Offence Cases

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Abstract

Introduction. The cognitive component in the structure of students' legal consciousness still remains an understudied area. It is unclear how students use the content of representations of economic offences in the analysis of potentially unlawful situations. This study aims to identify and examine the content of cognitive component elements in the structure of students' legal consciousness in the process of solving economic offence cases (exemplified by corruption risk situations) – namely, representations of corruption, cognitive skills required to recognize it, and characteristics of the relationship between these elements.

Methods. The correlation and regression study involved 119 students of Moscow universities. The diagnosis of variables was performed using authors' original diagnostic tools (the Open-Ended Questions and the Test of the Ability to Recognize Economic Offences).

Results. We observed significant correlations between the content of students' representations of economic offences exemplified by corruption ('knowledge') and the level of the cognitive ability to identify essential characteristics of economic offences ('characteristics') ($\rho = 0.438$; $p \leq 0.01$), as well as between the content of students' representations of economic offences ('knowledge') and the cognitive ability to apply the rule of logical inference when recognizing economic offences in corruption risk situations ('inference') ($\rho = 0.441$; $p \leq 0.01$). We found a significant impact of the 'characteristics' and 'inference' variables on the 'knowledge' variable ($p < 0.05$).

Discussion. For the first time it has been shown that cognitive component elements of legal consciousness related to representations of economic offences are coordinated with each other. To form complete and generalized representations of economic offences among students, it is necessary to develop their cognitive skills that may enable them to (a) analyze problem situations and identify essential characteristics of economic offences and (b) infer whether the situation can be classified as unlawful. The findings of this study may be used to develop training programs aimed at forming the cognitive component of students' legal consciousness.

Keywords

legal consciousness, representations, cognitive skills, logical operations, naive conceptions, scientific concepts, economic offences, corruption, legal socialization, case method

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

Highlights

- Students' representations of economic offences (exemplified by corruption) exhibit characteristics of naive conceptions and are incomplete, specific, intuitive, and unstructured.
- It is necessary to extend the structure of the cognitive component of students' legal consciousness, which should include representations of legal offences, and also cognitive skills required to incorporate these representations into the process of recognizing unlawful situations.
- Completeness and generality of students' representations of economic offences are significantly determined by the level of their cognitive skills – the ability to identify essential characteristics of economic offences and the ability to infer whether the situation is unlawful.

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Introduction

The establishment of the rule of law in civil society is impossible without a high level of legal socialization and legal culture. Legal consciousness of citizens should be developed in the process of family upbringing and through appropriate educational programs (Fundamental Principles of State Policy..., 2011).

Legal consciousness is described as a complex psychological construct that includes a set of social attitudes to such objects and phenomena of the legal sphere as law, crimes and criminals, punishment, as well as law enforcement, judicial, and penitentiary systems (Gulevich, 2009). Some researchers distinguish the following elements in the construct of legal consciousness: (a) worldview (an individual's system of beliefs about the world and one's own place in it, basic life philosophy in the form of principles, ideals, and values), (b) perception (assessment and interpretation of ongoing legal events), and (c) decision (choice of a behavior model in the legal sphere) (Chua & Engel, 2019). Other researchers propose a two-component structure of legal consciousness, which includes (a) legal psychology (a combination of feelings, emotions, desires, expectations, and experiences in relation to legislative and law enforcement activities of social institutions) and (b) legal ideology (a system of legal ideas, theories, and approaches, according to which individuals recognize the existing law, assess legal reality, and express the desired law) (Bieliauskaite & Slapkauskas, 2015). As shown by the descriptions of the constructs, some components of legal consciousness are associated with emotional and motivational spheres of the human psyche, while others are related to its cognitive sphere. Some researchers add a third (behavioral) component of legal consciousness, which is understood as a process of translating legal norms into actual legal behavior guided by legal attitudes and motives (Orekhova, 2020). In other words, they address the need to study not only characteristics of motivational, emotional, and cognitive spheres of the human psyche, but also the algorithm for making decisions about legal behavior.

We agree with the authors who distinguish the following three components in the structure of legal consciousness: (a) cognitive (representations of each of the following legal spheres: law, crime and criminals, punishment, and law enforcement systems), (b) affective (emotional evaluation of legal phenomena in the indicated spheres), and (c) behavioral (intention to behave

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

in a certain way in legal situations associated with the four indicated legal spheres) (Gulevich, 2009). Therefore, in the context of this study representations of economic offences are regarded as an element of the cognitive component of legal consciousness related to economic offences.

In our study, we analyze economic offences using a case study of corrupt practices. The Criminal Code of the Russian Federation provides the following definition of corruption, "Corruption is (a) abuse of public office, giving or receiving bribes, abuse of powers, commercial graft, or other illegitimate use by an individual of his/her official status against interests of society and the State to receive private gain in the form of money, values, other property or services involving property, and other property rights for himself/herself or for third parties, or illegal provision of such a benefit to the specified individual by other individuals; (b) committing the above mentioned acts on behalf or for the benefit of a legal entity" (Criminal Code..., 2017; Federal Law..., 2008). This definition makes it possible to distinguish three essential characteristics of corruption: (a) the office holder, (b) abuse of authority, and (c) personal gain. "The content of this definition can serve as a basis for studying subjects' representations of corruption and the ability to recognize situations of economic offences using corruption as an example" (Pogozhina & Pshenichnyuk, 2020, p. 31).

Up to this day, legal psychology has not paid sufficient attention to studying the cognitive component of legal consciousness related to representations of economic offences. It was identified that "structural and substantial components of public representations of corruption are formed at the level of everyday interaction and do not reflect macro psychological threats to society's well-being" (Kitova, 2019, p. 157). Students fail to correctly identify legal characteristics of corruption ("What is corruption?"); their representations of corruption are incomplete, non-generalized, and depend on their specialization (Lukina & Larionova, 2017). Law students demonstrate higher level of knowledge and better ability to recognize corruption compared to students specializing in other fields (Becker, Hauser, & Kronthaler, 2013). It was established that to form the skill of recognizing corruption situations, students need to have the following two psychological conditions: (a) complete and generalized knowledge of corruption and (b) developed ability to perform the logical operation of 'bringing under the concept' (Pogozhina & Pshenichnyuk, 2020). At the same time, there are no studies that demonstrate *how* students use the content of representations of corruption in the analysis of corruption risk situations (i.e., based on which cognitive skills representational content is incorporated in the process of recognizing this type of situations). Therefore, it is still important to examine a relationship between students' representations of corruption as an element of the cognitive component of legal consciousness and characteristics of incorporating this element into the process of recognizing this type of economic offences.

We proceed from the assumption that representations, as generalized sensory image that possesses the property of meaningfulness, are incorporated in the analysis of problem situations with a risk of committing economic offences using special cognitive skills (mental actions), aimed at identifying characteristics of the situation and categorizing it by type (Bogoyavlenskii & Menchinskaya, 1959; Gal'perin, 1966). The knowledge criterion is inextricably associated with cognitive actions (skills). Thus, to know is to be able to perform actions (in particular, cognitive ones) associated with this knowledge. Without such actions, an individual can neither acquire new knowledge, nor apply it to solving his/her problems (Talyzina, 2018). Therefore, in our opinion, the analysis of the cognitive component of legal consciousness should not be limited to studying the content of students' representations of corruption. It is also necessary to analyze how these representations are incorporated into the problem situation. Consequently, the study

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

of the cognitive component of legal consciousness should analyze the relationship between at least two its elements: representations of economic offences and the ability *to use them in the analysis* of corruption risk situations.

Some studies indicated that although the society provides an individual with a system of cultural legal meanings, the content of legal representations remains largely naive (Fein, 2017; Rifai, Pitriadin, & Triono, 2021). These naive (everyday) conceptions are relatively independent from the actual legal relations in the society and exert their influence on the behavior and decisions associated with the legal sphere (Moscovici, 1995).

The main parameters that distinguish naive conceptions from scientific concepts include (a) the level of generalization, (b) the method of knowledge acquisition, (c) the level of consciousness, and (d) the level of interconnectedness. Naive conceptions (prior knowledge) are specific, acquired during sensory and practical experience, poorly realized, and usually unstructured. Scientific concepts, on the other hand, are generalized, acquired during a purposefully organized training, conscious, and systematic (Vygotsky, 1999; Klopfer, Champagne, & Gunstone, 1983). The diagnosis of prior knowledge is a prerequisite for any effective training, as erroneous prior conceptions are persistent and obstruct the process of obtaining objectively correct knowledge (Lucariello & Naff, 2010). In addition, along with cognitive skills prior conceptions are significant predictors of effective complex problem solving (Süß & Kretzschmar, 2018).

Legal cynicism, with its inherently inaccurate knowledge of economic offences, carries high risks of making unlawful decisions in problem situations associated with potentially corrupt interactions (Ameri et al., 2019; Gifford & Reisig, 2019). One of the reasons for committing unethical acts, which include corruption practices, is lack of knowledge regarding ethical behavior (Ashari, Nanere, & Trebilcock, 2018; Kim & Loewenstein, 2020) and legal norms – in particular, lack of knowledge about the essence of corruption (Becker et al., 2013; Feldman, 2017; Hauser, 2019). It was established that ethical decision-making is affected not by mere knowledge in the fields of morality, law, and ethical principles (Chen, Treviño, & Humphrey, 2020), but by complex constructs represented by mental models – complex forms of knowledge that reflect causal relationships between key characteristics of the problem (Bagdasarov et al., 2016). It was observed that there is a negative relationship among rational decision-making, which involves logical structures, delinquent and deviant behaviors (alcoholism and drug addiction) (Paternoster, Pogarsky, & Zimmerman, 2011; Pogarsky, Roche, & Pickett, 2018), and victimization and cybercrime (Louderback & Antonaccio, 2017). The overall level of students' cognitive abilities was found to be an important factor determining dishonest behavior (Gerlach, Teodorescu, & Hertwig, 2019).

Therefore, to avoid the risk of making an unlawful decision, the system of the cognitive component of students' legal consciousness should contain (a) normative representations (scientific concepts) of economic offences, in particular, corruption, and (b) cognitive skills that help an individual to recognize characteristics of this offence type in a problem situation. The results of review demonstrate that naive conceptions of economic offences are incomplete, non-generalized, intuitive, and poorly systematized, which can interfere not only with correct recognition of this type of offence, but also with the process of acquiring objectively correct knowledge in this area and formation of legal consciousness in general. In the literature there are no studies that describe the relationship between the content of students' representations of corruption and the level of skills that incorporate these representations into the process of recognizing corruption risk situations. Therefore, we undertook this study to solve this scientific problem.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

This study aims to identify and examine the content of cognitive component elements of students' legal consciousness in the process of solving cases of economic offences (exemplified by corruption risk situations) – namely, representations of corruption and cognitive skills that help recognize it, and characteristics of the relationship between these elements.

Hypotheses. There is a significant relationship between the content of students' representations of economic offences (exemplified by corruption) and the level of cognitive skills that help recognize this type of offences, including the ability to analyze problem situations and identify significant characteristics of corruption and the ability to infer whether the situation is corrupt (in a case study).

Methods

The sample comprised 119 students (83 females and 36 males; mean age = 30 ± 10.6 years) from different academic programs and modes of attendance, enrolled in the following Moscow universities: Lomonosov State Moscow University (Faculty of Psychology), Moscow Aviation Institute (Faculty of Aviation Engineering), and Plekhanov Russian University of Economics (Faculty of Business and Additional Education).

Diagnostic tools

The diagnosis of representations of economic offences (exemplified by corruption) was performed using the Open-Ended Questions (I. N. Pogozhina, D. V. Pshenichnyuk, & M. V. Sergeeva), which included the following three tasks: (a) to define corruption ("What is corruption?"), (b) to provide an example of corruption, and (c) to justify the provided example ("Why is it corruption?") (Pogozhina & Pshenichnyuk, 2020).

To diagnose the level of cognitive skills that help determine (recognize) corruption risk situations, we used the case study method (Cronbach's alpha = 0.889). The cases (developed by M. V. Sergeeva) required analysis and solution of three types of problem situation that suggested a possibility of corrupt interaction: (a) everyday situations (Kendall's $W = 0.621$, $p < 0.05$), (b) excerpts from fiction (Kendall's $W = 0.674$, $p < 0.05$), and (c) episodes from feature films (Kendall's $W = 0.837$, $p < 0.05$). Test success was evaluated on the following two scales: (a) ability to identify the characteristics of corruption ('characteristics'; Cronbach's alpha = 0.918) and (b) ability to infer whether the situation was corrupt ('inference'; Cronbach's alpha = 0.687).

To assess the level of cognitive skills, which help recognize corruption, in the case study we used normative content of the corruption concept, which is formulated in the Criminal Code of the Russian Federation and includes the following three characteristics: (a) the holder of office, (b) abuse of his/her authority, and (c) his/her personal gain (Pogozhina & Pshenichnyuk, 2020).

Statistical methods of data analysis applied in this study included correlation analysis (Spearman's ρ) and multiple regression analysis in SPSS 25.0 software.

Procedure

The study was carried out face to face; the respondents successively completed the diagnostic tasks. Access to any information sources was prohibited. We determined specific characteristics of representations of economic offences and the level of cognitive skills that help recognize this type of offences (exemplified by corruption risk situations). Next, we studied the relationship between the indicators of students' representations of economic offences and the cognitive skills, which

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

help them to recognize such offences, using the following statistical procedures: (a) correlation analysis using Spearman's ρ coefficient and (b) multiple regression analysis in SPSS 25.0 software.

Results

1. *Tables 1–3 show diagnostic results of respondents' representations of economic offences (exemplified by corruption risk situations).*

The majority of students (65.5 %) relied on all three characteristics of corruption (in accordance with the Criminal Code) only when they provided their examples. The task, where the students were the least likely to identify all three characteristics of corruption, was the definition (39.5 %) (Table 1).

Table 1
Number of identified characteristics of corruption (the Open-Ended Questions)

N of identified characteristics	Definition ("What is corruption?")			Example ("Provide an example of corruption")			Example justification ("Why is it corruption?")		
	N of students	% of students	Accumulated %	N of students	% of students	Accumulated %	N of students	% of students	Accumulated %
0	9	7.6	7.6	5	4.2	4.2	9	7.6	7.6
1	9	7.6	15.1	12	10.1	14.3	18	15.1	22.7
2	54	45.4	60.5	24	20.2	34.5	35	29.4	52.1
3	47	39.5	100.0	78	65.5	100.0	57	47.9	100.0
Total	119	100.0		119	100.0		119	100.0	

'The holder of office' was least frequently identified characteristic in the content of the corruption concept; less than half of respondents took it into account in their definitions and examples (42.9 % and 49.6 %, respectively) (Table 2). In definitions, the leading characteristic that students relied on in their answers was 'personal gain'. Meanwhile, in the examples and their justifications 'abuse of authority' and 'personal gain' were most pronounced.

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

Table 2
Main characteristics of corruption (the Open-Ended Questions)

Main characteristics of corruption	Definition ("What is corruption?")			Example ("Provide an example of corruption")			Example justification ("Why is it corruption?")		
	N of students	% of students	Accumulated %	N of students	% of students	Accumulated %	N of students	% of students	Accumulated %
Holder of office	51	42.9	100.0	88	73.9	100.0	59	49.6	100.0
Abuse of authority	105	88.2	100.0	103	86.6	100.0	100	84.0	100.0
Personal gain	107	89.9	100.0	103	86.6	100.0	100	84.0	100.0
Total	119	100.0		119	100.0		119	100.0	

Only 24 % of participants relied on all the three necessary and sufficient characteristics of corruption ('knowledge'), when they answered each question of the Open-Ended Questions (Table 3). We may assume that only these respondents are characterized by fully developed representations of this type of economic offence, which are complete and general.

Table 3
Descriptive statistics according to the diagnostic results

Variables	N	M	SD	% of students	Min	% of students	Max	% of students
Knowledge	119	6.82	2.02	24	0	2	9	24
Characteristics (literature)	119	8.12	3.40	53	0	7	15	8

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

Table 3
Descriptive statistics according to the diagnostic results

Variables	N	M	SD	% of students	Min	% of students	Max	% of students
Characteristics (video)	119	16.79	4.93	64	0	1	30	5
Inference (10 everyday situations)	119	4.69	1.52	24	0	1	8	1
Inference (literature)	119	2.71	1.40	27	0	3	5	15
Inference (video)	119	5.94	1.75	24	1	1	9	7

2. *Tables 3–4 show diagnostic results for the level of cognitive skills that help determine (recognize) economic offences (exemplified by corruption).*

2.1. Ability to identify characteristics of corruption in case analysis (Tables 3–4).

The majority of students identified two main characteristics of corruption, when they justified their answers whether the behavior of protagonists of literary excerpts (for 52.9 % of respondents) and film episodes (for 64.7 % of respondents) was corrupt (Table 4).

In 5 literary excerpts, the maximum total score on the 'characteristics' scale was obtained by only 8 % of respondents; 5 % of students scored maximum in 10 film episodes (Table 3).

Table 4
Number of identified characteristics of corruption (Test of the Ability to Recognize Economic Offences)

N of identified characteristics	Literary excerpts			Film episodes		
	N of students	% of students	Accumulated %	N of students	% of students	Accumulated %
0	8	6.7	6.7	1	0.8	0.8
1	38	31.9	38.7	35	29.4	30.3
2	63	52.9	91.6	77	64.7	95.0
3	10	8.4	100.0	6	5.0	100.0
Total	119	100.0		119	100.0	

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

2.2. Ability to apply the rule of inference in the analysis of problem situations that contain a possibility of corrupt interaction (Table 3).

On the average, students (24 %) correctly recognized 4 or 5 everyday situations out of 10; only 1 % of students obtained the maximum score. Students (27 %) were correct about 3 situations out of 5 literary excerpts; 15 % of respondents demonstrated the maximum score. In the analysis of film episodes, the majority of study participants (24 %) made the right inference in 6 situations out of 10; only 7 % of surveyed students scored maximum.

3. *Results of correlation analysis.*

To test research hypotheses, we compared total scores of the respondents, obtained using both diagnostic tools (Table 5).

Table 5
Descriptive statistics of the variables and correlations between them (N = 119)

Variables	M	SD	1	2	3
Knowledge	6.82	2.02		0.438**	0.441**
Characteristics	13.34	3.36	0.438**		0.427**
Inference	24.88	7.19	0.441**	0.427**	

Note: ** the correlation (Spearman's ρ) is significant at the 0.01 level (2-tailed).

We observed a significant relationship ($p \leq 0.01$) between the content of representations of corruption and the level of cognitive skills (Table 5) – (a) ability to identify characteristics of corruption in case analysis ($\rho = 0.438$) and (b) ability to infer whether the situation is corrupt ($\rho = 0.441$).

Independent variables (ability to identify the main characteristics of economic offences and ability to make correct inference) significantly correlate with the dependent variable (knowledge/representations of corruption) ($R = 0.530$ at $p < 0.05$). A combined effect of 'characteristics' and 'inference' predictors explains 28.1 % of variance in the 'knowledge' variable (Table 6). Taken separately, each predictor exerts significant influence on the 'knowledge' variable; the contribution of 'characteristics' is greater ($\beta = 0.323$) than that of 'inference' ($\beta = 0.307$).

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

Table 6
Multiple regression analysis of representations of economic offences

Variables	B	SH_B	β	t	p
Characteristics	0.091	0.24	0.323	3.734	0.000
Inference	0.185	0.52	0.307	3.550	0.001
$R = 0.530$ $R^2 = 0.281$ $F = 22.645$ $p = 0.000$					

Note: dependent variable – *knowledge*; predictors – *characteristics, inference*.

The relationship between the 'characteristics' and 'knowledge' variables tends to be linear, although the quadratic equation explains a higher percentage of variance ($R^2 = 0.204$) than liner one ($R^2 = 0.203$) (Table 7). The relationship between 'inference' and 'knowledge' variables is better described by a quadratic equation, which means that even students with the lowest level of representations (0–2 scores) can correctly recognize economic offences. As the level of the development of representations increases the number of correctly recognized situations increases as well.

Table 7
Estimation of the curvilinearity of the relationship between representations of economic offences and the ability to recognize them

Variables	Equation	R^2	F	df1	df2	p	Const	b1	b2
Knowledge (dependent)	Linear	0.194	28.221	1	117	0.000	8.344	0.734	
Inference (independent)	Quadratic	0.206	15.074	2	116	0.000	10.043	0.012	0.064

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

Table 7
Estimation of the curvilinearity of the relationship between representations of economic offences and the ability to recognize them

Variables	Equation	R^2	F	df1	df2	p	Const	b1	b2
Knowledge (dependent)	Linear	0.203	29.741	1	117	0.000	13.974	1.601	
Characteristics (independent)	Quadratic	0.204	14.910	2	116	0.000	15.391	0.998	0.053

Discussion

The data obtained demonstrated that out of 119 respondents, only 29 students (24 %) identified all three characteristics in their definitions of the studied concept, example, and its justifications (Table 3). This is in line with the general statement of the activity approach to education that to form *any* scientific concept, students need to develop a basic logical operation of defining the concept ('bringing under the concept') (Talyzina, 2018). It also confirms the results of the study in the field of students' terminological competence, which states that the ability to verbatim reproduction of terms does not imply its accurate usage and correct understanding (Bordovskaya, Koshkina, Tikhomirova, & Bochkina, 2018). Since only 29 out of 119 students have developed this logical operation, the others had difficulties in providing an example of corruption and justifying it, even if they could reproduce the definition of corruption (similarly, schoolchildren from the study by N. F. Talyzina unmistakably reproduced the definition of 'circumference' but found it difficult to answer whether an ellipse was a circumference or not) (Talyzina, 2018).

The results obtained are also consistent with L. S. Vygotsky's provisions on scientific and everyday concepts, as well as 'naive theories' in cognitive psychology. Our study participants did not identify all the three significant characteristics of corruption in the proposed tasks, as their intuitive and spontaneously formed knowledge was incomplete, unstructured, and did not possess the necessary level of generalization (Vygotsky, 1999). Moreover, our data do not contradict the theory of social representations by S. Moscovici and the concept of legal consciousness by O. A. Gulevich, according to which social representations of economic offences (in our case, representations of corruption) among students exist regardless of the actual legal relations in the society (we proceed from the assumption that our respondents do not engage in unlawful activities) and, therefore, do not contain all the essential characteristics of the concept of corruption (Gulevich, 2009; Moscovici, 1995).

The relationship between the content of students' representations of economic offences (exemplified by corruption) and the level of cognitive skills that help recognize unlawful situations was

Russian Psychological Journal, 2021, Vol. 18, No. 2, 122–137. **doi**: 10.21702/rpj.2021.2.8

significant ($p \leq 0.01$). Therefore, both proposed hypotheses were confirmed. Regression analysis showed that a set of predictors (the ability to identify main characteristics of corruption and the ability to make correct inference) made a significant contribution ($p < 0.05$) to the 'knowledge' variable (the level of representations of economic offences). The relationships observed in cognitive component elements of legal consciousness related to representations of economic offences confirm the results of studies, which demonstrate that knowledge and skills are qualitatively superior in those individuals, who have developed basic logical structures, in particular, the skill of 'bringing under the concept' (Pogozhina & Pshenichnyuk, 2020; Talyzina, 2018). Moreover, our results correlate with requirements for legal and anti-corruption educational programs. For example, in Australia law students are encouraged to develop specific logical skills (Burton, 2017). Thus, first year students are suggested to use a categorizing grid based on IRAC (*Issue, Rule, Application, and Conclusion*) in their analysis of problem situations (whether the case participant is guilty or not guilty). IRAC involves the following sequence of actions: (a) distinguishing the elements in a problem situation, (b) finding laws that correspond to these elements, (c) comparing the elements of the problem situation to the elements in the legislative acts, and d) drawing conclusions (Burton, 2017). In our opinion, this sequence of actions is similar to the orienting basis for the logical operation of defining concepts ('bringing under the concept'). Foreign educational programs in the field of corruption prevention focus on the development of anti-corruption attitude, which is based not only on affective reactions and intentions, but also on cognitive skills associated with recognizing corruption (Basabose, 2019).

Thus, we have established that cognitive skills that help recognize economic offences exert significant influence on the level of development of representations of corruption and should be included in the structure of the cognitive component as one of the elements of legal consciousness. Therefore, the programs of legal socialization for forming citizens' legal consciousness related to economic offences should include a special section aimed at developing such skills. This will be the aim of our future research.

Conclusion

For the first time we described the relationship between the elements of the cognitive component of students' legal consciousness related to representations of economic offences – students' representations of corruption and cognitive skills that help incorporate these representations into the process of recognizing corruption risk situations.

The content of students' representations of corruption correspond to the level of naive conceptions, which makes them incomplete, specific, intuitive, and unstructured.

We confirmed both hypotheses about the presence of a significant relationship between the content of students' representations of corruption (as one of the types of economic offences) and the level of cognitive skills, including (a) the ability to analyze problem situations and identify essential characteristics of corruption and (b) the ability to infer whether the situation is corrupt. This significant relationship indicates that the structure of the cognitive component of legal consciousness, along with other elements, should also include the cognitive skills described above.

The results of regression analysis enabled us to draw the following conclusion: the development of the ability to identify main characteristics of economic offences and the ability to make correct inference when recognizing potentially unlawful situations leads to more complete and generalized representations of economic offences among students. These findings should be

taken into account when creating legal socialization programs, aimed at forming and developing the cognitive component of students' legal consciousness.

Prospects for further research. As shown in the theoretical part of the study, legal consciousness is systemic. One of its components may play a pivotal role, while others are subordinated (Gulevich, 2009). Therefore, in addition to the cognitive component it is necessary to investigate other components, such as emotional and behavioral ones (in our opinion, the latter should be considered as 'motivational') and determine which one plays the leading role in the system of legal consciousness. This can help develop programs for forming citizens' legal consciousness based on its leading component.

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I. N. Pogozhina conducted scientific supervision, developed methodological concept of the study, designed the empirical study, developed diagnostic tools, performed critical analysis and revision of the manuscript.

M. V. Sergeeva wrote the literature overview, developed diagnostic tools, collected data, performed statistical processing of the results, and prepared the first version of the manuscript.

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THE SOVIET COLLECTIVE AS A PSYCHOLOGICAL AND HISTORICAL PHENOMENON

Review of the book entitled "Genealogy of the Soviet Collective" by Dontsov, A. & Dontsov, D. (2019).

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It is difficult and sometimes impossible to discover personal involvement and subjectivity of authors who create a documentary or journalistic work. In fact, the book entitled "Genealogy of the Soviet Collective" by A. Dontsov & D. Dontsov (Dontsov & Dontsov, 2019) is a deep insight into the way the matrix of Soviet life was formed and the reasons why the collective has occupied a central place in the existence of Soviet generations, and why it came into the lives of the 21st century generations, continuing to act as the main need to be together, to establish relations, to belong, etc. The book answers to these historical and psychological questions by combining the 'biography' of such a phenomenon as the Soviet collective and the genealogy of the creators of this original book.

Group–collective – space and school of life

A family (genealogical) tree is used to record the genealogy of individuals, events, and phenomena, as everyone knows. The authors of the book create a family (genealogical) tree, which includes the most important events that influenced not only their participants, but also all subsequent generations (Baranova & Dontsov, 2019; Gal'perin, 2009; Nurkova, Mitina, & Yanchenko, 2005; Sapogova, 2005). A. Dontsov & D. Dontsov, carrying out a historical and psychological analysis of the lifetime of ancestors, showing the origins of values, ideas, characters, aspirations, and experiences, are not so much concentrated on their own family tree, but rather through its prism demonstrate vitality, fundamentality, and, in a certain sense, timelessness and necessity of such a phenomenon as 'collective' and such a property of generations as 'collectivism' (Dontsov & Dontsov, 2019).

One of the authors of the book, Academician A. I. Dontsov, bluntly writes that "the interest in the collective is not accidental in my scientific anamnesis. This will probably affect the subjectivity of assessments. However, it will save readers from amateurishness" (Dontsov & Dontsov, 2019, p. 9). Indeed, this book was written by biased authors who defend the values of their lives, but at the same time it was created by scientists who have devoted many years of their academic lives to the study of the 'collective'. A. I. Dontsov is rightfully considered as one of the creators of the 'group–collective' concept (Dontsov, 1982, 1984; On the anniversary of A. I. Dontsov, 2019). Considering the phenomenon of cohesion, he identified the basic characteristics of the collective

and created diagnostic guidelines for identifying such a group (Dontsov, 1979). Until now, in Russian social psychology, these guidelines represent the foundation on which new or long-forgotten old indicators of the 'group–collective' development are being built (Sidorenkov, 2019).

Including in their genealogy belonging to a certain class, to a certain place, to certain relations generated by the cultural and historical context, the authors enrich the content of the book with personal meanings (Klement'eva, 2019; Kravtsov, 2006; Nurkova, 2000, 2008) and, therefore, actualize the experience of readers, make them experience, empathize, and understand the collective in a new way. This phenomenon could disappear, but thanks to the text created by A. Dontsov & D. Dontsov it remains, convincing us that the 'humaneness' of society is, in a certain sense, the result of the philosophical, psychological, and existential predestination of the 'collective' and 'collectivism'.

I think that noting that "...the Soviet collective... has lost in history. Together with the social system that generated and nurtured it" (Dontsov & Dontsov, 2019, p. 35), the authors of the book once again emphasized the idea that the content of a particular phenomenon and its formation are derivatives of sociocultural context, which is an important idea in social and historical psychology. Undoubtedly, in the interpretations of the Soviet society and the ideologists of the second half of the 20st century, 'the collective has lost' (Zinov'ev, 1994; Fitzpatrick, 2011; Kharkhordin, 2016). In modern interpretations of representatives of the humanities, its content changes, but the main existential functions remain (On the anniversary of A. I. Dontsov, 2019).

Defining the status of the collective as a unit of society, a space of life, the authors of the book, a father and his son, refer not only to the official documents of the epoch that made the research of the Soviet collective relevant (26th Congress of the Communist Party..., 1981) and the achievements of psychological science, but also to the judgments, conclusions of researchers in the field of sociology, political science, culturology, history, and education (Russian Public Opinion Research Center..., 2016; Fitzpatrick, 2011; Kharkhordin, 2016), who studied, as they write, "...the 'ancestors' of our 'main character' – the collective, the circumstances of its birth and socialization" (Dontsov & Dontsov, 2019, p. 20). This section of the book raises the most important issues of interdisciplinary knowledge, certainly, using the example of our 'main character' – the collective. For example, how do previous strangers, who happened to be perhaps by chance in the same place at the same time, become a real psychological community? Why does it happen? How is it expressed? How long does it last? Alexander Ivanovich writes that he searched for answers to these questions "in those distant years" (Dontsov & Dontsov, 2019). I dare to say that at present, representatives of psychological science try to answer the same questions (Sal'nikova & Sidorenkov, 2020; Sidorenkov, Sal'nikova, & Borokhovsky, 2019). In other words, the group as a psychological community and the collective as a social matrix that directs our behavior are the subjects of inexhaustible interest for researchers. It is quite another matter to explain the reasons why this interest grows and becomes stable and why psychology researchers try to find answers to these questions. The authors of the book explain their interest by a particular combination of their own 'genealogy' and the 'biography' of such a phenomenon as the 'Soviet collective', by their own academic history, which is inextricably linked to the history of the Department of Social Psychology at Moscow State University, by meetings and conversations with colleagues, observations and, finally, by faith in the collective as a psychological community with inexhaustible resources of both positive and negative modality (Dontsov & Dontsov, 2019). In general, after reading this book, readers become convinced that the 'group–collective' is both a space of life and a school of life.

The book describes in sufficient detail the place of the collective in the social, labor, and personal life of our compatriots in the 1980s-1990s and points to the parents of the main character – the Soviet collective – who formed and 'reared' it (Dontsov & Dontsov, 2019). The book answers to these questions. And I am thrilled by another question, "...where did the boy (A. I. Dontsov, – *author's note*) with not the most 'righteous' genealogy... get a purely Bolshevik conviction of solidarity and unity of the destitute as a guarantee of universal happiness?" (Dontsov & Dontsov, 2019, p. 15). Where indeed, I wonder? Alexander Ivanovich directly answers this question in his book, emphasizing that the way of life in childhood, adolescence, and youth, coupled with the way of life of the whole country, underlie our interests, values, and hopes.

The book doesn't sing the praises of the Soviet epoch and such a phenomenon as the 'Soviet collective'. Instead, it provides a multilayered analysis of the time of life and sometimes contradictory statements regarding the epoch. This is what it was. Therefore, the Soviet collective can exist as an optimistic model of the world order, which in the process of interiorization turns into more realistic models of our being. In view of the conflicting ideas of the Soviet collective, the authors of the book raise the fundamental question of many epochs, "Can the political system be responsible for a balance between good and evil in souls and behaviors of citizens?" (Dontsov & Dontsov, 2019, p. 22). Readers will certainly find the authors' answer to this question in the book. But for me it is more important that they posed this question, and it received an ambiguous answer. Having formulated this question, the creators of the book involve the reader in a discussion that lasts for many centuries, and the stand of the participants in the discussion will certainly indicate both their genealogy and the way they understand the Soviet collective, the role of socio-political institutions in its formation, and the role of human needs in consolidation and solidarity.

The book includes sections which reflect the psychological, historical, and biographical stand of the authors. Readers will learn about the 'ancestors' of the Soviet collective, to get acquainted with the way of life of their parents, which is difficult to imagine without ideology and institutions of power, without a place and time of birth. In this book, readers will find the 'breadwinner' of the Soviet collective – social pedagogy – which is not often mentioned from this viewpoint.

Conclusion

In conclusion of the review, I would like to disagree with the authors of the book, who, as they write, did not strive to create a "fundamental theory of a 'the extinguished star' – the Soviet collective" and only outlined "some cultural and historical preconditions for its emergence and enviable vitality" (Dontsov & Dontsov, 2019, p. 24). In my opinion, if the "Genealogy of the Soviet Collective" cannot be ranked among the fundamental scientific books, then it may be classified as one of the works that, using humanitarian methodology, leave room for multiple and unfinished interpretations of life. If the star of the Soviet collective has extinguished somewhat, then the star of the collective and collectivism shines more and more brilliantly. Therefore, following the authors of the book, I repeat, "The collective is dead. Long live collectivism".

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