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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 is intended not only for researches, scholars, students, and practitioners, but also for general readers with an interest in the state-of-the-art and most recent developments in psychology.

Russian Psychological Journal welcomes submissions from established researchers, young scholars, educators, and practitioners making significant contributions to thematic fields of the journal.

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The Narrative Identity Analysis as a Way to Study the Crisis of Adulthood

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Abstract: **Introduction**. The article is devoted to the narrative identity analysis of people experiencing a crisis of adulthood. Narrative identity analysis has so far been used to study ego-identity in adolescents. As a study of the ego-identity of people experiencing a crisis of adulthood, it is used for the first time. **Methods**. The study involved 80 people (40 men and 40 women aged 35–45). The analysis of narrative identity was carried out according to the algorithm of M. Syed and S. Nelson. The reliability of the resulting Kappa toolkit k = 0.69, which is a sufficient indicator of reliability. Quantitative indicators of differences in the structure of narrative identity were calculated using Pearson's chi-square, and qualitative indicators were calculated using hierarchical cluster analysis. **Results**. As a result of the study, there were no differences in the experience of the crisis of adulthood between men and women. Nevertheless, quantitative differences were revealed in the narrative identity of people who did not experience a crisis of adulthood, who are experiencing an acute crisis, and who survived it in the recent past. Qualitative differences showed that the three structures differ in the degree of immersion in contradictions and immersion in difficult emotional states associated with them. **Discussion**. The lack of differences in the experience of the crisis between men and women revealed in the course of the study contradicts the well-established opinion that women's crises are related to family cycles. We assume that the 30-year difference in the obtained data may be the reason for this. Qualitative and quantitative differences in groups at different stages of experiencing a crisis have been confirmed both in empirical data obtained by other authors and in psychological theory.

Keywords: age-related crises, ego identity, narrative identity, adulthood crisis, displacement of emotions, qualitative analysis, quantitative analysis, gender-role requirements, cluster analysis, localization of a crisis

Highlights:

- Men and women experience the crisis of adulthood in the same way.

- The structure of narrative identity differs between those who survived the crisis and those who did not experience it: the differences relate to the degree of acceptance of the contradiction and immersion in difficult emotional states associated with them.
- The analysis of narrative identity is an adequate and promising method for studying the crisis of adulthood.

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Introduction

The number of fears of modern man is no less than thousands of years ago. Ancient people were afraid of thunder, the wrath of the gods, and wild animals. Current society have managed that situations, but many other fears have appeared instead of these ones: the fear of tomorrow, the fear of oldness, and the fear of one's finiteness (Verdeş & Rusnac, 2015). These fears especially are actualized with the transition from youth to maturity, when personal believes and achievements are rethought in the context of a limited time. Moreover, the severity of a such fear is the stronger, the stronger social competition is expressed. As K. Lash said, modern culture is a culture of competitive individualism, in which the war of all against all was proclaimed, and the pursuit of happiness led to narcissistic preoccupation (Lasch, 1991). That is why the problem of the crisis of adulthood should now be more relevant than ever. Nevertheless, the peak of interest in the problem of the midlife crisis in Russia occurred in 2005–2007, in the West – in the 90s.

The idea of a midlife crisis became popular in the United States after the publication of Passages (Sheehy, 1976), a book by journalist G. Sheehy, which described the crisis of adulthood in women (Schmidt, 2018). In response to the "Passage" of G. Sheehy, three leading psychoanalysts – D. Levinson, J. Vaillant and R. Gould – postulated the crisis of adulthood as an exclusively male prerogative. In this regard, the midlife crisis has become a springboard for the struggle for the recognition of women as full participants in social relations, and the very concept of "midlife crisis" has been reduced to a chauvinistic cliche and has lost scientific interest (Schmidt, 2018).

In Russia, the crisis of adulthood was studied in the context of mental development (Vygotski, 2000; Elkonin, 2007) without reference to gender. We believe that it was because of the leveling of gender differences in the Soviet Union (Ilyina, 2014). Nevertheless, the qualitative studies described by E. L. Soldatova (Soldatova, 2007) point the opposite of the American idea: both men and women experience a crisis of adulthood, but it passes in different ways and depends on role prescriptions.

Despite the limited interest to the problem of the crisis of adulthood, there are gaps in the study of this topic (Oles, 1999), such as changes in ego-identity during the crisis and after its completion. So far, the structure of ego identity has been studied for the adolescent crisis (McLean, 2005; McLean & Mansfield, 2012), while the ego identity of people experiencing a midlife crisis has remained unexplored. Therefore, the purpose of this work is to describe the structure of a person's ego-identity in the context of the crisis of adulthood.

The crisis of adulthood as a contradiction between fantasy and reality

Throughout our lives, we met several crisis periods, and each of them does not come suddenly, but through the accumulation of dissatisfaction due to discrepancies between expectations and abilities (Craig, 2000). The vast majority of authors (Erikson, 2006; Bratus, 1980; Soldatova, 2007; Levinson et al., 1976) agree that at the age of 30–45, significant changes occur in the personality: time is perceived as limited; people become to compare their believes with the actual achievements, as well as an aware the unfulfillment of many goals set in the early periods of life. B. S. Bratus described most striking manifestation of the crisis: the depressing awareness of the discrepancy between the real Self and ideal Self, between the desired and the possible (Bratus, 1980). In 1965, E. Jacques (1965) published a monograph titled "Death and the midlife crisis", where he empirically proved changes in time perception in adulthood. During ages, the time perspective become shorter and turn to the central motivational aspect: we are above to understand that all of our planes never could be realized, so there is a necessity to concentrate on the most important goals. The tragedy of this period is that people, perceiving the future as limited, are forced to abandon their fantasies in favor of real plans (Freund & Ritter, 2009).

Since the end of the 70s there was a question about experience of the crisis of adulthood by men and women. Due to different gender-role prescriptions, the midlife crisis has long been seen as a lot of men (Schmidt, 2018). D. Levinson (Levinson et al., 1976) conducted research on a male sample of 35–45 years old. With the help of a series of interviews on the example of various biographies, the adult life path of each man was built, including leaving the parental family, mastering the adult world, settling down and reassessing the achieved results and expectations. Later, similar studies were carried out on a female sample (Soldatova, 2007). It turned out that for women, the stages of the family cycle are the most significant indicator (not the transitions of 30–40–50-years, but the birth of children – the growing up of children – leaving the house by grown-up children). It turned out, in particular, that women face the same tasks, but they are solved it in a different way: women's dreams about the future are heterogeneous (there are various options for combining a career and marriage).

Narrative identity

Stories about self are not only information about an isolated episode of life. Narratives contain a personal orientations and evaluations of social events, as well as attitude towards himself (Habermas & Bluck, 2000). Narrating one's life is a mechanism for creating ego continuity (McAdams, 1988). An identity formed through a narrative is commonly referred to as a narrative identity.

The phenomenon of narrative identity was first described by P. Riker (Riker, 1989), but its conceptual apparatus was developed much later by K. McLean (McLean, 2005, 2008). The main idea of K. McLean, taken from E. Erickson (Erikson, 2006) and J. Marcia (Marcia, 1993), is that identification arises as a result of awareness and resolution of contradictions between the Self and the external world (McLean, 2005). As an example, K. McLean (McLean, 2008; Suvorova & Glebov, 2018) described the story of a 17-year-old girl, Annie, about a turning point in her life. The narrator recovered from a medical operation, and if she physically recovered fairly quickly, then she suffered from lost sense of security. Contacts with the surrounding reality began to be experienced differently. So, she had to aware herself and to build social contacts anew. The second story is from18-year-old Sarah, who decided to left university because of discrepancy between university policy and personal values. This conscious choice gave her strength, she said, and now, when she finds herself with a fear of defending her interests, she remembers that incident.

Later, the followers of K. McLean proposed a method for quantitative processing of narratives (McAdams, 2015; Syed & Nelson, 2015). The search for narrative analysis code units is a multi-stage procedure that involves additional research to confirm the legitimacy of identifying certain units (Adler et al., 2017; McAdams & Guo, 2015; McAdams & Pals, 2006). Four categories of encodings have been proposed, varying from study to study (McLean et al., 2020): motivational and affective themes (Tomkins, 1987), autobiographical reasoning (Adler et al., 2017) and structural aspects (Adler et al., 2018).

It is assumed that motivational and affective themes, negative/positive light, narrative coherence will differ in people who have experienced an adult crisis and those who have not. And, since previous studies have established differences in the crisis of adulthood in men and women, we believe that narratives will manifest them. Therefore, our study put forward the following *hypotheses:*

1. The narrative identity structure is different for men and women.
2. The narrative identity structure differs between those who survived the crisis and those who did not.

Methods

Our study involved 80 subjects (40 men and 40 women, 35–45 years old). Respondents were asked to write an essay about the crisis of middle age as well as the goals and values were revised. After receiving responses, a coding system was developed. Statistical analysis included calculation of differences between groups (men-women, no crisis-acute crisis-passed crisis) and hierarchical cluster analysis. Since narrative identity is described by nominal data, statistical analysis was performed using contingency tables (Pearson's chi-square).

Development and verification of the coding system

The parameters for evaluating narratives are given in Appendix 1. In total, 10 parameters were allocated. To check the reliability of the codes used, each text was evaluated for each of the parameters with two appraisers. Thus, each appraiser received 800 assessments. Reliability was calculated with the help of Kappa Cohen (Cohen, 1968) as the ratio of matching assessments to all estimates on the following formula:

$$k = \frac{P_o - P_c}{1 - P_c},$$

where P_o (*relative observed agreement among raters*) – the ratio of the number of coincidences to the total number of assessments; P_c (*hypothetical probability of chance agreement*) – the ratio of expected coincidences to the total number of assessments.

When calculating K, it is recommended to use the following interpretation of the coefficient value (Fleiss, 1981): 0.40–0.60 – meets the minimum requirements; 0.60–0.75 – a sufficient indicator of the validity of the tools; > 0.75 – the composed system of codes is a reliable and valid tool. By substituting our data into the formula, we get the following results (Fig. 1):

Figure 1

Calculation of the Kappa

$$P_O = (278 + 404) / 800 = 0.85$$
$$P_C = (141.9 + 267.9) / 800 = 0.51$$
$$k = 0.69$$

	Yes	No	
Yes	278 (141,9)	50 (186,1)	328
No	68 (204,1)	404 (267,9)	472
	346	454	800

In our case, the coefficient k = 0.69, which is a sufficient indicator of the reliability of the tools.

Results

The frequency analysis showed that 50 % of men (20 people) and 75 % of women (30 people) indicated that they passed crisis or are exercising it by now. The difference of 25 % in favor of women can indicate their greater sensitivity to their emotional states. Moreover, unlike previous studies, according to which the life cycles of women were associated with the development cycles of their children, in our study the crisis of the maturity of women was mainly associated with work. The family take a second place. In men, the crisis in the family and at work was distributed equally (Table 1).

Table 1

The dispersion of the crisis in men and women by spheres of life

Location	Male, %	Female, %
Family	25	21.1
Interpersonal relations	25	15.8
Work	0	26.3
The search of sense of life	0	5.3
Other	50	31.5

We believe that the shift of the women's middle age crisis from a family to work is the fact that modern women identify themselves not only through family roles and seek to occupy official positions along with men.

If we consider the main topics of the crisis, then 20 % of the men indicated the search for relations, 15 % – the search for personal growth, and another 15 % tied the crisis with turning point in life, a sudden occurrence of dissatisfaction which starts the search (see Table 2). In women 36 % cases was associated with the search for professional growth. In second place (21.1 %) – a search for relations.

Table 2

The content of the crisis in men and women

Content of the crisis	Male, %	Female, %
The search of sense of life	0	5.3
The search of relations	20	21.1
The search of inspiration	5	5.3
The search of growth	15	36.8
Crucial moment	15	5.3
Other	45	26.2

Despite the percentage differences in the distribution of the crisis, Pearson's chi-square did not determine the differences. This means that men and women as a whole equally experience a crisis of adulthood. The hypothesis 1 was not confirmed.

When using chi-square to compare a group of people who survived the crisis and did not experience it, differences were discovered in six of the nine evaluated parameters (Table 3). This indicates that the structure of narrative identity is different in people who have survived the crisis and those who have not. The hypothesis 2 was confirmed.

Table 3

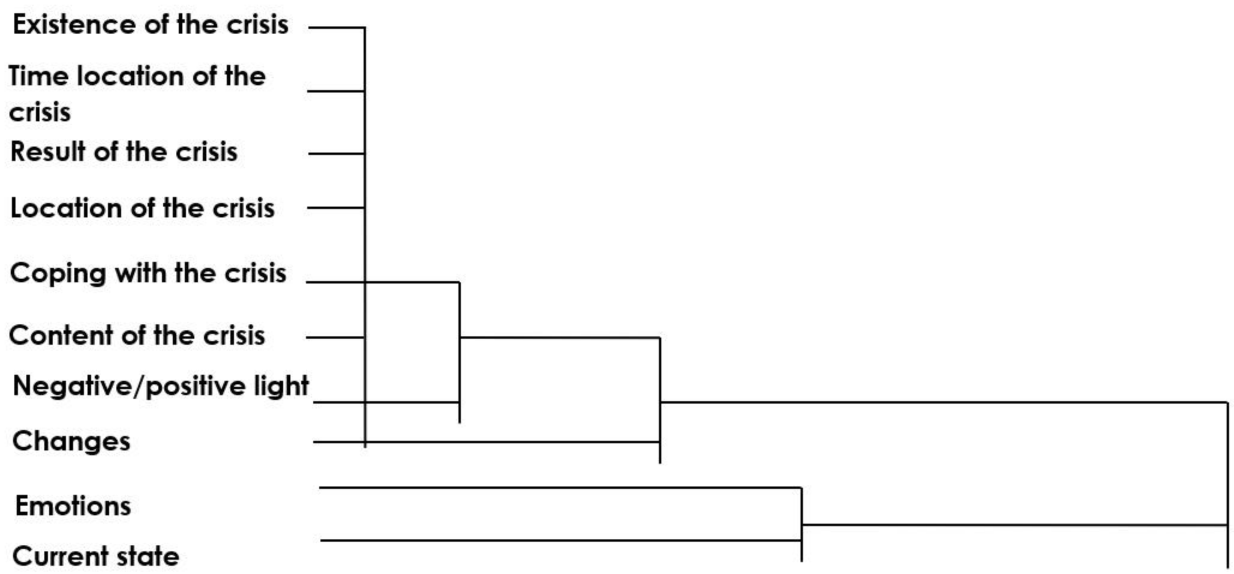
Comparison of crisis experience between sample who survived the crisis and did not

Comparison parameters	chi-square	p
Coping strategies	12.590	0.006
Emotions	13.548	0.001
Result of the crisis	17.435	0.001
Negative/positive light	12.523	0.001
Time location of the crisis	13.418	0.009
Current position	14.354	0.002

A qualitative analysis of differences in the narrative identity structure was carried out using hierarchical cluster analysis. Figure 2 shows the structure of the narrative identity of a person who noted the lack of undergoing a crisis.

Figure 2

Cluster analysis of the narrative identity of people who do not survive the crisis



In Figure 2, we see that the most powerful connections are observed between the presence of the crisis, a temporary segment of the crisis, the result of the crisis, localization of the crisis, the method of coping with the crisis and the content of the crisis. All topics regarding the crisis are in the center of narrative identity. However, emotions are taken beyond the limits of this center. A free-crisis experience of 35–45 years is associated with alienation from emotional life and insensitivity to the contradictions that have arisen (in the event that they arise). An example of such a narrative is presented below.

A man, 37 years old: "I don't know what has changed. I live where I lived before, I work in the same specialty. Was divorced last year. Only boxing somehow entertains me, but without special plans for a career, in this path.

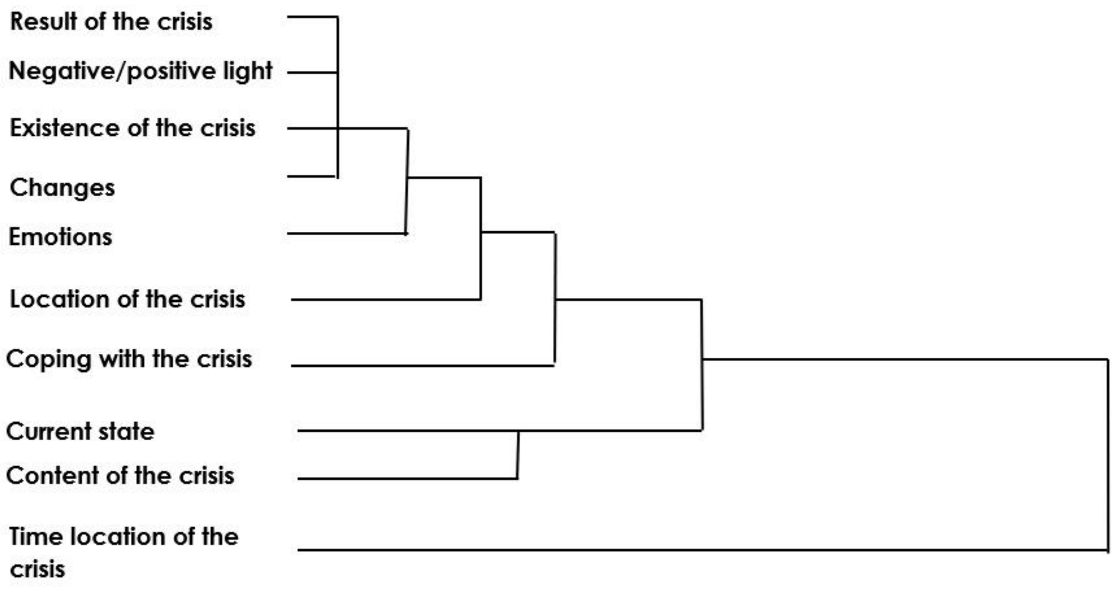
There are no children, I don't plan animals, now I live in a rented apartment, after a divorce.

From time to time, I see my friends, but I have lost many during a married life, so there are not many candidates".

Figure 3 presents a cluster analysis of the narrative identity of people who experience an acute crisis.

Figure 3

Cluster analysis of the narrative identity of people experiencing an acute crisis



In Figure 3, the most powerful connections are found between the result of the crisis, negative/positive light, the presence of a crisis, and the presence of changes. In some distance – emotional background and localization of the crisis. Methods of coping with the crisis, the assessment of the current position and coping strategy are located on the periphery itself. Unlike the previous structure, here the experience of the crisis is intertwined with emotional states. A person at the moment does not see a way out of the situation and is emotionally immersed in an acute crisis state. An example of such a structure can be a narrative of a 42-year-old man.

A man, 42 years old: "I think I have been going through a crisis now for a long time. It seems that I am in this state for at least a year. I have a great job, a car, built a house for my parents – from the material side everything is fine. But inside I feel emptiness. I think I'm missing something in my life, but I don't know how to change it. I like to travel and be free, but because of my work I can't fully do it, but I can't quit work, since it brings me a very good income, although I can't say that I really like it".

Finally, a cluster analysis of the narrative identity of the people who survived the crisis in the past is presented in Figure 4.

Figure 4

Cluster analysis of the narrative identity of people who survived the crisis

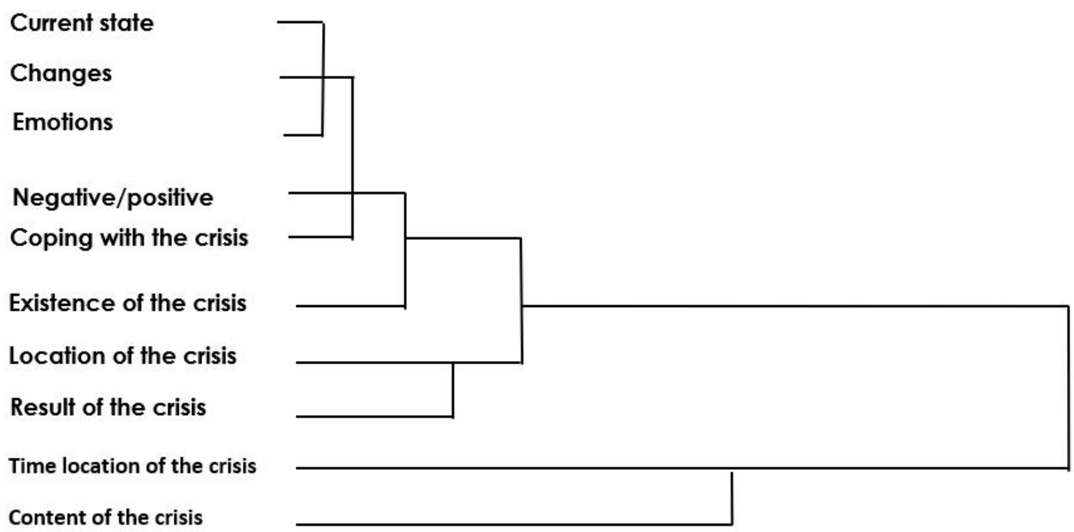


Figure 4 depicts the narrative identity of people who noted that they experienced a crisis in the recent past but believe that they coped with it. As you can see, everything that relates to the crisis is on the periphery of the structure. The closest connections have combined categories such as the current position, the presence of changes, emotional background, negative/positive light and methods of coping with the crisis. We see that a person who has survived the crisis accepts his/her emotions, changes that have occurred to him. An example of such a narrative can be a woman of 38 years old.

Woman, 38 years old: "I definitely passed a crisis and not alone.

But the most memorable was two years ago. I left my husband and moved from him. In general, I wanted to do this for a long time, but I was somehow ashamed, because he left previous family because of me.

But I did not love him anymore, and this made me crazy.

I have never traveled. We always had plans and expenses. Either we build a house, we buy a car, etc.

I have never lived for myself. I'm tired of all. We were together for almost fifteen years, and only the first couple of years were happy. Now I feel as free as never before.

I understand why I hadn't left him before. I had nowhere to go, the condemnation of my parents, well, the fact that I destroyed his past family ... But now I am free and very happy".

Discussion

In our work, unlike previous studies (Tolstyh, 1988; Kulagina, 1999), it was shown that men and women as a whole are equally experienced an adult crisis. So, unlike data of 30 years ago, according to which women are associated with family cycles, in our study, concentration on a career in women was even higher. The reason for this may be female emancipation, which has grown significantly over the past decades. Moreover, there are the date, shown, that women masked their fear about future as an anxieties for children or even for the country as a whole (Skripacheva, 2014). It was the mechanism of transferring the experience of the crisis of the middle of life to the sphere, which is more filed by control (children), or to the sphere, the lack of control over which is obvious. Another reason for the lack of differences between men and women may be the small number of a sample that does not give a complete premium of all the variety of answers.

Nevertheless, the results of our study are confirmed by the data of other modern studies. According to E. A. Pozdnyakova, during the period of the crisis both men and women get tired of work (56 % of men, 62 % of women), and adapt hard to the profession (33 % of men, 43 % of women) (Babiyants & Pozdnyakova, 2020).

Further, we found that the structure of narrative identity differs in people who survived the crisis and did not. Three structures differ between each other by the degree of immersion in contradictions and immersion in severe emotional states associated with them: in the absence of a crisis, that contradictions is not realized, and the emotions associated with it are replaced; in an acute crisis, a person falls into negative emotional states, the contradictions are experienced by unresolved; after the experience of the crisis, the contradictions that have arisen in the past are integrated into the structure of the personality in the same way as emotional states. Our data are confirmed with the data of the empirical study of S. V. Dukhnovsky (Dukhnovsky, 2015), according to which the experience of the crisis of the middle of life is accompanied by the desire of the subject to reject his own unpleasant, negative emotional states and project them on others. Moreover, this condition can be permanent when a person, without solving his contradictions, attributed his negative states to the consequences of the actions of others. Such a permanent crisis state corresponds to the experience of the crisis by women, disguised as care for the family and children described by E. N. Skripacheva (Skripacheva, 2014). Its danger is that it is not solved, but forms a vicious circle, where the projections of a person form an unfavorable reality, which, in turn, only aggravates the crisis state.

Conclusion

The purpose of this work was to investigate the structure of the ego-identity in the context of an adulthood crisis. Based on the existing literature about an adult crisis, we suggested that the structure of narrative identity is different in men and women. Further, relying on the theory of ego-identity E. Erickson and the theory of the ego-identity statuses of J. Marcia, we hypothesized the difference in the structure of narrative identity among those who survived the crisis and those who did not. As a result of analysis of narratives, it was found that there were no differences in the experience of the crisis by men and women. These data contradict the well-known information accepted 30 years ago. Nevertheless, even that literature said about the transference of women's crisis anxiety to the family or global processes. This transference could also be a result of an attitude to devote woman's life to her family after marriage. Nevertheless, this issue needs to be clarified on a larger sample.

The second hypothesis was confirmed: the structure of narrative identity differs between those who survived the crisis and those who did not. As a result of a qualitative analysis, three groups were identified: those who did not experience a crisis on a conscious level, those who were in an acute crisis, and those who experienced a crisis in the recent past. The three structures differ from each other in the degree of immersion in difficult emotional states associated with them: in the absence of a crisis, the acuteness of contradictions is not recognized, and the emotions associated with it are repressed; in an acute crisis, a person falls into negative emotional states, contradictions are experienced unsolvable; after solving the crisis, the contradictions that arose in the past are resolved and integrated into the structure of the personality in the same way as emotional states. The results of our study are confirmed by the empirical data of other authors, and also 'lay down' on the psychological theory. This means that narrative analysis as a method of studying the crisis of adulthood is justified and promising.

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Appendix 1

Narrative codes

Presence of changes	Yes – 1 No – 0
Presence of a crisis	Yes – 1 No – 0
Ways to cope with a crisis	No crisis – 0 Self – 1 With the help of other people – 2 Not aware of the crisis – 3
Crisis localization	Family – 1 Relations with people – 2 Work – 3 Search of since of life – 4

Emotional background	Depression – 1 Irritability – 2
Overcoming the crisis	No crisis – 0 No way out of crisis – 1 Overcoming the crisis – 2
The result of the crisis	Happy with everything – 1 Lack of close relationships – 2 Not realized in life – 3
Negative/positive light	Negative light – 0 Positive light – 1
The content of the crisis	Looking for a sense of life – 1 Looking for relationships – 2 Looking for an inspiration – 3 Looking for a «growth» – 4 A crucial moment – 5
Timeline of the crisis	Childhood – 1 Teens – 2 Youth – 3 Maturity – 4 Permanent – 5

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Conflict of Interest Information

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Post-COVID Color Perception: The Impact of COVID-19 on Color Naming

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Abstract: **Introduction**. There is an accumulating evidence of various ophthalmological symptoms, accompanied by visual impairment, post-COVID-19. We hypothesized that color vision may have been affected post-COVID-19 too manifesting as changes in color-naming patterns. To test this hypothesis, we compared color naming in individuals who have recovered from COVID-19 (N = 201, 54 men and 147 women, aged 19–65 years, M = 33.4, SD = 13.2) and those participants whose responses were obtained before the pandemic (hereafter, non-COVID-19 controls) (N = 2,457, 1,052 men and 1,402 women, aged 16–98 years, M = 41.36, SD = 17.7). **Methods**. We collected data in an online experiment (http://colournaming.com) with Russian respondents in their native language. Participants were presented, with virtual color cards selected from 606 stimuli randomly by a computer program. We asked respondents to name each color using the most appropriate color descriptor (an unconstrained color-naming method). **Results**. The study showed that, compared to non-COVID-19 controls, post-COVID-19 respondents revealed an altered pattern of color naming. In particular, we found a significant increase in 'brown', 'green', and 'gray' names, along with an increased use frequency of achromatic modifiers "dirty", "pale", "dull", and "pastel". **Discussion**. These differences suggest general "darkening" and decreased saturation of perceived colors. The change in the color-naming pattern provides an indirect evidence of the impact of coronavirus on color vision. We speculate that a relatively high frequency of use of color terms *koričnevyj* 'brown' and *seryj* 'gray' may reflect an accelerated aging of the crystalline lens, while general "darkening" and desaturation of perceived colors may point to an affected processing of luminance contrast. These assumptions are currently being tested (by the authors) in COVID-19 survivors by using a color vision diagnostic test.

Keywords: color perception, psycholinguistic experiment, color naming, COVID-19, post-COVID syndrome, color categories, color vision, CIELAB, color space, chromatic discrimination

Highlights:

➢ In post-COVID-19 (Russian) individuals, the pattern of color naming is altered with regard to both relative frequency of basic color terms and their denotative meanings.

- The revealed differences indicate general "darkening" and desaturation of perceived colors, in post-COVID-19 individuals.
- Provided these phenomena will be confirmed by testing color vision in post-COVID-19 individuals, they may be indicative of an affected processing of luminance contrast.

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Introduction

There is an accumulating evidence that COVID-19 survivors reveal various ophthalmological symptoms accompanied by visual impairment. The most common symptoms include eye pain (19.4 %), photophobia (13.9 %), light flashes or floaters (11.8 %), blurred vision (11.1 %), and red eyes (10.4 %) (Gangaputra & Patel, 2020). Clinically, such symptoms may be associated with higher intraocular pressure, spasm of ocular muscles, clouding of the vitreous body (reducing the intensity of light falling onto the retina), and various symptoms of retinopathy – dilation of retinal veins and arteries, discrete changes in the structure of photoreceptor outer segments and inner retinal layers (Costa et al., 2021; Invernizzi et al., 2020; Yusef et al., 2021).

Currently it is unclear whether coronavirus affects color vision. However, according to previous studies unrelated to COVID-19, the changes in the visual system functioning, such as higher intraocular pressure and retinopathy, are accompanied by color-vision impairment. In particular, a significant number of patients with long-term ocular hypertension revealed selective changes in functioning of both blue-yellow and red-green channels (see, e.g., Castelo-Branco et al., 2004). Also, in patients with type II diabetes mellitus, diabetic retinopathy caused by microvascular changes in the retina is accompanied by color-vision impairment along the blue-yellow axis of the color space (for a review, see Simunovic, 2016). Moreover, in comparison with healthy normal trichromats, such patients have difficulties in discriminating low-saturated colors and predominantly rely on their differences in luminance (Bimler et al., 2014).

Psycholinguistic studies demonstrated that changes in physiological processes in the eye and the visual system affect color naming. For example, age-related changes in the visual system – such as yellowing and clouding of the crystalline lens, decreased pupil size and photoreceptor sensitivity – are manifested in a greater variability of naming colors in green, blue, purple, and brown parts of color space, as well as in an increase of frequency of compounds with *seryj*- 'gray'- and achromatic modifiers (*svetlyj* 'light', *tëmnyj* 'dark') (Hardy et al., 2005; Lindsey & Brown, 2002; Wijk et al., 1999, 2002).

In the present context, it is worth ing that psycholinguistic experiments may provide an insight on the nature of the change or impairment of color vision. In particular, analysis of color-naming patterns in observers with different types of color-vision abnormalities enabled to make inferences about characteristics of their color vision and reconstruct their perceptual color spaces (Montag, 1994; Paramei, 1996; Shepard & Cooper, 1992). Furthermore, the kind of distortions of color space structure has been shown to reflect the type and the degree of color -vision abnormality (anomalous trichromacy or dichromacy) (Paramei, 1996).

In the present study of color names, we leaned upon Berlin and Kay's (1969/1991) theory of universal basic color categories (BCCs) and the corresponding basic color terms (BCTs). The BCTs are to apply to diverse classes of objects and be psychologically salient to all informants implying that they occur in ideolects of all respondents and used by them with high consensus. In Russian, there are 12 BCTs; six of them are primary – *čërnyj* 'black', *belyj* 'white', *krasnyj* 'red', *zelënyj* 'green', *žëltyj* 'yellow', and *sinij* 'blue'; the remaining six categories are secondary – *koričnevyj* 'brown', *goluboj* 'light blue', *rozovyj* 'pink', *oranževyj* 'orange', *fioletovyj* 'purple', and *seryj* 'gray' (see, e.g., Griber et al., 2021).

In addition to BCTs, native Russian speakers have a rich vocabulary of color names which includes combinations of BCTs with achromatic modifiers (*svetlyj* 'light', *tëmnyj* 'dark', etc.), suffixed forms (e.g., *sinevatyj* 'bluish'), as well as non-BCTs, such as *vasil'kovyj* 'cornflower', *lososevyj* 'salmon', *salatovyj* 'lettuce-colored', *bordovyj* 'claret', etc. (see, Griber et al., 2018).

Based on the available data, we hypothesized that, compared to controls, post-COVID-19 respondents may have impaired color vision; if this is the case, it would manifest itself as an altered color-naming pattern – for example, as a predominance of certain BCTs and/or as changed frequencies of certain compound names. We also hypothesized that there would be a change in the denotative meanings of the BCTs, i.e., color stimuli they denote. To test this hypothesis, we compared color naming of individuals who have recovered from COVID-19 with healthy controls' responses that had been obtained before the pandemic (Griber et al., 2021).

Methods

Participants

In the study 2022, the post-COVID-19 sample comprised 201 participants (54 men, 147 women) aged 19–65 years (M = 33.4, SD = 13.2). All respondents had suffered from coronavirus infection in various forms of the disease and the doctor's confirmed diagnosis. Responses (N = 5,215) from the 2022 sample were compared with those (N = 55,515) from the pre-pandemic control group obtained in 2018–2019 that comprised 2,457 participants (1,052 men, 1,402 women) aged 16–98 years (M = 41.36, SD = 17.7), with normal color vision confirmed by the Barbour test (Barbur et al., 1994).

Self-report of wellbeing in post-COVID-19 participants

To assess coronavirus-related changes in wellbeing and lifestyle, we used *the COVID-19 Yorkshire Rehabilitation Scale* (C19-YRS), with 15 items (O'Connor et al., 2022), modified for Russian-speaking respondents by one of the authors (Yu. A. Griber).

Almost all the participants in our study (96.5 %) commented that in some degree the disease had changed their usual way of life. In particular, more than a half (54 %) developed dyspnea, 6 % severely dyspnea; they became fatigued more quickly than before the disease (55.8 %). More than a third (37 %) post the disease registered problems with mobility (walking, movement). After the recovery many (54.2 %) still experience pain or discomfort in their joints, cough during strenuous exercise or without such, heart problems, problems with hearing and blood pressure, headaches, and abnormal blood test results. Individual participants remarked on hair loss, weight gain, muscle weakness, or drowsiness. The disease also affected effectiveness of their routine activities, life satisfaction, and subjective wellbeing (Klimochkina et al., 2022). By the time of the study, more than half (54.2 %) experienced problems with performing their usual activities (household chores, leisure) or professional activities (work or studies).

The participants commented that they tried not to think about the disease, however, almost half of them (45.5 %) failed. Many respondents reported experiencing anxiety and depression (Dovbysh & Kiseleva, 2020). A few (4.5 %) even had thoughts of harming themselves in some way. These symptoms are in accord with those described in a systematic review of a large number of COVID-19 studies in various countries (Ceban et al., 2022).

There also appeared cognitive problems – with concentration (39.1 %) and short-term memory (38.5 %). Further, some respondents (23.7%) reflected on a change in the way they interacted with others: it became more difficult for them to comprehend the content of the oral or written narrative, to express their own thoughts or conduct a conversation. The overwhelming majority (82.1 %) reported changed sense of smell and more than half (55.8 %) changed sense of taste during or after the disease.

In general, using a scale from 0 to 10, with "0" indicating "it can't be worse" and 10 standing for "excellent", the post-COVID-19 participants gave, on average, wellbeing rating of 6.

The online experiment

We collected data from native Russian speakers in an online experiment (http://colournaming.com). The participants were instructed to choose most appropriate names for virtual color stimuli randomly selected by the computer program from a predefined set of samples (see, e.g., Griber et al., 2021). Participants could offer any linguistic form of a color name – a simple or a complex word, binary compounds or multi-component words.

The devices used for the experiment (computer, laptop, or tablet PC) were chosen by the participants individually. The color samples were presented one-by-one, on a gray background; the presentation time was not limited. Each subsequent stimulus appeared only after the color name of the previous one has been entered using a keyboard.

Stimuli

A total of 606 color samples were used in the study, whose photometric coordinates were defined using the CIELAB system. The CIELAB system is an international standard that enables characterization of a color using three coordinates: two coordinates represent chromaticity (a^* – red-green and b^* – blue-yellow components) and the third one represents lightness (L^*). The chromaticity coordinates (a^* and b^*) may be both positive and negative: a positive value of a^* corresponds to the reddish gamut, while a negative value of a^* corresponds to the greenish gamut. A positive value of b^* corresponds to the yellow(ish), while a negative value of b^* corresponds to blue part of color space. The lightness value (L^*) can vary from $L^* = 0$ (black) to $L^* = 100$ (white). Medium L^* values correspond to shades of gray.

The theoretical framework for this model, developed by the International Commission on Illumination (*Communication Internationale de l'Eclairage*, *CIE*), is based on Hering's (1964) opponent-colors theory. According to this theory, normal color vision implies three postreceptor channels; two of these are chromatic and opponent – red-green and blue-yellow; the achromatic channel transmits information about lightness, not about hue.

Intergroup comparisons

The following linguistic indices were used for the intergroup comparison of color-naming patterns in post-COVID-19 participants and non-COVID-19 controls:

(1) frequency of the BCTs (N = 12) and most frequently offered non-BCTs;
(2) frequency of achromatic modifiers;
(3) number of words in color descriptors;
(4) color-naming patterns.

Psycholinguistic analysis of intergroup comparison included:

(5) estimating centroids of the BCCs and most frequent non-BCCs, coordinates of the points in the CIELAB color space, calculated as weighted averages for the corresponding BCC along each of the dimensions (a^*, b^*, L^*);
(6) estimating distances between BCC centroids in the CIELAB color space;
(7) cluster analysis of the shifts in denotative meanings of the BCTs and most frequent non-BCTs.

Data analysis

We compared diversity of color names derived from the BCTs using the Simpson index (Simpson, 1949) according to the formula:

$D = 1 - \Sigma(n_i (n_i - 1)) / N(N-1)$,

where n_i corresponds to the number of color names (word types) and N is the number of responses.

The Simpson index takes into account not only the number of word types in the dataset but also the number of occurrences of each word type. Its value ranges from 0 to 1 and represents the probability that two responses chosen at random from the dataset may contain different types of color names.

Since each color sample was described by certain CIELAB coordinates, systematization of the responses enabled us to produce denotative maps of colors for each of the BCC.

Since in 3D color space color categories are not points but areas with fuzzy borders and a cloud-like shape, for each of the BCC we calculated a "center of gravity" (centroid) – average values of the three CIELAB coordinates (a^*, b^*, L^*) of all the color samples with the same name.

The centroids were represented graphically in 2D and 3D CIELAB space. To compare centroids of the BCCs and most frequent non-BCCs in the CIELAB color space, we applied *Delta E2000* color difference formula (ΔE^*00; CIELAB) (Sharma et al., 2005).

Psycholinguistic analysis of the data (7) was performed using an agglomerative hierarchical clustering R program of *the Microsoft R Open 3.5*. Distances between clusters were calculated using Ward's minimum variance algorithm (Ward.D2; Ward, 1963). For visualization, *ggplot2* package was used.

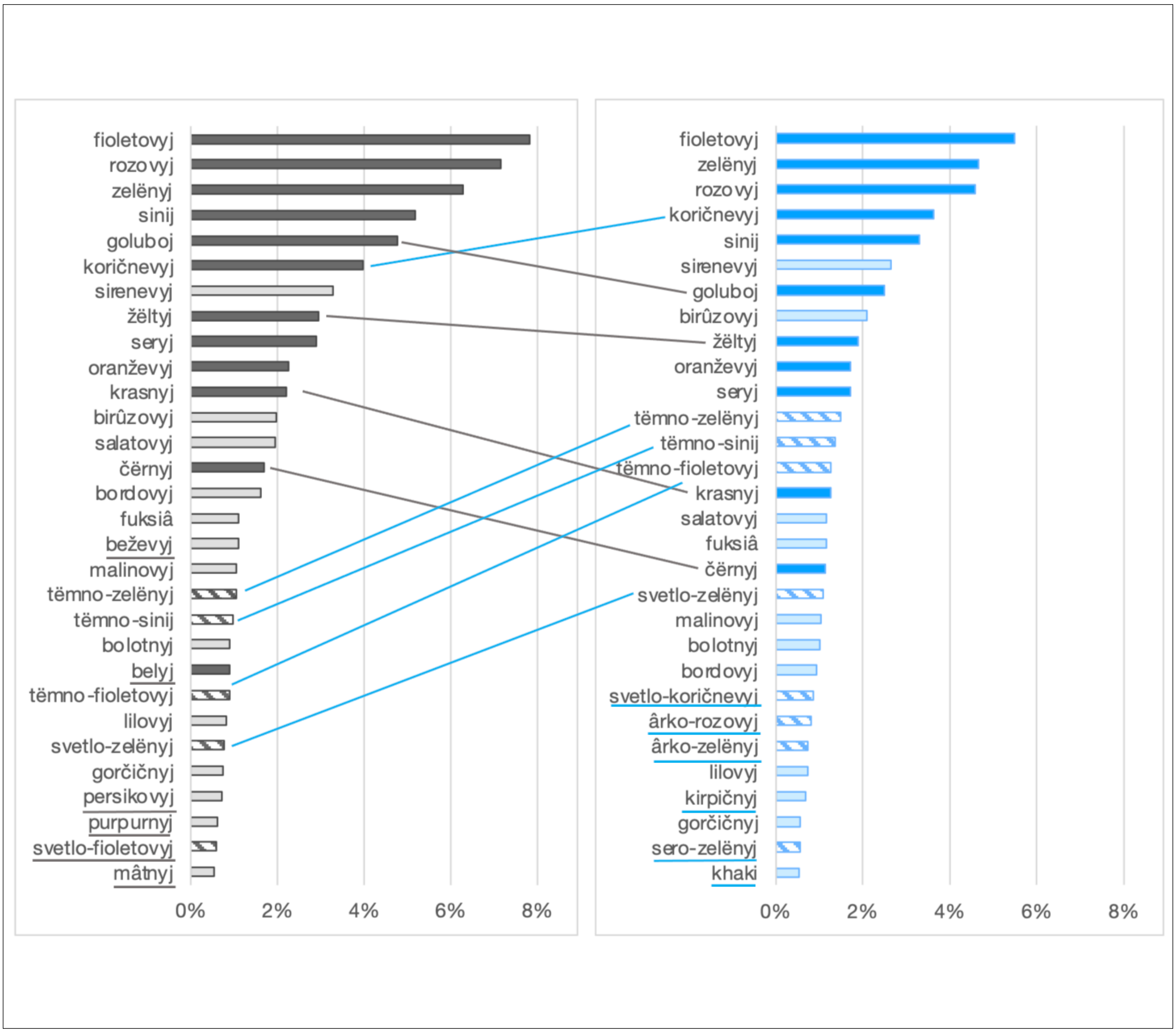
Results

(2.1) Linguistic analysis: frequency of occurrence of color terms and color-naming patterns

Comparative analysis of ranks of the 30 most frequently used color names (Fig. 1) showed that the participants of both groups used BCTs more frequently than non-BCTs. Notably, post-COVID-19 participants were much less likely to use color name *belyj* 'white', which ranked 49, compared to rank 22 in non-COVID-19 controls. Also, post-COVID-19 respondents offered color names *čërnyj* 'black' and *krasnyj* 'red' less frequently (ranks 15 and 18, respectively) compared to controls (ranks 11 and 14, respectively).

Figure 1

30 most frequent Russian color names in non-COVID (left) and post-COVID (right) respondents



BCTs are indicated by bars, frequent non-BCTs by unfilled bars, and modified or compound terms are thatched. Underlined are color names offered frequently by one group but not by the other.

Ranking based on frequency of the 12 BCTs in both groups is comparable with one exception: post-COVID-19 participants used color name *koričnevyj* 'brown' considerably more frequently. Figure 2 shows a hierarchical diagram of relative frequency of each of the 12 BCTs. The hierarchy is organized in the order for non-COVID-19 controls (left), from highest (bottom) to lowest frequency (top). For the group of post-COVID-19 participants (right), the order of the BCT frequency is identical to that of the controls, despite the change in relative frequency of the BCTs.

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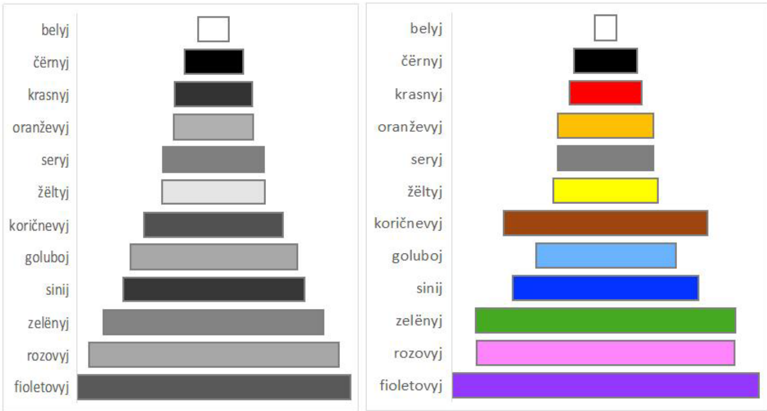
Figure 2

Frequency of the 12 Russian basic color terms in non-COVID-19 controls (left) and post-COVID-19 participants (right)

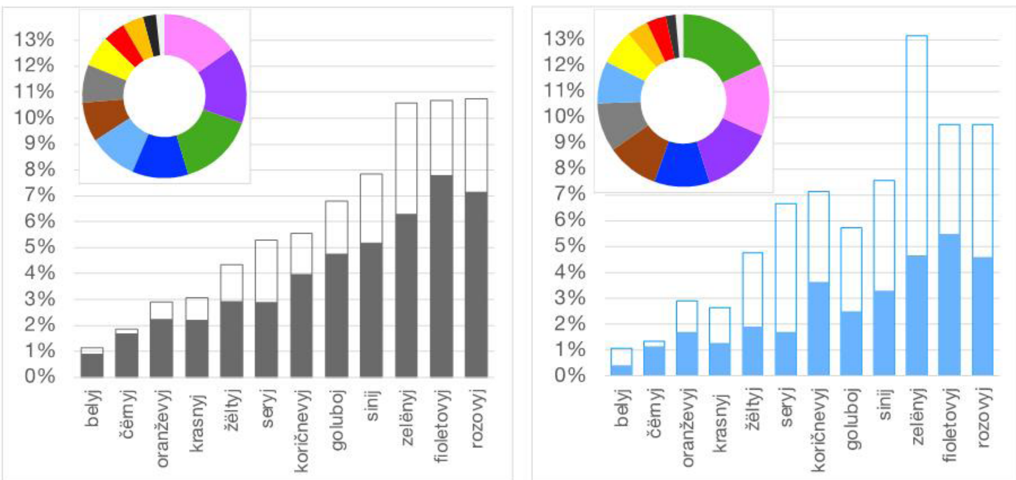


Furthermore, post-COVID-19 participants used elaborated color names derived from the BCTs *zelënyj* 'green', *koričnevyj* 'brown', *seryj* 'gray', *žëltyj* 'yellow', and *oranževyj* 'orange' more frequently than controls; in contrast, they offered derivatives of BCTs *goluboj* 'light blue', *sinij* 'dark blue' and *krasnyj* 'red' much less frequently than controls (Fig. 3).

In addition, compared to controls, in post-COVID-19 participants, the Simpson diversity index was markedly higher for two BCTs – *zelënyj* 'green' (0.63 and 0.85, respectively) and *koričnevyj* 'brown' (0.43 and 0.71, respectively).

Figure 3

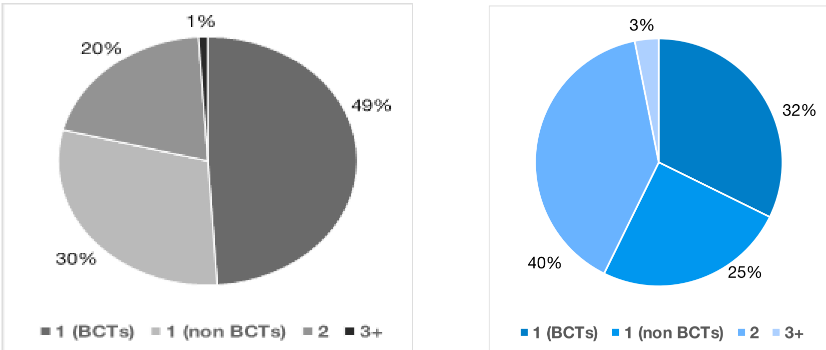
Relative size of the "families" derived from the 12 Russian BCTs in non-COVID-19 controls (left) and post-COVID-19 participants (right). In each "family", the proportion of a BCT is shown by a solid bar supplemented by the proportion of its derivative forms.



Noteworthy, the respondents who had recovered from COVID-19 were inclined to use lexically elaborated color descriptors (Fig. 4). In particular, compared to non-COVID-19 controls, they used less frequently monolexemic *krasnyj* ‘red’ (49 % and 32 %, respectively) or non-BCT *birûzovyj* ‘turquoise’ (30 % and 25 %, respectively), and preferred multi-component names to itemize and specify the color (e.g., *nežno-zelënyj travânoj* ‘soft/tender green grass’ or *koričnevyj s rozovatym ottenkom* ‘brown with a pinkish tint’).

Figure 4

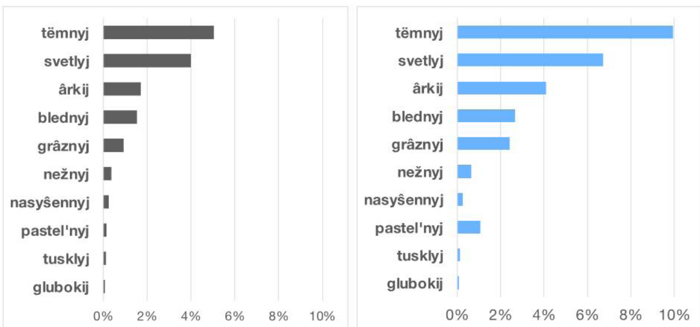
The number of words in Russian color descriptors in the groups of non-COVID-19 controls (left) and post-COVID-19 respondents (right)



Another important difference between the two groups was prevalence of a certain color-naming patterns. Compared to the control group, those who had recovered from COVID-19 were (almost) twice as likely to use achromatic modifiers – *tëmnyj* ‘dark’ (5.0 % and 10.0 %, respectively), *svetlyj* ‘light’ (4.0 % and 6.7 %), *ârkij* ‘bright’ (1.7 % and 4.1 %), *blednyj* ‘pale’ (1.5 % and 2.7 %), or *nežnyj* ‘soft, tender’ (0.4 % and 0.7 %). Furthermore, they were almost three times as likely to use *grâznyj* ‘dirty’ (0.9 % and 2.4 %, respectively) and almost seven times as likely to use *pastel'nyj* ‘pastel’ (0.2 % and 1.1 %), implying unsaturated and dull shades (Fig. 5). Also, in their responses, frequent were lightness-modified BCTs (e.g., *tëmno-zelënyj* ‘dark green’, *tëmno-sinij* ‘dark *sinij*’ or *tëmno-fioletovyj* ‘dark purple’) (cf. Fig. 1).

Figure 5

Frequency of achromatic modifiers in Russian compound color names in non-COVID (left) and post-COVID (right) respondents

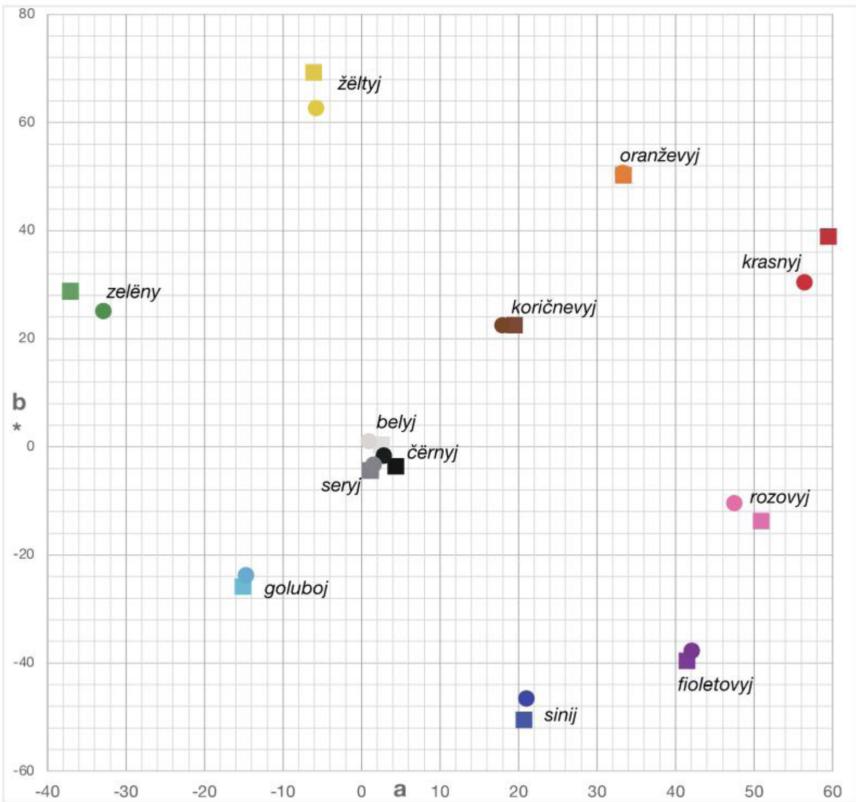


(2.2) Psycholinguistic analysis: coordinates of centroids of basic color categories in the CIELAB color space

Between the groups of post-COVID-19 participants and non-COVID-19 controls, the greatest CIELAB differences in centroids were found for the "opponent" primary BCCs *krasnyj* 'red' (ΔE*ab = 4.22) and *zelënyj* 'green' (ΔE*ab = 3.42); *žëltyj* 'yellow' (ΔE*ab = 2.68) and *sinij* 'dark blue' (ΔE*ab = 2.60); and f *belyj* 'white' (ΔE*ab = 3.14) and *čërnyj* 'black' (ΔE*ab = 2.81). In addition, in post-COVID-19 participants centroids of *krasnyj* 'red' and *zelënyj* 'green', *žëltyj* 'yellow' and *sinij* 'dark blue' BCCs were shifted to the periphery of the CIELAB chromatic plane *a*b**, compared to non-COVID controls (Fig. 6).

Figure 6

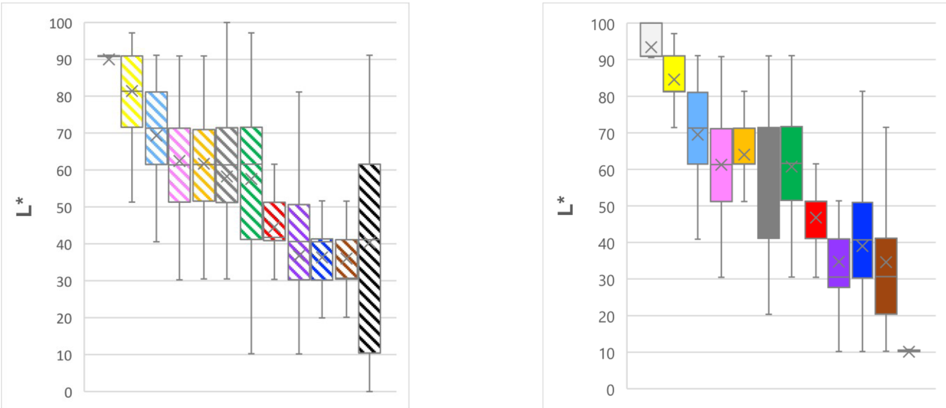
*Centroids of the 12 Russian basic color categories in projection onto the chromatic plane a*b* of the CIELAB color space. Circles – non-COVID-19 controls, squares – post-COVID-19 participants*



For post-COVID-19 participants, denotative meanings of "darker" chromatic categories of *koričnevyj* 'brown' and *sinij* 'dark blue', as well as those of light(er) achromatic categories of *seryj* 'gray' and *belyj* 'white', had a much larger variation in the lightness component (*L**). In comparison, denotative meanings of *žëltyj* 'yellow', *oranževyj* 'orange', *fioletovyj* 'purple', and *čërnyj* 'black' varied much less along the lightness dimension (Fig. 7).

Figure 7

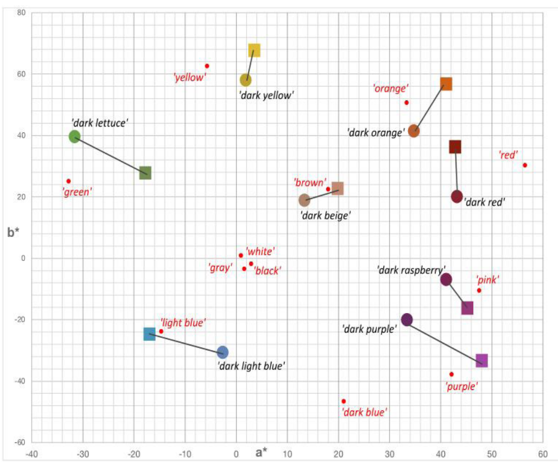
Lightness (L) of colors denoted by the BCTs in non-COVID-19 controls (left) and post-COVID-19 participants (right). The 12 Russian BCCs are arranged according to the mean lightness (L*) of their denotata (in descending order) for the group of non-COVID-19 controls*



Also, we found considerable differences in denotative meanings of non-BCTs *beževyj* 'beige', *salatovyj* 'lettuce-colored', *lilovyj* 'mauve', *malinovyj* 'raspberry', predominantly when these denoted darker shades of blue, green, purple, brown, and red areas of color space, as illustrated by Figure 8. The shifts of centroids of these non-BCCs to the periphery of the chromatic plane *a*b** in post-COVID-19 participants indicates that, compared to the controls, they used the names in question to denote more saturated colors.

Figure 8

*Centroids of the categories of color names denoting dark shades in projection onto the chromatic plane a*b* in the CIELAB color space. Circles – non-COVID-19 controls, squares – post-COVID-19 participants. Red points and accompanying names (in red) depict centroids and names of the "parent" BCTs or frequent non-BCTs*



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For post-COVID-19 participants, Tables 1–5 present detailed information on the centroid shifts (in DE_{00} units) of BCCs and some non-BCCs with frequent achromatic modifiers (*tëmnyj* 'dark', *svetlyj* 'light', *ârkij* 'bright', *blednyj* 'pale', and *grâznyj* 'dirty'). Table 1 indicates that the greatest "darkening" is observed for the color names in the blue-purple area of color space, *goluboj* 'light blue' and *lilovyj* 'mauve', while the greatest "dullness" of perceived colors is observed in the yellow-green areas (Table 5).

Table 1

Centroids (sr) of color names with the modifier tëmnyj 'dark' on each of the three coordinates of the CIELAB color space and their shifts (DE_{00}) in post-COVID-19 participants compared to the controls

Color names	Non-COVID-19 controls			Post-COVID-19 participants			DE_{00}
	sr_L*	sr_a*	sr_b*	sr_L*	sr_a*	sr_b*	
tëmno-bordovyj 'dark claret'	19.05	28.03	–0.85	18.97	28.38	–2.73	1.16
tëmno-fioletovyj 'dark purple'	19.92	28.96	–23.82	21.72	27.27	–23.79	1.51
tëmno-birûzovyj 'dark turquoise'	49.41	–21.34	–7.69	50.90	–23.15	–7.38	1.85
tëmno-sirenevyj 'dark lilac'	38.60	35.57	–30.70	40.05	31.51	–28.17	2.05
tëmno-sinij 'dark b *sinij*'	20.22	15.19	–31.75	22.77	16.38	–34.47	2.09
tëmno-rozovyj 'dark pink'	50.62	44.13	–4.38	50.28	48.68	–7.70	2.12
tëmno-seryj 'dark gray'	30.94	1.23	–6.23	34.83	1.02	–6.47	3.14
tëmno-zelënyj 'dark green'	29.52	–17.23	11.38	34.06	–18.53	12.47	3.70
tëmno-koričnevyj 'dark brown'	19.40	14.30	11.48	23.71	15.42	8.21	4.12
tëmno-beževyj 'dark beige'	58.51	13.35	18.86	62.73	19.90	22.72	5.51
tëmno-oranževyj 'dark orange'	50.24	34.75	41.41	54.22	41.11	56.72	6.37
tëmno-salatovyj 'dark lettuce'	61.06	–31.57	39.60	55.43	–17.74	27.78	8.34
tëmno-žëltyj 'dark yellow'	67.19	1.89	58.02	77.97	3.60	67.71	8.52

Color names	Non-COVID-19 controls			Post-COVID-19 participants			DE_{00}
	sr_L*	sr_a*	sr_b*	sr_L*	sr_a*	sr_b*	
tëmno-krasnyj 'dark red'	31.80	43.18	20.09	30.50	42.88	36.22	8.97
tëmno-malinovyj 'dark raspberry'	29.64	41.07	–6.92	39.35	45.23	–16.26	9.15
tëmno-goluboj 'dark light blue'	53.79	–2.65	–30.72	58.16	–16.93	–24.71	10.67
tëmno-lilovyj 'dark mauve'	28.10	33.43	–20.10	44.83	48.04	–33.39	15.38

Table 2

Centroids (sr) of color names with the modifier svetlyj 'light' in each of the three coordinates of the CIELAB color space and their shifts (DE_{00}) in post-COVID-19 participant compared to the controls s

Color names	Non-COVID-19 controls			Post-COVID-19 participants			DE_{00}
	sr_L*	sr_a*	sr_b*	sr_L*	sr_a*	sr_b*	
svetlo-koričnevyj 'light brown'	53.60	15.60	24.71	54.10	15.14	24.72	0.59
svetlo-fioletovyj 'light purple'	56.25	34.68	–35.84	56.04	36.17	–36.33	0.62
svetlo-rozovyj 'light pink'	74.73	27.54	–6.27	73.14	29.57	–5.83	1.54
svetlo-krasnyj 'light red'	52.93	47.61	21.83	51.18	48.74	23.37	1.88
svetlo-žëltyj 'light yellow'	85.20	–6.74	44.86	85.32	–3.02	42.87	2.55
svetlo-seryj 'light gray'	77.48	1.09	–2.98	78.37	2.86	–4.19	2.57
svetlo-lilovyj 'light purple'	67.56	24.25	–21.52	68.06	21.17	–25.12	3.39
svetlo-sirenevyj 'light lilac'	67.78	25.29	–26.22	67.09	33.76	–27.51	3.93
svetlo-zelënyj 'light green'	75.39	–36.50	24.79	80.10	–32.32	29.48	4.68

Color names	Non-COVID-19 controls			Post-COVID-19 participants			DE_{00}
	sr_L*	sr_a*	sr_b*	sr_L*	sr_a*	sr_b*	
svetlo-bordovyj 'light claret'	42.99	35.51	0.68	46.13	31.69	5.84	4.72
svetlo-birûzovyj 'light turquoise'	81.76	–30.44	2.33	88.96	–31.95	0.76	4.88
svetlo-oranževyj 'light orange'	72.94	21.48	43.84	73.90	27.07	37.50	5.70
svetlo-salatovyj 'light lettuce'	85.50	–35.36	33.14	80.27	–34.32	46.77	6.59
svetlo-beževyj 'light beige'	81.98	7.17	17.94	81.12	1.73	11.08	6.71
svetlo-sinij 'light blue'	52.11	10.82	–41.98	60.01	–2.14	–31.38	9.40
svetlo-goluboj 'light light blue'	79.03	–15.55	–12.36	71.81	–1.01	–18.90	14.12

Table 3

Centroids (sr) of color names with the modifier blednyj 'pale' in each of the three coordinates of the CIELAB color space and their offsets (DE_{00}) in post-COVID-19 participants compared to the controls

Color names	Non-COVID-19 controls			Post-COVID-19 participants			DE_{00}
	sr_L*	sr_a*	sr_b*	sr_L*	sr_a*	sr_b*	
bledno-rozovyj 'pale pink'	72.94	25.08	–3.20	71.69	29.06	–1.02	2.54
bledno-krasnyj 'pale red'	57.78	44.29	18.96	56.78	54.05	22.44	3.20
bledno-zelënyj 'pale green'	73.03	–27.03	17.58	76.36	–21.32	16.70	3.73
bledno-žëltyj 'pale yellow'	85.13	–7.87	40.18	85.99	–0.96	34.35	5.20
bledno-oranževyj 'pale orange'	68.63	26.94	37.31	71.32	18.11	27.83	5.25
bledno-sirenevyj 'pale lilac'	69.05	17.52	–20.02	78.14	17.08	–23.21	7.03
bledno-sinij 'pale blue'	53.00	3.50	–28.31	61.26	0.64	–31.71	7.78
bledno-goluboj 'pale light blue'	76.65	–9.59	–11.11	79.12	–4.26	–21.53	8.41
bledno-salatovyj 'pale lettuce'	81.80	–29.89	25.83	91.11	–51.21	46.27	10.50
bledno-fioletovyj 'pale purple'	60.83	25.05	–25.93	49.02	39.74	–24.84	13.24

Table 4

Centroids (sr) of color names with the modifier ârkij 'bright' in each of the three coordinates of the CIELAB color space and their offsets (DE_{00}) in post-COVID-19 participants compared to the controls

Color names	Non-COVID-19 controls			Post-COVID-19 participants			DE_{00}
	sr_L*	sr_a*	sr_b*	sr_L*	sr_a*	sr_b*	
ârko-krasnyj 'bright red'	49.43	69.30	42.96	48.45	73.25	44.36	1.37
ârko-rozovyj 'bright pink'	57.25	70.31	–16.99	56.89	74.58	–22.19	1.97
ârko-salatovyj 'bright lettuce'	84.81	–57.42	56.87	83.57	–53.42	48.88	2.38
ârko-sinij 'bright blue'	35.54	52.38	–78.61	38.59	45.63	–75.82	3.53
ârko-goluboj 'bright light blue'	67.53	–12.65	–34.25	63.30	–10.77	–37.33	3.76
ârko-birûzovyj 'bright turquoise'	81.93	–42.64	–4.66	87.24	–47.44	–0.47	4.68
ârko-zelënyj 'bright green'	75.95	–55.01	45.06	81.93	–60.38	52.65	4.75
ârko-sirenevyj 'bright lilac'	52.95	56.93	–50.56	56.15	49.14	–55.34	5.47
ârko-fioletovyj 'bright purple'	44.51	59.15	–54.62	37.52	61.70	–59.63	6.39
ârko-žëltyj 'bright yellow'	85.73	–7.32	76.04	91.35	–17.53	77.53	6.50

Table 5

Centroids (sr) of color names with the modifier grâznyj 'dirty' in each of the three coordinates of the CIELAB color space and their offsets (DE_{00}) in post-COVID-19 participants compared to the controls

Color names	Non-COVID-19 controls			Post-COVID-19 participants			DE_{00}
	sr_L*	sr_a*	sr_b*	sr_L*	sr_a*	sr_b*	
grâzno-goluboj 'dirty light blue'	60.62	–7.87	–16.13	61.52	–6.45	–13.40	2.02
grâzno-rozovyj 'dirty pink'	59.43	26.84	0.00	58.42	31.49	2.23	2.62
grâzno-sinij 'dirty blue'	37.85	–1.92	–22.56	31.95	–0.39	–26.61	5.11
grâzno-žëltyj 'dirty yellow'	69.04	–5.04	51.76	76.29	–0.91	57.25	6.35
grâzno-zelënyj 'dirty green'	49.78	–17.60	23.00	44.80	–7.93	26.62	8.95

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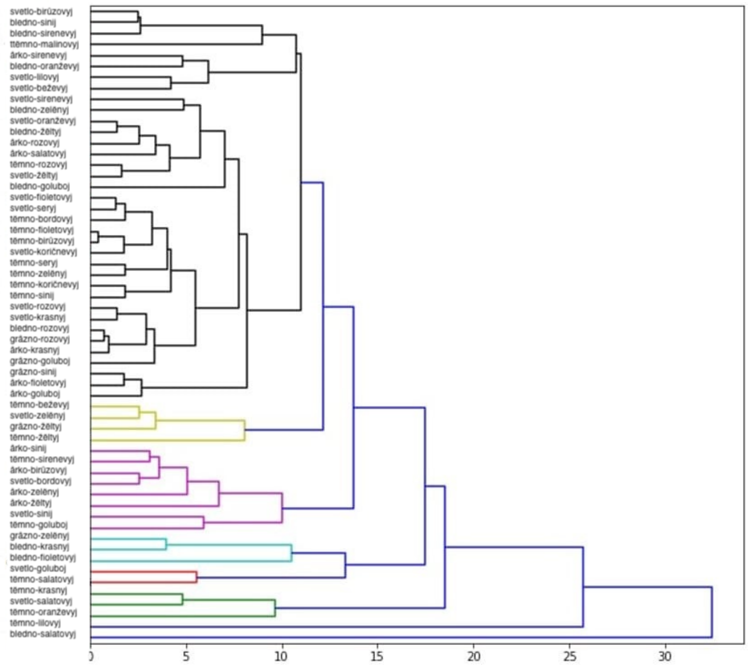
Cluster analysis revealed that vectors of the centroid shifts are similar for the color descriptors that specify color discernment by lightness and/or saturation. In particular, the shift vectors are similar within the following color clusters: (i) light or unsaturated blue and yellow shades (*svetlo-birûzovyj* 'light turquoise', *bledno-sinij* 'pale *sinij*', *bledno-goluboj* 'pale *goluboj*', *svetlo-žëltyj* 'light yellow', *bledno-žëltyj* 'pale yellow', and *svetlo-beževyj* 'light beige'); (ii) dark shades of yellow (*tëmno-beževyj* 'dark beige', *grâzno-žëltyj* 'dirty yellow', and *tëmno-žëltyj* 'dark yellow'); (iii) light shades of green (*svetlo-zelënyj* 'light green'); and (iv) unsaturated shades of green and red (*grâzno-zelënyj* 'dirty green', and *bledno-krasnyj* 'pale red') (Fig. 9).

Figure 9

Dendrogram representing outcomes of the cluster analysis of the vector shifts, in the CIELAB color space, of color-name centroids



Discussion

Results of the present study are in accord with the hypothesis that, compared to non-COVID-19 controls, post-COVID-19 participants reveal an altered color-naming pattern.

First, it is apparent that relative frequency of the BCTs differs noticeably between the two groups: post-COVID-19 participants use *koričnevyj* 'brown' much more frequently compared to *žëltyj* 'yellow' and *oranževyj* 'orange' in the controls. The occurrence of the color terms *zelënyj* 'green' and *seryj* 'gray' increases, while the occurrence of the color terms *sinij* 'dark blue' and *fioletovyj* 'purple' decreases. Also, the color terms *belyj* 'white' is offered much less frequently by post-COVID-19 participants.

It is worth noting that a similar increase in the number of *green* and *grey* terms and a decrease in the use of *blue* and *purple* terms was observed in young English-speaking observers in an experiment with a yellow filter that simulated the yellowing and thickening of the crystalline lens that occurs during its natural physiological aging (Hardy et al., 2005). Moreover, these observers frequently referred to short-wavelength colors as *dark*, while the colors that, unfiltered, looked pale blue, bluish, or cyan/ turquoise were referred to by them as *greenish*. These phenomena were, however, not observed in in the experiment's older observers with a naturally aged lens. The authors (Hardy et al., 2005) consider that the decrease in the *blue* and *purple* names under the simulated condition indicates a decrease in light absorption in the short-wavelength part of the spectrum due to lens yellowing (brunescence hypothesis; Lindsey & Brown, 2002). Moreover, it points out the role of central perceptual factors – namely, a general change in the spectral composition of filtered light, which in younger observers occurred abruptly, in a very short (experimental) period, impeding the process of perceptual adaptation that occurs slowly during natural aging.

The difference in the color-naming pattern of older observers and young observers provided with the yellow filter estimated by Hardy et al. (2005) is of note in view of the present study results which conceivably are due to an accelerated (abrupt) lens aging – yellowing and thickening – in post-COVID-19 participants. Since the period of illness was relatively short, the visual system probably cannot fast compensate for the overall change in the spectral light composition. The hypothesis of a "sudden" lens aging, as a result of coronavirus infection, currently is being tested experimentally by the authors using a color vision diagnostic test.

Apart from the changes in the relative frequency of color names, the respondents who had recovered from COVID-19 also showed changes in the denotative meanings of the BCCs – a shift, from the center to the periphery of the chromatic plane, of the centroids of the "opponent" BCCs *krasnyj* 'red' and *zelënyj* 'green', *žëltyj* 'yellow' and *sinij* 'dark blue'. Similar changes of denotative meanings of the BCCs are documented in individuals with various congenital and acquired abnormalities of color vision. It was found that deterioration of chromatic discrimination (along red-green and blue-yellow channels) was accompanied by an elevated "weight" of the two achromatic characteristics – brightness and saturation (Paramei, 1996; Paramei & Bimler, 2001a, 2001b). A similar tendency was also observed in diabetic patients (Bimler et al., 2014).

Furthermore, the present experiment demonstrated that the two groups differ in the pattern of color-descriptor word formation, in particular, the tendency of post-COVID-19 participants to produce complex color names, with an increased number word components, variety of BCT derivatives, modified terms, binary and multicomponent word combinations. According to previous findings (e.g., Mkrtychian et al., 2021; Wijk et al., 1999, 2002), such complex elaboration of the color-descriptor structure may be the marker of difficulties in precise nomination (of memory retrieval of adequate lexical units) experienced by COVID-19 survivors when they search for appropriate color naming.

Frequently these respondents added to BCTs and variously structured non-BCTs achromatic modifiers *tëmnyj* 'dark', *svetlyj* 'light', *ârkij* 'bright', *tusklyj* 'dull', *nasyŝennyj* 'saturated', *grâznyj* 'dirty', *bleklyj* 'faded', etc.. These adjectives allow specifying a certain characteristic of a color – its lightness/brightness, saturation, and purity. Probably, for post-COVID-19 participants these aspects become essential fro nominating the perceived color.

Furthermore, high frequency of the modifier *tëmnyj* 'dark' in combination with BCTs, which in the color space denote color categories of relatively low lightness – green, blue, and purple (namely, *tëmno-zelënyj* 'dark green', *tëmno-sinij* 'dark *sinij*', *tëmno-fioletovyj* 'dark purple') – and, in some cases, use of color descriptors with the '*dark*' modifier instead of the color name *čërnyj* 'black' indicate general subjective "darkening" of the corresponding colors.

The COVID-19 survivors' relatively high frequency of the BCTs *koričnevyj* 'brown' and *seryj* 'gray', as well as the use of the modifiers *grâznyj* 'dirty', *blednyj* 'pale', *tusklyj* 'dull', and *pastel'nyj* 'pastel' indicate a decrease in saturation, relative loss of vividness of perceived colors.

Undertaking a color vision diagnostic test in COVID-19 survivors will allow to assess whether the blue-yellow opponent system is predominantly affected, the impairment typical for the majority of acquired color vision deficiencies (Simunovic, 2016). Finally, if the phenomena of general "darkening" and loss of vividness of perceived colors will be confirmed the color vision diagnostic test, these might indicate an impairment of processing of luminance contrast in COVID-19 survivors (cf. Bimler et al., 2009).

We cannot exclude the possibility that the phenomena found in this study are reversible and may (progressively) lessen with an increasing time lapse after the COVID-19 disease. If this indeed would be the case, the results of the present study can be useful in clinical practice for monitoring recovery and wellbeing of COVID-19 survivors.

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Yu. A. Griber contributed to the study design; supervised the experiment, collected, analyzed and interpreted the; participated in writing the manuscript and formatted it in line with the journal requirements.

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The Dynamics of Marital Relations and Parental Attitudes in Families Who Conceived the Child Through in Vitro Fertilization

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Abstract: **Introduction**. The growing prevalence of assisted reproductive technology leads to an increase in the research interest in the psychological characteristics of families who have conceived a child through in vitro fertilization (IVF), as a significant factor contributing to child's health and development. However, there are some deficits and contradictions in the available data. The study is aimed at identifying the specifics and dynamics of marital relations, parental attitudes and the mental well-being of the spouses who conceived the child through IVF, during the pregnancy and child's infancy. **Methods**. Participants were 250 married couples: 160 couples with natural pregnancy (NC), and 90 couples with induced pregnancy (IVF). Marital relations, parental attitudes and mental well-being as the affective component of relations were assessed via a set of psychodiagnostic instruments during the pregnancy and at the child's infancy. **Results**. Most characteristics of marital relations did not differ significantly across the NC and IVF groups at both research waves. Parental attitudes were significantly more positive in the IVF than in the NC families, indicating high value of parenthood. During the pregnancy, two types of families were identified in both groups: "Marital and parental well-being" (58 %) and "Marital discord and a high value of parenthood" (42 %) in the main group, "Marital and parental well-being" (67 %) and "Difficulties in marital relations and parental attitudes" (33 %) in control group. Characteristics of these types of families remained stable during the child's infancy. **Discussion**. The results suggest that marital relations are not significantly associated with the method of conception, and the observed tendencies are mostly related to the critical periods in family life cycle. In contrast, parental attitudes in IVF families have special characteristics, e.g. the high value of parenthood that is relatively independent of other aspects of family functioning. The results can be used in the process of psychological support for families with induced pregnancy.

Keywords: marital relations, family relations, parental attitudes, parenting, in vitro fertilization, infertility, IVF, ART, motherhood, fatherhood

Highlights:

- Based on the characteristics of marital relations and parental attitudes, two types of families with induced pregnancy were identified: "Marital and parental well-being" and "Marital discord and a high value of parenthood". The characteristics of these types were stable during the pregnancy and child's infancy.
- No significant differences in most aspects of marital relations were observed across the NC and IVF groups.
- High value of parenthood was identified as one of the key aspects of relationships in families who conceived the child through IVF.

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Introduction

Currently, the prevalence of the reproductive health problems is increasing. According to the latest statistics, more than 15 % couples in the world have been diagnosed with infertility (Simionescu et al., 2021). In 40 % of couples the infertility is caused by the female factor, in 30 % – by the male factor, and in 30 % of couples it is caused by the reproductive problems of both partners (Dyachkova, 2013). Therefore, in a large number of psychological studies, partners are studied separately in order to investigate the psychological characteristics of women or, more rarely, men with reproductive disorders. Thus, it was found that women with infertility have higher levels of stress, anxiety and depression (Zybailo et al., 2015; Yusuf, 2016). For men, the infertility is also a traumatic experience (Hanna & Gough, 2020), causing the feeling of being unsuccessful in family, social and professional relationships (Hadley & Hanley, 2011). However, irrespective of the factor causing infertility, the reproductive problems are considered to be a stressful experience, that affects marital relationships and contributes to an increase in psycho-emotional stress in the family (Ying et al., 2015).

Assisted reproductive technology (ART), and particularly in vitro fertilization (IVF), are considered as the most effective method of infertility treatment. The prevalence, availability and efficacy of ART is increasing, therefore, there is a special growing category of families – families that conceived a child through ART. In such families, the stressful experience of having reproductive problems is accompanied by stress associated with fertility treatment (Miller et al., 2019), which also affects marital relations and parental attitudes. Other psychological characteristics of such families include the strong desire to have a child, and the perception of assisted reproductive technology as a way to overcome the reproductive health problems.

However, there is a lack of data on the characteristics of marital relations and parental attitudes in families who have conceived a child through IVF. Most research was conducted on a female sample, and there is a limited number of studies investigating the psychological state of men during the IVF treatment (Gardanova et al., 2021a). The characteristics of marital relations in couples undergoing infertility treatment include: the moderately balanced type of relations (Gardanova

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et al., 2021b); women's dissatisfaction with marital relations (Blake et al., 2012; Darwiche et al., 2015), with no difference for fathers (Blake et al., 2012); the decrease in marital congruence and satisfaction after childbirth, with initial relationship satisfaction (Gameiro et al., 2011; Cairo et al., 2012). The absence of significant differences in the quality of marital relations associated with the conception type was also reported (Cebert et al., 2019).

The parental attitudes towards the child conceived through IVF was shown to be characterized by: high maternal expectations from the child (Solovyova, 2014), from themselves and others (Mohammadi et al., 2015); mothers' tendency to express overprotection and permissive parenting style (Dueva, 2014; Mohammadi et al., 2015); excessive positive emotionality during the pregnancy and overestimation of own parental skills, with a tendency to have codependent relationships with the child (Malenova & Kytkova, 2015); unconditional acceptance of the child and the desire to establish the bodily contact with them, with lower support of child's initiative (Yakupova & Zakharova, 2016); and an overall warmer attitude towards the child compared to families who conceived naturally (Fata et al., 2021; Paterlini et al., 2021).

The affective aspects of relations in families with induced pregnancy, especially maternal anxiety and depression, were actively studied. The data are contradictory: high levels of trait anxiety and depression (Naku et al., 2016); low levels of state and trait anxiety, and a high level of anxiety associated with pregnancy (McMahon et al., 2013); hyperthymia and impulsivity, euphoric attitude towards childbirth and anxious attitude towards pregnancy (Kocherova et al., 2016). The presence of increased anxiety and depression was also observed in men participating in the ART program (Gardanova et al., 2021a), as well as the relationship between parental well-being and the time to pregnancy (Jongbloed-Pereboom et al., 2012). No significant differences in parental mental health in families with induced vs natural pregnancy were observed after childbirth (Caparros-Gonzalez et al., 2019).

All in all, the data on the characteristics of relationships in families with induced pregnancy are contradictory. Also, there is a lack of data on the psychological characteristics of fathers, as well as an integral family system. All this emphasizes the need for comprehensive longitudinal studies aimed at investigating the problems indicated above. This present study was aimed at identifying the characteristics and dynamics of marital and parental relationships in families who conceived a child through IVF, based on the comparative and typological approach.

Methods

Procedure

The data were a part of the prospective and longitudinal study of child development. Two assessment waves were included in the study: pregnancy and child's infancy (9 months), which reflected two stages of family life cycle, associated with a critical period. The recruitment of participants was conducted via partner clinics in Tomsk, Novosibirsk and Barnaul. The study was approved by the Ethical committee of interdisciplinary research.

Participants

The participants were 250 families: 90 families with induced pregnancy (IVF) and 160 families with natural conception (NC). Parents who conceived the child through IVF were significantly older than parents of the control group (mean age of NC mothers M = 28.96 (SD = 4.06), IVF mothers – M = 33.40 (SD = 4.90); NC fathers M = 31.01 (SD = 4.99), IVF fathers – M = 34.75 (SD = 5.50)).

Methods

The diagnostic booklets are based on the materials used in the large-scale longitudinal studies of childhood development: QLSCD (The Quebec Longitudinal Study of Child Development, Canada) and C-IVF (Cardiff IVF study, Great Britain). The questionnaires were translated and adapted for the Russian-speaking sample.

During the pregnancy the following characteristics were studied: 1) Marital satisfaction (Marital Adjustment Test, MAT) (Locke & Wallace, 1959); 2) Warmth and hostility in marital relations (Warmth and Hostility scale of The Iowa Family Interaction Rating Scales) (Melby & Conger, 2000); 3) Attachment to the fetus (Maternal Fetal Attachment Scale) (Cranley, 1981); 4) Stressful events in parents' life (The List of Threatening Experiences) (Brugha & Conroy, 1985); Life Event Scales for Obstetric Groups (Barnett et al., 1983); 5) The levels of anxiety, irritability and depression (The Irritability, Depression, Anxiety Scale (IDA)) (Snaith et al., 1978);

During the child's infancy we explored: 1) Level of happiness in the relationship (Happiness in the Relationship Scale of Marital Adjustment Test, MAT) (Locke & Wallace, 1959); 2) Warmth and hostility in marital relations (Warmth and Hostility scale of The Iowa Family Interaction Rating Scales) (Melby & Conger, 2000); 3) Family functioning (Family Functioning Scale of McMaster Family Assessment Device, MFAD) (Epstein et al., 1983); 4) Parental attitudes (parental self-efficacy, perceived parental impact, overprotection, warmth towards the child, hostile-reactive parental behavior, perception of infant's qualities of the Parental Perceptions and Behaviors Regarding the Infant Scale, PACOTIS) (Boivin et al., 2005); 5) Postpartum depression (The Center for Epidemiologic Studies Depression Scale, CES-D) (Poulin et al., 2005).

The statistical analysis was performed with IBM SPSS Statistics 26: descriptive statistics; Kolmogorov–Smirnov normality test, parametrical and non-parametrical methods of comparison (Mann–Whitney U test; Wilcoxon test), hierarchical cluster analysis. At the first stage of analysis the internal consistency of scales was tested with Cronbach's alpha coefficient. Several scales were excluded from the further analysis because of the low internal consistency ($\alpha < 0.6$): «Differentiation of self from the fetus» subscale of Maternal Fetal Attachment Scale; «Depression» and «Inward irritability» subscales of the Irritability, Depression, Anxiety Scale (IDA) Scale.

Results

Pregnancy

At the first step, the observed characteristics were compared between the parents of the IVF vs NC groups, as well as between mothers and fathers within each group. Marital relations in both groups were characterized by a high degree of satisfaction with the relationship, warmth, support, trust, and low conflict. The only measure that differed significantly between groups was the warmth expressed towards the partner, which was significantly higher in fathers from the IVF families compared to fathers from the NC families ($U = 4978.00$; $p = 0.04$; $r = 0.14$). In the NC families, the composite measure of marital satisfaction was significantly higher for mothers than for fathers ($z = 3.27$; $p = 0.00$; $r = 0.27$), which was not observed in IVF families.

The measures of the parental attitudes indicated the high level of attachment to the child in both parents, which was expressed in the interaction with them (touching the stomach, talking), the desire to take care of them, and the readiness to change the lifestyle. Parents from IVF families, compared with NC parents, performed higher levels of paternal ($U = 4988$; $p = 0.04$, $r = 0.13$) and maternal ($U = 4356.5$; $p = 0.00$, $r = 0.28$) behaviors, were more likely to imagine the child's feelings (mother: U = 5502.5; p = 0.04, r = 0.13; father: U = 4469.5; p = 0.00, r = 0.21) and were in general more attached to the child (mother: U = 4257; p = 0.00, r = 0.29; father: U = 4727; p = 0.01, r = 0.17); mothers often interacted with the fetus (U = 5165; p = 0.01, r = 0.17) and were more prone to self-sacrifice (U = 4117.5; p = 0.00, r = 0.31).

All measures of mental well-being did not differ significantly between the groups for both family members. Most participants experienced low levels of anxiety and irritability, indicated the low perceived levels of stress caused by events that took place in their lives over the past year. In both groups, mothers had higher level of anxiety than fathers (NC: Z = 4.05; p = 0.00; r = 0.33; IVF: Z = 2.90; p = 0.00; r = 0.24).

At the second step, the cluster analysis was performed, and two types of IVF and NC families with different characteristics of relations were identified.

The following types of IVF families were observed (table 1):

1. «Marital and parental well-being» (58 % of couples). Both parents were significantly more satisfied with marital relations, had positive parental attitudes, significantly higher mental well-being. Mothers had lower stress level.

2. «Marital discord and a high value of parenthood» (42 % of couples). Both parents were significantly less satisfied with marital relations, significantly lower mental well-being, and positive parental attitudes. Mothers had higher stress level.

Table 1

Significant differences in psychological characteristics of types of IVF couples during the pregnancy

Measures	Family member	Comparison	U/t	r
Marital satisfaction	M**	Type 1 > Type 2	356.50	0.46
	F**	Type 1 > Type 2	299.50	0.52
Warmth towards the partner	M**	Type 1 > Type 2	3.79	0.09
	F**	Type 1 > Type 2	5.86	0.53
Perception of partner's warmth	M**	Type 1 > Type 2	5.65	0.56
	F**	Type 1 > Type 2	199.00	0.63
Stressful life events	M**	Type 1 < Type 2	4.73	0.49
Anxiety	F**	Type 1 < Type 2	390.50	0.43

*Here and below: * significant at p < 0,05; ** significant at p < 0,01; M – mother, F – father; r – effect size.*

In NC families two types of families were also observed (table 2):

1. «Marital and parental well-being» (67 %). Both parents were significantly more satisfied with marital relations, had more positive parental attitudes and higher mental well-being.
2. «Difficulties in marital relations and parental attitudes» (33 %) was characterized by significantly lower marital satisfaction, less positive parental attitudes and lower mental well-being.

Table 2

Significant differences in psychological characteristics of types of NC couples during the pregnancy

Measures	Family member	Comparison	U/t	r
Marital satisfaction	M**	Type 1 > Type 2	1569.00	0.37
	F**	Type 1 > Type 2	6.16	0.48
Warmth towards the partner	M**	Type 1 > Type 2	729.50	0.61
	F**	Type 1 > Type 2	1306.00	0.45
Perception of partner's warmth	M**	Type 1 > Type 2	1163.00	0.49
	F**	Type 1 > Type 2	1231.50	0.47
Attachment to the fetus	M**	Type 1 > Type 2	1650.50	0.35
	F**	Type 1 > Type 2	1451.00	0.41
Stressful life events	M**	Type 1 < Type 2	2029.50	0.24
	F*	Type 1 < Type 2	2300.00	0.17
Anxiety	M**	Type 1 < Type 2	1134.50	0.50
	F**	Type 1 < Type 2	1827.00	0.30
Irritability	M**	Type 1 < Type 2	1210.50	0.50
	F**	Type 1 < Type 2	1999.50	0.26
Negative emotional states	M**	Type 1 < Type 2	710.00	0.62
	F**	Type 1 < Type 2	1666.50	0.35

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Child's infancy

At this assessment wave, all characteristics of marital relations did not differ significantly between the IVF and NC parents. Most couples were satisfied with warmth and acceptance they experienced in marital relations, and perceived home as a safe place. No IVF family was included in the risk group for low quality of family functioning; in the control group, the proportion of such families was 2.3 %. In both groups, fathers reported a higher level of happiness experienced in relationships (NC: $Z = 2.92$; $p = 0.00$; $r = 0.24$; IVF: $Z = 2.21$; $p = 0.03$; $r = 0.25$), higher quality of interaction with the partner (E3: $Z = 4.65$; $p = 0.00$; $r = 0.39$; IVF: $Z = 2.64$; $p = 0.01$; $r = 0.29$), lower hostility towards the partner (E3: $Z = 5.19$; $p = 0.00$; $r = 0.43$; IVF: $Z = 2.07$; $p = 0.04$; $r = 0.23$), and a lower level of family functioning (E3: $Z = 2.61$; $p = 0.01$; $r = 0.22$; IVF: $Z = 2.22$; $p = 0.03$; $r = 0.25$).

For NC fathers, the perceived level of happiness was significantly higher compared to the first assessment wave ($\Delta M = 2.72$; $Z = 2.68$; $p = 0.01$; $r = 0.25$). In the IVF families, both spouses reported significantly lower warmth in relationships (mothers: $\Delta M = 2.63$; $Z = 4.23$; $p = 0.00$; $r = 0.50$; fathers: $\Delta M = 2.37$; $Z = 4.34$; $p = 0.00$; $r = 0.51$) and higher level of hostile behavior towards the partner (mothers: $\Delta M = 1.52$; $Z = 3.10$; $p = 0.00$; $r = 0.37$; fathers: $\Delta M = 0.93$; $Z = 2.50$; $p = 0.00$; $r = 0.30$) than during the pregnancy. For the NC mothers, the level of warmth significantly decreased ($\Delta M = 2.76$; $Z = 5.16$; $p = 0.00$; $r = 0.43$) and the level of hostility to the partner increased ($\Delta M = 2.06$; $Z = 4.26$; $p = 0.00$; $r = 0.36$). For fathers, only the decreased in warmth was statistically significant ($\Delta M = 0.94$; $Z = 2.54$; $p = 0.01$; $r = 0.21$).

Parental relations in both groups were characterized by a high degree of warmth, care, awareness of parents' importance for the child's development and feeling of being effective as a parent. Fathers from IVF families reported higher levels of perception of infant's qualities as exceptional, compared to NC fathers ($U = 5436.5$; $p = 0.01$; $r = 0.16$), both IVF parents treated their child with more warmth and care (mothers: $t = 2.27$; $p = 0.02$; $r = 0.16$; fathers: $U = 5421.5$; $p = 0.01$; $r = 0.17$) that NC parents.

Most parents of both groups reported low levels of postpartum depression. However, in both groups, a risk group of participants with increased level of depressive symptoms was identified: in IVF group – 4.4 % of mothers and 3.3 % of fathers, in the NC group – 18.7 % of mothers and 10.8 % fathers. The significant differences in postpartum depression scores between mothers and fathers were observed only in NC families: mothers were significantly more depressed than fathers ($Z = 4.14$; $p = 0.00$; $r = 0.35$).

In order to identify the dynamics of the typological characteristics of couples, we analyzed the differences in characteristics of marital relationships, parental attitudes and mental well-being between the family types.

In IVF families, all characteristics of marital relations were significantly higher for the first type of families than for the second one, except for fathers' happiness in relationships, that did not differ significantly between the types (Table 3). Differences in mental well-being were significant only for the fathers' postpartum depression: it was higher for the second type of families. During the pregnancy, the measures of the attachment to the fetus did not differ significantly between types of families. At this assessment wave, the overall attitude towards the child was also positive in both types of families, however, some of differences were revealed. In the first type of families, fathers considered themselves as more effective in the role of a parent, which can be related to low levels of support from their spouses. In families of the second type, fathers tended to consider their child more unique, exceptional, compared with fathers from the first type of families, which can probably act as compensation for marital problems.

Table 3

Significant differences in psychological characteristics of types of IVF couples during the child's infancy

Measures	Family member	Comparison	U/t	r
Happiness in the relationships	M*	Type 1 > Type 2	304.00	0.22
Warmth towards the partner	M*	Type 1 > Type 2	287.00	0.25
	F**	Type 1 > Type 2	2.99	0.36
Family functioning	M*	Type 1 > Type 2	2.88	0.35
	F**	Type 1 > Type 2	4.13	0.47
Parental self-efficacy	F*	Type 1 > Type 2	2.38	0.29
Perception of infant's qualities	F*	Type 1 < Type 2	2.37	0.30
Depression	F**	Type 1 < Type 2	278.00	0.31

NC families of the first type were also characterized by better marital relations compared to the families of the second type (Table 4). The levels of mothers' and fathers' happiness in the relationship did not differ significantly between the groups. In addition, in the first type of families, both parents had significantly lower levels of postpartum depression, which is similar to the pregnancy period. Families of the first type were characterized by more positive parental attitudes: higher levels of self-efficacy in motherhood and fatherhood, higher warmth and care towards the child, higher paternal perceived influence on the child, less frequent strict discipline performed by the father.

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Table 4

Significant differences in psychological characteristics of types of NC couples during the child's infancy

Measures	Family member	Comparison	U/t	r
Warmth towards the partner	M**	Type 1 > Type 2	2.91	0.34
	F**	Type 1 > Type 2	3.00	0.32
Family functioning	M**	Type 1 > Type 2	3.95	0.29
	F**	Type 1 > Type 2	1214.50	0.32
Parental self-efficacy	M**	Type 1 > Type 2	1392.50	0.27
	F*	Type 1 > Type 2	1574.50	0.19
Perceived parental impact	F**	Type 1 > Type 2	1206.00	0.32
Hostile-reactive parental behavior	F*	Type 1 < Type 2	1529.00	0.20
Warmth towards the child	M*	Type 1 > Type 2	1593.00	0.21
	F*	Type 1 > Type 2	1575.00	0.20
Depression	M**	Type 1 < Type 2	1432.00	0.26
	F**	Type 1 < Type 2	1189.50	0.33

Discussion

The results indicate the absence of the significant differences in marital relations associated with the conception type, which is consistent with the data presented by Cairo et al. (2012), Cebert et al. (2019). At the same time, fathers from families with induced pregnancy demonstrated higher warmth, care and support towards their spouse during the pregnancy, compared with the fathers from NC families (Ying et al., 2015). Therefore, marital relations can be identified as a resource that helps women to cope with the stress associated with IVF procedures and the pregnancy period (Anaman-Torgbor et al., 2021). However, the observed effect sizes were low.

In the child's infancy, in families of both groups universal tendencies were revealed, that were characterized by an increase in marital discord, which was previously demonstrated by Gameiro et al. (2011), Cairo et al. (2012). This result suggests that the characteristics of marital relations are largely explained by the feelings caused by the transition to new stage of the family life cycle beginning after the childbirth (Lévesque et al., 2020).

During the pregnancy and the childbirth, most participants who conceived a child through IVF didn't experience any mental health problems, which is not consistent with the results presented in Russian and international studies (McMahon et al., 2013; Kocherova et al., 2016), and may be explained by the differences in the samples and the psychodiagnostic methods. However, an increased level of depression, observed in 3.3 % of fathers, highlights the need for psychological support to be provided for such fathers after the childbirth. It should be noted that the low levels of postpartum depression in mothers observed in the present study may indicate a tendency to suppress negative emotions, which was not investigated due to the limitations of the research.

Parental attitudes in families with induced pregnancy were characterized by the early development of maternal and paternal roles, higher prenatal attachment to the child, compared with the control group. In the child's infancy, the parents showed a high level of warmth, care towards the child. They expressed the awareness of their own importance for the child's development and perceived themselves as the parents who a capable of childcare. The total measure of the attitude towards the child of both parents was significantly higher than in control group. This is consistent with the results indicating high level of attachment to the child in families who conceived a child through IVF, which is developed even before the birth of the child (Chen et al., 2011). At the same time, while this characteristic was previously identified in mothers (Malenova & Kytkova, 2015; Langher et al., 2019), our study confirmed the high significance of the child for fathers as well. Yakupova & Zakharova (2016) revealed the ambivalent nature of maternal attitude to the child: a declared positive attitude towards the child combined with an unconscious rejection of them, which was not tested in the present study. In the child's infancy, the group-specific differences in perception of child's qualities as special, positively different from the qualities of other children, was significant only for fathers: fathers in IVF had significantly higher scores than NC fathers. This result may indicate the risk for having high expectations from the child, which was previously observed in mothers (Solovyova, 2014).

High value of parenthood identified in IVF families was also observed in the typological differences. During the pregnancy, in each group, 2 types of families were identified with different levels of marital and mental well-being, and these differences remained stable during the child's infancy. In the first type of IVF families called "Marital and parental well-being", the spouses successfully coped with the stress associated with infertility and IVF treatment. The high degree of cohesion of the spouses, and satisfaction with marital relations contributed to their mental well-being and stability in stressful circumstances. On the contrary, for families of the second type "Marital discord and a high value of parenthood", the infertility had a destabilizing effect, and could be probably diagnosed in families that were having some marital problems. In such families, problems in marital relations and the emotional isolation of the spouses were combined with their psycho-emotional distress. During the pregnancy both types of families were characterized by a high degree of attachment to the fetus, associated with a long-awaited pregnancy, and the need to go through fertility treatment to achieve conception. It is likely that the similarly high degree of attachment to the fetus in each of these types of families has its own specifics. In families of the second type, it can act as the compensation for marital and mental problems, but this aspect was not studied in our study.

Types of NC families were similar to IVF families in terms of marital relationships and mental well-being. At the same time, the second type of families was called "Difficulties in marital relations and parental attitudes", since levels of the attachment to the fetus and the attitude towards the infant in such families were significantly lower than in the first type of families. This result demonstrates a close relationship between marital relations, mental well-being and attitude towards the child in families with natural conception, while in families with induced pregnancy parental relations are relatively independent.

The present study adds to the scientific data on the high value of parenthood for spouses with reproductive health disorders, and shows its relative independence from other aspects of family functioning for both parents. The results indicate the directions of psychological support for families during the transition to a new stage of the family life cycle.

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Features of Memory Consolidation and Reconsolidation Processes in Patients With Cerebrovascular Disorders

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Abstract: **Introduction**. Given the high prevalence of cerebral circulatory disorders (both acute and chronic), which are accompanied by a decrease in cognitive functions, for the most part, the effectiveness of rehabilitation and rehabilitation measures depends, among other things, on mnestic processes. The authors describe the characteristics of the memory consolidation and reconsolidation processes in patients with chronic (chronic cerebral ischemia) and acute (ischemic stroke in the circulation of the middle cerebral artery of hemispherical localization) disorders of the cerebral circulation. The study aimed to investigate the processes of consolidation and reconsolidation of memory in patients with impaired cerebral circulation (with acute and chronic cerebral ischemia). **Methods**. The research methods were methods of "10 words" and "Visual memory" by A. R. Luria, the experiment according to F. Bartlett's scheme, methods of descriptive and comparative statistics. The total size of the research sample is 57 people aged 65.2 ± 2.78 years. The first group included patients with chronic cerebral ischemia – 21 people; the second group included the patients with left-sided localization of the ischemic stroke focus – 17 people; the third group also included patients who had suffered an ischemic stroke, 19 people – with the localization of the dextrocerebral affected area. **Results**. In patients with cerebral circulatory disorders, a decrease in short-term audio-verbal and visual-picturesque memory volume was revealed, regardless of the type of cerebral circulatory disorder (acute or chronic cerebral ischemia). In an ischemic stroke of hemispheric localization, a change in the qualitative and quantitative characteristics of the memory consolidation and reconsolidation processes has been experimentally proven. This change is a consequence of a decrease in the volume of short-term audio-verbal and visual-picturesque memory. **Discussion**. The decrease in volume leads to instability of the memory traces, which distorts the consolidated information. In the process of reconsolidation, there is a reduction (in case of chronic cerebral ischemia) and distortion (in case of ischemic stroke of hemispheric localization) of the reproduced information.

Keywords: visual-picturesque memory, semantic memory, memory consolidation, memory reconsolidation, cerebrovascular disorders, ischemic stroke, chronic cerebral ischemia, short-term memory, long-term memory, memory traces (engrams)

Highlights:

- Memory as a process is carried out through memorization, which goes through short-term and long-term phases.
- Consolidation of memory leads to the transformation of the stored content.
- Each time the memory is retrieved, the old memory trace is replaced with new content (the change may be partial or complete).
- A decrease in volume leads to instability of memory traces and distortion of consolidated information, regardless of its quality (audio-verbal and visual-picturesque).

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Introduction

According to statistics, in 2017 in Russia, the number of patients diagnosed with the ICD group "Other cerebrovascular diseases" per 100.000 adult population was 5.560. Several works indicate the early development of cognitive disorders, including mnestic, in chronic cerebral ischemia (Zakharov et al., 2020; Kulesh et al., 2021).

Currently, a lot of attention is paid to the research of mnestic functions: in sensory disorders (visual and hearing disorders) Rosemann & Thiel (2020), Loughrey et al. (2021), Moorman et al. (2020), Griffiths et al. (2020), Zakharova et al. (2022); in Parkinson's disease and other neurodegenerative diseases, memory processes are studied by Barone et al. (2009), Berganzo et al. (2016), Brefel-Courbon et al. (2013), Hou & Lai (2007), Pourzinal et al. (2021), Siciliano et al. (2021), Nikishina et al. (2022), Nikishina et al. (2021). In mental illness, the role of memory was considered by Alekseev et al. (2021). Tikhomirova et al. (2020) present the results of a study of the dynamics of changes in visuospatial working memory in primary school, adolescence and youth, indicating the importance of several years of study in the development of visuospatial working memory during the training period. Many studies are devoted to the study of the possibilities of using memory reconsolidation processes for psychological interventions aimed at modifying memories (Yang et al., 2019; Bellfy & Kwapis, 2020; Pan et al., 2021; Milton, 2022). Nikitin et al. (2020) in their research question the effectiveness of the memory reconsolidation procedure to suppress negative pathological memory, pointing out that a violation of reconsolidation of at least some forms of memory can lead not only to temporary suppression or erasure of memory but also to the formation of stable irreversible anterograde amnesia.

Mnestic functions are studied concerning processes and types in which it is implemented and functions, have a significant compensatory resource for several disorders, regardless of age. In terms of the effectiveness of rehabilitation measures for patients with cerebral circulatory disorders (both acute and chronic), mnestic functions play an essential role.

Presenting the results of modern research in a review article by Jardine et al. (2022), the authors concluded that after consolidation, long-term memories exist in a stable form. During reactivation, memory can become labile or unstable, depending on whether the reactivation conditions involve destabilization mechanisms. It is possible that memory reactivation does not cause memory destabilization if there are certain boundary conditions that prevent modification, in which case the memory will remain in a stable form. When memory destabilization occurs, the memory becomes susceptible to change. A destabilized memory is labile for a limited period before it reconsolidates and returns to a stable and potentially enhanced or otherwise updated state. Violation of reconsolidation by pharmacological or behavioral interventions will prevent the return of memories to a stable form (erasure) or lead to the restoration of a weakened version of the original memory. The process of reconsolidation "opens a window" of opportunities for updating consolidated memories with new information. Numerous studies presented in the authors' review paper have shown that reactivated memory traces can be weakened, strengthened, or otherwise "updated" during the post-reactivation window. Incorporating new information into existing memory networks is another type of memory update that probably happens regularly in the real world. The phenomenon of recovery-extinction is the most widely studied form of memory renewal outside the models of memory weakening or strengthening. Extraction-extinction paradigms demonstrate that targeting and remodelling of established memory during the window after reactivation can more efficiently update memory performance compared to typical extinction procedures.

Bazyan (2013), considering the molecular-neurochemical and neurophysiological mechanisms of brain plasticity in the process of consolidation, storage, and reproduction of memory, found that the basis for the implementation of behavior and learning is the modification of the efficiency of synaptic transmission, which is consolidated and maintained for a long time. From the point of view of molecular and cellular mechanisms of neuronal functioning, it does not matter how the efficiency of synaptic transmission is modified: by training an entire animal, by combined activation of two neuron inputs, by high-frequency stimulation or by pharmacological action. The NMDA receptor plays a key part in the plasticity of glutamatergic synapses. The reminder starts the recycling and updates the neural network and working memory from the storage stage. The prolonged absence of a reminder leads to the degradation of a specific cluster in the endosome, forgetting and erasing memory. Actualization of the neural network and working memory is possible because the reproduction of the specific activity of the GABA receptor reproduces the specific activity of the glutamatergic receptors of this neuron associated with it through the intracellular integration based on a transduction signal.

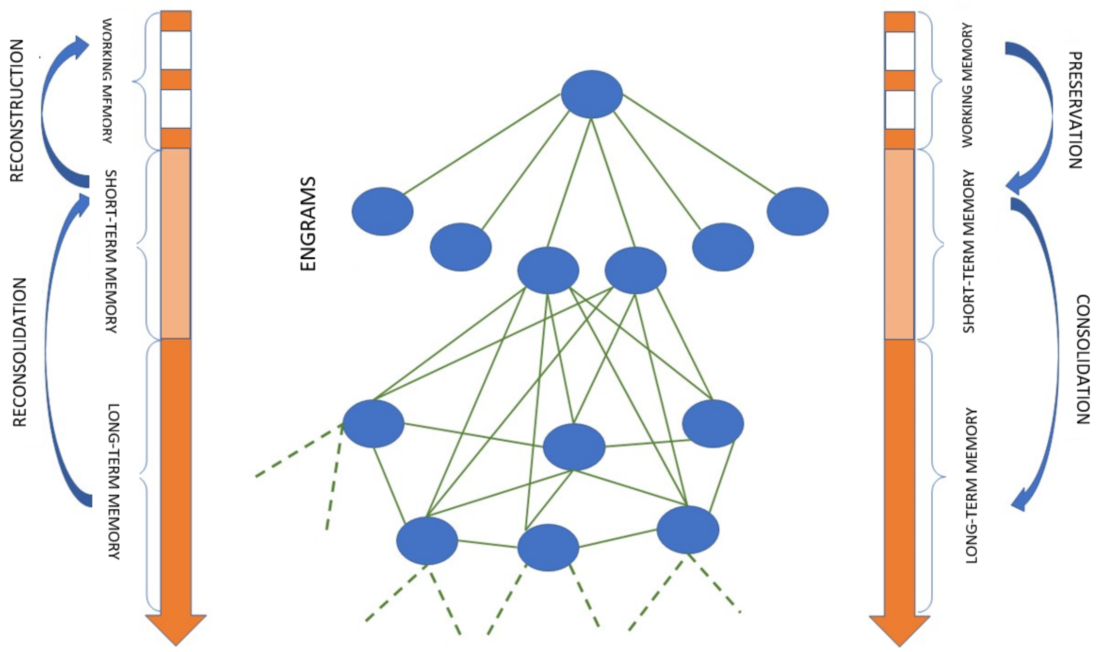
Molecular mechanisms of memory modification were also considered by Balaban (2017). The author proceeds from the assumption that when reactivating long-term memory, a process of local labilization/destabilization/erasure of existing memory occurs in the synapses of the neural network underlying this type of memory, with the participation of nitric oxide. In this case, the mechanism of synthesis of the same proteins is triggered, violations of which manifest themselves in the form of memory disappearance during subsequent testing. On the basis of the results of numerous studies conducted by Balaban, the mechanism of maintaining long-term memory can be mediated by the protein kinase M-zeta, and memory modification can be associated with the destruction of this protein with the participation of nitric oxide.

Mastrorilli et al. (2022), evaluating the role of memory in the process of restorative learning, found that distributed learning leads to more reliable memory formation compared to short-interval learning. Although this phenomenon, called the distributed practice effect, is ubiquitous for a variety of tasks and organisms and has long been known to psychologists, its neurobiological basis is still poorly understood. Using the striatum here as a model system, we tested the hypothesis that the ability of distributed learning to optimize memory may depend on the recruitment of various neural substrates compared to those involved in massive training. First, by comparing the medial and lateral domains of the dorsal striatum after massive and distributed training, we demonstrated that the neural activity assessed using c-Fos expression depends differently on the training protocol in the two subregions of the striatum. Then, by blocking AMPA receptors before recollection, we provide evidence confirming the selective role of the medial and lateral striatum in storing information obtained as a result of massive and distributed training, respectively. Finally, we found that optogenetic stimulation of the dorsolateral striatum during massive learning allows the formation of long-term memory similar to that observed in distributed training. Hegazy et al. (2022) in their study of the relationship between memory deficit and motor dysfunction of the upper extremities in stroke patients proved the presence of a significant correlation between memory deficiency and motor dysfunction in stroke and hemiplegia patients, leading to a decrease in the efficiency of the process of restoring motor functions (because restoring motor functions requires stored memory).

The presented research was methodologically based on the provisions of K. V. Anokhin's concept of memory (Anokhin, 2009) and the provisions of B. B. Velichkovskii's working memory concept. Memory as a process is carried out through memorization, which goes through two stages (phases). The short-term phase is characterized by the fixation of the stored information fully (without loss and distortion of the content) for a short period. It is a labile phase of memory, which corresponds to the retention of an information trace in the form of reverberation of nerve impulses. The long-term phase of memorization is characterized by a reduction in the amount of information during its subsequent long-term storage without making changes (Fig. 1).

Figure 1

Conceptual and experimental modelling of the study of memory consolidation and reconsolidation



Working memory characterizes the system of cognitive processes that ensure the processing and operational storage of information. It is a multi-component system, the functional organization of which ensures the implementation of the storing and processing information functions. By its purpose, working memory is not species-specific. Its content is determined by the type of memory. According to the functional result, memory is divided into figurative (visual-picturesque, figurative-symbolic, audio-verbal) and semantic.

At the stage of saving information, its simplification ("compression") occurs. While cognitive processing, information in working memory is transformed into a primary mnestic image or primary semantic content, forming traces of memory (engrams). Accordingly, the storage of information in working memory is driven by mechanisms of both short-term and long-term storage. Short-term storage mechanisms are meant to be used for the operational storage of information, which is especially significant for solving the current cognitive task (Velichkovskii, 2015).

When new information is consolidated, providing a transition from short-term to long-term memory, neural circuits are organized by changing synaptic activity between neurons included in this circuit. An access system is being formed to extract the information needed at a given time and to reconsolidate memory traces after "using" them (reproducing stored information). During consolidation, there is a further transformation of the stored information (regardless of the modality) by the available experience. The newly saved information is compared with the information already available in the long-term system. With the reactivation of memory, which provides information retrieval, its active reconstruction occurs, which, in turn, is accompanied by recategorization. Each recategorization is followed by the process of re-preservation of information (reconsolidation) (Grigor'yan, Markevich, 2014). Thus, each memory extraction is accompanied by the replacement of the old memory trace with new content (it may fully or partially change).

According to the results of Velichkovskii's long-term research (2014, 2015), violations of working memory, regardless of their cause, lead to a reduction in a person's ability to process information, make suboptimal decisions and, in general, to a decrease in adaptive potential (Velichkovskii, 2014, 2015).

The paper aimed to study the processes of consolidation and reconsolidation of memory in patients with cerebral circulatory disorders (ischemic stroke in the middle cerebral artery circulation of sinistrocerebral and dextrocerebral localization; chronic cerebral ischemia due to occlusion and arctation of cerebral arteries).

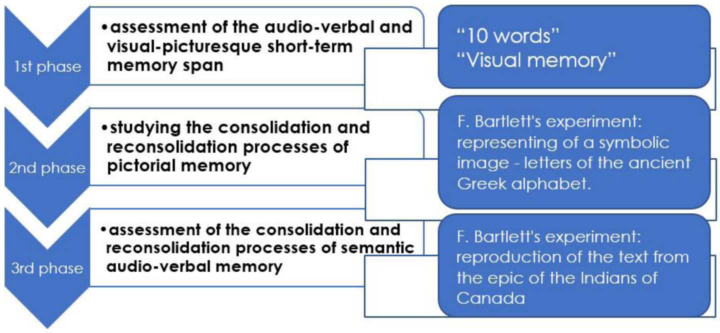
Methods

The total volume of the research sample was 57 people aged 65.2 ± 2.78 years. The first group included patients with a diagnosis of I66 – "Occlusion and arctation of the cerebral arteries that do not provoke a cerebral infarction" (according to ICD-10) – 21 people; the second group consisted of patients with a diagnosis of I63 – "Cerebral infarction" (according to ICD-10) – 17 people with the sinistrocerebral lesion; in the third group also included patients with a diagnosis of "Cerebral infarction" in the number of 19 people – with the dextrocerebral lesion. The research groups were equalized by gender. The criterion for inclusion of patients in the study program was the absence of pronounced cognitive impairment (at least 23 points on the MMSE scale in quantitative terms). The study was carried out individually with the informed consent of the patients.

The organization of the study included three stages (Fig. 2).

Figure 2

Stages of research and methodological support



In the first stage, the volume of short-term audio-verbal and visual-picturesque memory was estimated using techniques developed by A. R. Lariya (Bizyuk, 2005). To estimate the volume of short-term audio-verbal memory, we let the patients read a list of 10 unambiguous one- or two-syllable words, semantically unrelated, having a specific meaning. After presenting a complete list of words, the patient had to reproduce the presented stimulus words. The procedure was repeated five times. In this stage following indicators were fixed: the number of correctly reproduced stimulus words, the number of repeatedly repeated words in each presentation, and the number of introduced words. The volume of short-term visual-picturesque memory was evaluated using the "Visual memory" technique. As stimulus material, patients were presented with a table consisting of 16 cells. Each cell contained one contour image of a separate object (geometric shapes and schematic images of objects). The one-time table presentation time was 2 minutes. After each presentation, the patient had to name all the objects depicted in the table cells that he remembered. This procedure was also repeated five times. The following indicators were recorded: the number of correctly reproduced visual-picturesque stimuli, the number of repeated images in each presentation and the number of words introduced.

To determine the features of the processes of consolidation-reconsolidation of memory in patients with cerebral circulatory disorders, a comparison group with the normative ageing process (52 people) was included in the study – correlated by age (67.2 ± 3.26 years), but with no history of cerebral circulatory disorders and the absence of severe somatic pathology. This group of subjects was formed based on the results of the planned medical examination procedure.

The study of the processes of consolidation and reconsolidation of visual-picturesque and semantic audio-verbal memory was carried out according to the experimental scheme proposed by F. Bartlett for the reconstruction of memory during its active extraction.

In the second stage, to study the processes of consolidation and reconsolidation of visual-image memory as a stimulus material (the selection criterion was the absence of this image in the previous experience), patients were offered an emblematic figure – a letter of the ancient Greek alphabet resembling an owl (Fig. 5). This symbol included four parts ("head", "trunk with leg", "wing", "leg"), in each of which elements were highlighted (for example, the "head" part contains two components – the head itself and the inner part in the form of a "tick"). Initially, patients had to copy the image. Then, at some intervals (after 40 minutes, 4 hours, and 36 hours), the patients had to reproduce the figure from memory. The evaluation of visual-picturesque memory was carried out according to such criteria as the integrity of the image, the number of losses, the number of distortions, and the number of stored elements.

The assessment of the processes of consolidation and reconsolidation of semantic audio-verbal memory was carried out in the third stage of the study. The text from the epic of the Indians of Canada, presented in Russian, acted as stimulus material. The text consisted of 79 semantic units (33 sentences, 1427 simbols, 295 words). A semantic unit was understood as a grammatical form characterized by semantic content and realized in various combinations of nouns as the leading linguistic form with other ones (adjectives, verbs, pronouns). When the text was read to the patients, they had to retell it accurate as possible. After the time intervals (40 minutes, 4 hours, 36 hours), the patients had to reproduce the text from memory. The evaluation of semantic audio-verbal memory was carried out according to such criteria as the number of preserved sentences, the number of preserved semantic units, the number of distorted sentences, the number of distorted semantic units, the number of violations of the sequence of the sentences, the number of violations of the sequence of semantic units.

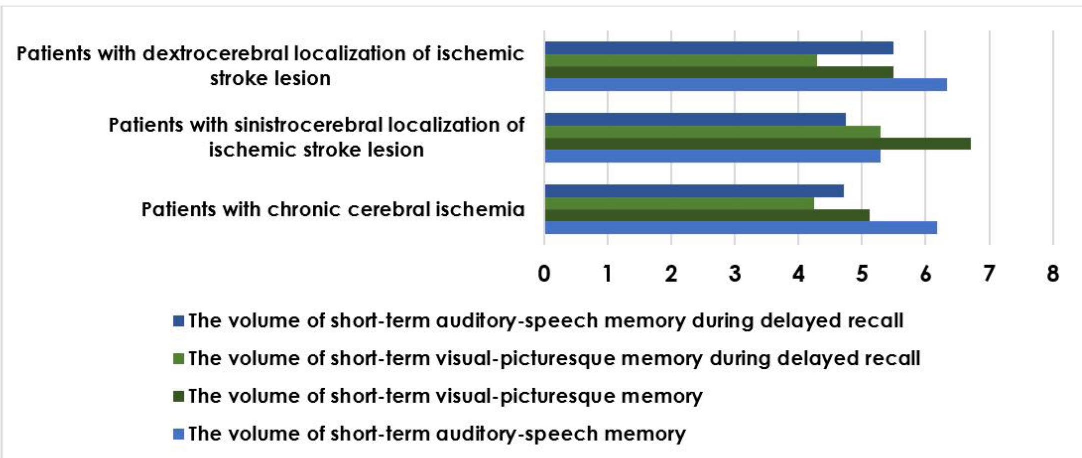
Statistical analysis of the obtained data was carried out using descriptive and comparative methods (Mann–Whitney U test, $p < 0.05$) statistics. A comparison of research groups by quantitative indicators was carried out in pairs.

Results

The volume of short-term auditory-speech and visual-picturesque memory was assessed in patients with cerebrovascular diseases. As a result, the persistent decrease in the volume of short-term auditory-speech and visual-picturesque memory was found in all groups of subjects in comparison with the group of subjects with normative aging (Fig. 3).

Figure 3

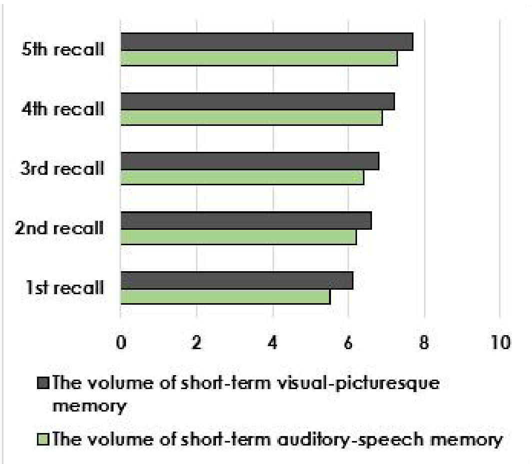
Histogram of average values of indicators of the volume of short-term auditory-speech memory during direct and delayed (40 minutes) recall



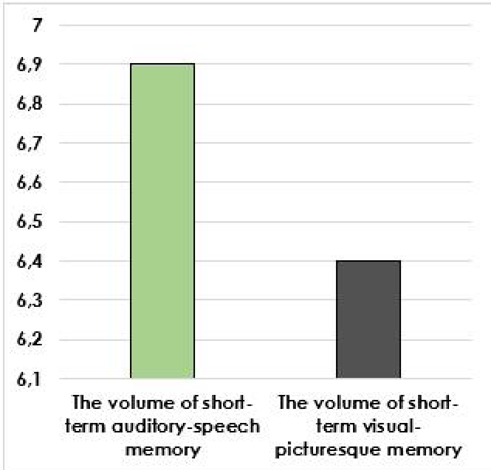
Considering that one has normative aging, the volume of short-term auditory-speech and visual-figurative memory corresponds to the lower limit of normal. The memory curve has the following form: visual-picturesque memory – 6, 7, 7, 7, 8; auditory-speech memory – 6, 6, 6, 7, 7 (Fig. 4).

Figure 4

Histogram of the average values of short-term auditory-speech memory during direct and delayed (40 minutes) recall during normal aging



Memory volume by series



Delayed recall

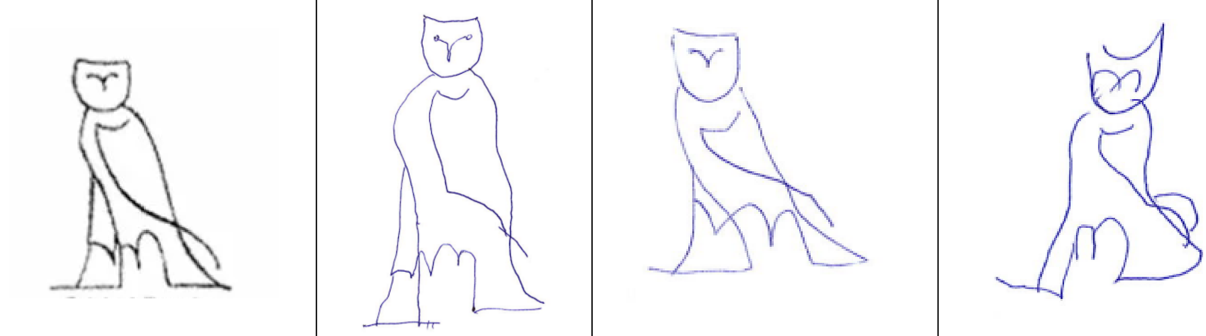
Qualitative analysis of the recalled material allows one to identify the specialized features of stored information. In chronic cerebral ischemia, the loss of incoming information with perseverative repetition of recalled stimulus words should be indicated as a general trend. In ischemic stroke, perseverative repetition of recalled stimulus words was not found. However, depending on the hemispheric localization of the lesion of ischemic stroke, recall errors have their own specifics. With sinistrocerebral localization of ischemic stroke lesion, patients almost flawlessly recalled the stimulus words presented last (2–3 words) and presented first in the list (2–3 words). When recalling visual-picturesque information, the patients primarily reproduced the visual images shown on the left side in the table. Rare perseverative repetitions of words consonant with stimulus word are noted. In case of dextrocerebral localization of ischemic stroke lesion, patients carried out the replacement of stimulus words with a synonymous concept. When recalling visual-picturesque information, patients reproduced a certain generalized image, including images of individual elements from different cells of the table with stimulus images.

When assessing the significance of the differences, we found that in patients with dextrocerebral localization of ischemic stroke lesion, the volume of short-term visual-picturesque memory is significantly lower than in patients with sinistrocerebral localization of the stroke lesion (both with direct recall – $p = 0.027$, and with delayed recall – $p = 0.022$), and also lower than in patients with chronic cerebral ischemia (with direct recall – p = 0.025, and with delayed recall – p = 0.020). The maximum decrease in the volume of short-term auditory-speech memory is reliably captured in the sinistrocerebral localization of the lesion: both during direct recall (compared with patients with dextrocerebral localization of the lesion, p = 0.020; compared with patients with chronic ischemia, p = 0.044), and with indirect recall (compared with patients with dextrocerebral localization of the lesion, p = 0.024; compared with patients with chronic ischemia, p = 0.048).

As a result of the study of the processes of consolidation and reconsolidation of visual-picturesque memory, the following features were revealed. At the stage of copying in all groups of patients, the preservation of the image of all elements of the symbol is clearly observed (Fig. 5).

Figure 5

Stimulus image for copying and example images at the copying stage divided by patient groups



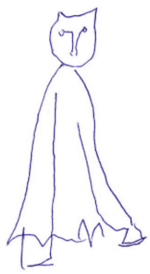
Stimulus image	Chronic cerebral ischemia	Sinistrocerebral localization of the lesion	Dextrocerebral localization of the lesion

In this case, we can state the preservation of the symbolic image at the stage of copying. In the volume of working memory, the original stimulus is preserved without losing elements and bringing it to a specific image. The process of storing visual-picturesque information in short-term memory with subsequent consolidation ensures the fixation of a symbolic image with almost no distortion. Inaccuracies in the connection of image lines were detected only in patients with dextrocerebral localization of ischemic stroke lesion.

With delayed recall after 40 minutes, as well as when recalling a stimulus symbolic image after 4 hours and 36 hours, regardless of the nature of cerebrovascular accident, recall of distorted symbolic content is observed (Fig. 6).

Figure 6

Examples of images of patients with cerebrovascular disease when recalled after 40 minutes, 4 hours, 36 hours

I. Recalled after 40 minutes		
		
Chronic cerebral ischemia	Sinistrocerebral localization of the lesion	Dextrocerebral localization of the lesion
II. Recalled after 4 hours		
		
Chronic cerebral ischemia	Sinistrocerebral localization of the lesion	Dextrocerebral localization of the lesion

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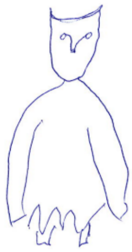
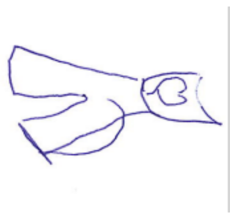
III. Recalled after 36 hours		
		
Chronic cerebral ischemia	Sinistrocerebral localization of the lesion	Dextrocerebral localization of the lesion

Minimal distortions of the symbolic image were found in the group of patients with chronic cerebral ischemia. When reproducing the symbol from memory, after 4 hours and 36 hours, the image details are brought to a symmetrical shape – the second leg is drawn in frontal view.

In groups of patients with ischemic stroke, with delayed recall – after 40 minutes, as well as after 4 hours and 36 hours, the reduction in image elements is observed up to a complete loss of the original content. In 50 % of cases, patients with ischemic stroke could not completely reproduce the stimulus symbolic image after 36 hours, regardless of the disease hemispheric localization. It indicates a complete loss of memory traces. As a specific feature, one should note that in patients with dextrocerebral localization of ischemic stroke lesion during delayed recall, the preservation of the largest elements of the symbolic image is observed, allowing it to be identified with the original one. At the same time, distortion during reproducing is quite significant. In patients with sinistrocerebral localization of ischemic stroke lesion, when recalled after 40 minutes, 4 hours and 36 hours, there is a complete loss of the original symbolic image. At the same time, we can state the preservation of individual elements in the form of continuous lines.

Therefore, when extracting visual-picturesque information in patients with cerebrovascular accident in the form of ischemic stroke of hemispheric localization, an image transformation is observed with a complete loss of symbolic meaning. In chronic cerebral ischemia, the original symbol is transformed in the direction of its concretization and reduction to a symmetrical image.

When studying the processes of consolidation and reconsolidation of auditory-speech memory in patients with cerebrovascular accident, a text evaluation scheme was built for each patient, reflecting the quality of reproduction of semantic units in relation to their distribution over text sentences (Fig. 7).

As a result of text recalling immediately after presentation, the maximum loss of semantic content was recorded in all groups of subjects. The most complete semantic content was recalled by patients with chronic cerebral ischemia. The loss of semantic content during direct recall was 61.7 %. In ischemic stroke, the loss of semantic content also ranges from 60 to 63 % (with the sinistrocerebral localization of ischemic stroke lesion 60.9 %; with the dextrocerebral localization of ischemic stroke lesion – 63.1 %). However, unlike patients with chronic cerebral ischemia, in ischemic stroke, semantic content distortions and semantic confabulations are observed.

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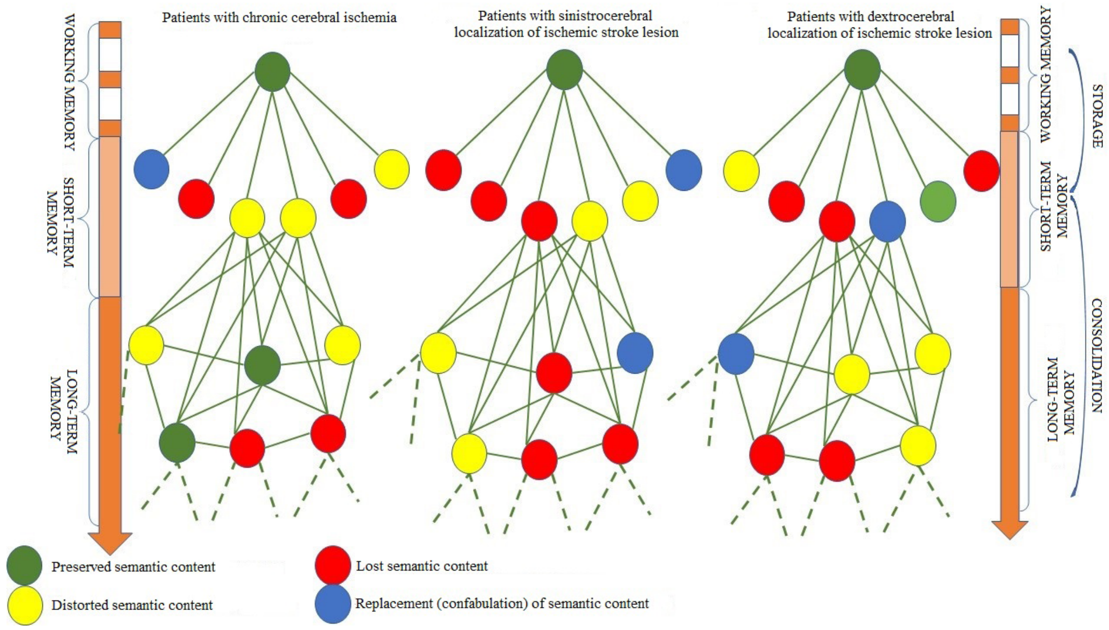
When analyzing the number and nature of errors made during the direct recalling of auditory-speech information, as well as at time intervals of 40 minutes, 4 hours and 36 hours, in all groups of subjects, a decrease in the number of correctly recalled semantic units was found with an increase in the number of distorted and confabulatory semantic units. In addition, one should note an increase in the number of incoherent sentences that do not have semantic content, with each subsequent reconsolidation – after 40 minutes, 4 hours, 36 hours.

As a general trend, we can state the schematization and concretization of the text. In cases of cerebrovascular accidents, with the general preservation of semantic units, the structure of the sentence is significantly reduced and simplified. The semantic content remains more unchanged in comparison with the specific wording of the sentence. At all of time intervals of recalling, the relative stability of the content of the text is characteristic in comparison with that which was saved by patients during direct recall.

For patients with chronic cerebral ischemia, it is typical to simplify the sentence with a distortion of its semantic content, as well as the use of sentences either short or, conversely, combined into one several sentences with a common semantic content. Patients with sinistrocerebral localization of ischemic stroke lesion are characterized by a violation of the sequence of semantic units, as well as their significant loss. At the same time, there are multiple additional details and their excessive use. Patients with dextrocerebral localization of ischemic stroke lesion, while maintaining the overall logical sequence of the presentation of the semantic content, miss a significant amount of detail. In turn, it leads to a distortion of the semantic content up to its complete loss.

Figure 7

Scheme of semantic transformation of auditory-speech information in the process of memory consolidation and reconsolidation in patients with cerebral circulatory disorders



Discussion

As a result of the study, a decrease in the volume of short-term auditory-speech and visual-picturesque memory was found in all groups of subjects with cerebral circulation disorders. Changes in the qualitative and quantitative characteristics of the processes of consolidation and reconsolidation of memory in ischemic stroke of hemispheric localization have been reliably established. This change is due to a decrease in the volume of auditory-speech and visual-picturesque short-term memory. In turn, it leads to the instability of memory traces, which ultimately distorts the consolidated information. At the stage of the short-term phase of the memory process, the stored information is fixed without loss and distortion of the content within a short period of time. It has been experimentally proven that memory traces (engrams) decrease even at the first reconsolidation – after 40 minutes. With each subsequent reconsolidation, the information distorted / partially lost during the previous reproduction is saved. In the process of reconsolidation, there is a reduction (in chronic cerebral ischemia) and distortion (in ischemic stroke of hemispheric localization) of the recalled information.

In chronic cerebral ischemia, the instability of memory traces leads to a reduction and partial loss of both visual-picturesque and semantic content. Moreover, in the process of reconsolidation of visual-picturesque information, it is concretized (with the loss of symbolic meaning, requiring more accurate preservation of memory traces) and simplification. The symbolic image is concretized and simplified (reduced to a detailed symmetrical image). Auditory-speech information is reduced and greatly simplified. Noteworthy that the sequence of information content is preserved. In patients with cerebrovascular accidents in the form of ischemic stroke of hemispheric localization, when extracting visual-picturesque information, a transformation of a symbolic image is observed with a complete loss of symbolic meaning. With sinistrocerebral localization of ischemic stroke lesion, a violation of the sequence of semantic units, a decrease in their number, multiple additional details and their excessive use are characteristic. These features are due to hemispheric violation of successiveness. The dextrocerebral localization of ischemic stroke lesion leads to the fact that while maintaining the overall logical sequence of the presentation of the semantic content, a significant amount of detail is lost. In turn, it leads to a distortion of the semantic content up to its complete loss. Such manifestations are due to a violation of the hemispheric factor of simultaneity, which ensures the integrity of perception and cognitive processing of incoming information.

Conclusion

A decrease in the volume of short-term auditory and visual-picturesque memory in patients with acute disorders of cerebral circulation (ischemic stroke) leads to a simplification and almost complete loss of the symbolic image at the stage of reconsolidation in the process of its reactivation and recategorization. Ultimately it leads to a complete loss in 50 % of cases. The instability of memory traces (engrams), which are neural chains that arise during the formation of memory and include neurons in the hippocampus, prefrontal cortex, and amygdala, is due to cerebrovascular disturbance. Cerebral ischemia (chronic or acute) leads, on the one hand, to a decrease in the number of corresponding neural connections in the process of consolidation, and, on the other hand, to their instability. With each subsequent reconsolidation, the number of neural connections that ensure the stability of memory traces decreases. This leads to a reduction in the volume of recalled information, regardless of its quality (both auditory-speech and visual-picturesque). Distortions and confabulations in the process of reconsolidation are due to the attempts to compensate for the missing neural connections by the formation of new ones, but without relying on the existing ones (formed at the stage of information storage).

Findings

Memory as a process is conducted through memorization and goes through short-term and long-term phases. The process of consolidation of memory traces, which characterizes the transfer of content from short-term memory to long-term memory, leads to the transformation of the stored content. Each retrieval of stored memory is accompanied by the replacement of the old memory trace with new content (it may be completely or partially changed).

A decrease in memory volume in case of cerebral circulation disorders leads to instability of memory traces and distortion of the consolidated information, regardless of its quality (auditory-speech and visual-picturesque). The transformation of the stored content with each extraction is manifested in the partial loss of the stored information content, as well as in the partial or complete change of the information content, regardless of its quality (both visual-picturesque and semantic).

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Author Contributions

V. B. Nikishina formed the concept of the study, interpreted and summarized findings.

E. A. Petrash formed the concept of the study, prepared and designed illustrative material, interpreted and summarized findings.

I. A. Zakharova conducted the study, collected primary empirical material, processed the data obtained.

V. A. Sotnikov conducted quantitative and qualitative processing of the received empirical material, interpreted and summarized findings.

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The Specifics of Oculomotor Activity in Children With Hearing Impairment in the Independent and Joint Performance Process of a Training Task With an Adult

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Abstract: **Introduction**. The transitional status of a sample of children with hearing impairment after cochlear implantation expands the possibilities of studying the consequences of violations of individual sensory systems affecting the joint attention deficit. The method of registering eye movement has advantages in studying the difficulties of learning processes in children with hearing impairment. The novelty of the study lies in the synchronous tracking of eye movements with superimposed gaze paths of two experimental participants (an adult and a child with hearing impairment) in a learning situation and the use of a time marker of simultaneous fixations as an indicator of joint attention. Based on the data of oculomotor activity during the independent and synchronous performance of an educational task with an adult, the specifics of visual attention that hinder the learning of children with hearing impairment can be identified. **Methods**. Study sample: 16 preschoolers with hearing impairment (sensorineural hearing loss, class H90 according to ICD-11) and 16 typically developing children. Experimental situations of independent and synchronous performance of an educational task with an adult are involved. The leading method was to register eye movement with a portable PLabs eye tracker. **Results**. When performing a task synchronously with an adult in oculomotor activity in children with hearing impairment, the number of fixations indicating constant joint attention increases (from 300 milliseconds), there is greater relevance of fixations and an increase in the duration of maintaining visual attention to educational samples, as a result, a decrease in errors. Compared to typically developing children, the speed of information processing and the allocation of targeted stimuli changes in children with hearing impairment. **Discussion**. In episodes of joint attention in a learning situation, the synchronicity of interaction between a child with hearing impairment and an adult is achieved through fixations lasting from 300–500 and above 500 milliseconds (ms). However, the ability to maintain this joint attention in children with hearing impairment is less than in typically developing peers.

Keywords: joint attention, divided attention, education, lifespan development, preschool age, anormogenesis, hearing impairment, cochlear implantation, oculography, eye tracker

Highlights:

- The primary token of learning difficulties in children with hearing impairment is the change in fixation time.
- Unlike typically developing children, the speed of information processing changes in children with hearing impairment.
- The main difficulties hindering the learning process of children with hearing impairment are highlighted: changes in the time of fixation, low duration of maintaining visual attention and joint attention, changes in the number and duration of targeted fixations.
- The special aspects of the organization of the perceptual action with varying degrees of compatibility/independence of task performance are analyzed; when performing tasks synchronously with an adult, children with hearing impairment had a greater relevance of fixations and an increase in the duration of joint attention, the time spent on the allocation of target stimuli decreased.

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Introduction

In modern science, the most relevant is the study of the atypical development of children through a deficit of socio-cognitive skills, namely, a deficiency of joint attention that hinders a child's comprehensive development and learning.

Joint attention is a cognitive process that is based on the mechanism of extrapolation of another person's line of sight (constructed along an imaginary line in space in accordance with the orientation of the interlocutor's head and eyes) in order to identify an object or event that has come into the focus of his attention (Franco & Butterworth, 1996). Such realization of joint attention requires making assumptions about the other person's intentions. This definition of shared attention leads to the understanding that when someone looks in a concrete direction, it should influence where the other person focuses their attention (that means we should keep track of where others are looking). At the same time, the other person's head and eyes positions are an insufficient source of information about the object of his attention. People generate multimodal behavior and their attention and interest in an object, potentially signaling to others through a variety of modalities, including interaction with the object itself, gestures, speech, and talking about objects (Bakeman & Adamson, 1984; Yu & Smith, 2017b; Yu & Smith, 2017a; Schroer & Yu, 2021). This mutual awareness is crucial in the learning process (for example, to focus on the learning material).

Many studies of the age-related development of joint attention focus on normative patterns and on the occurrence of joint attention deficit. Individual differences in joint attention skills in children are associated with subsequent speech and cognitive development (Adamson et al., 2019; Delgado et al., 2002; Mundy, 2018; Smith & Ulvund, 2003; Brooks & Meltzoff, 2005), the development of intellectual abilities and IQ (Mundy, 2018; Redcay et al., 2012), the effectiveness of learning processes (Dawson et al., 2004; Nichols et al., 2005), social competence (Van Hecke et al., 2007), self-regulation (Morales et al., 2005).

Researchers have successfully adapted the paradigm of joint attention for clinical cases, for example, autism (Johnson & Johnson, 2005; Ristic et al., 2005; Vlamings et al., 2005); it has been shown that atypical joint attention often comes with cognitive and affective deficits found in schizophrenia (Dalmaso et al., 2013), Turner syndrome (Campbell et al., 2002), attention deficit hyperactivity disorder (Marotta et al., 2018; Langdon et al., 2006), Williams syndrome (Marotta et al., 2018).

Few studies have been devoted to a detailed examination of primary disorders that can lead to a deficit of joint attention, directly resulting from the biological nature of pathologies (such as auditory analyzer). For this scientific task, it is significant to use a sample of children with disorders in the auditory analyzer system. It will be possible to trace the potential mechanisms underlying the atypical joint attention that prevents effective learning, using the example of the consequences of hearing impairment.

Previous studies have shown a variety of pathways leading to coordinated attention of hearing-impaired children and adults, suggesting flexibility and reliability in using multiple options to achieve the same functional goal of interaction (Chen et al., 2020). For the deaf and hard of hearing, for the purpose of communication, the following are most often used: a) gestures, in combination with b) facial expressions, c) the shape or movement of the mouth and lips, as well as in combination with d) the position of the body core. These sets special unique multimodal means of establishing joint attention. Limited sensory experiences with hearing loss affect attention coordination between children and adults (Chen et al., 2019, 2020, 2021). Hearing loss was shown to not affect the probability that parents and children addressed the same object at the same time during the game. However, following the attention of parents, children with hearing loss used both the direction of the parents' gaze and hand movements as signals, while typically developing children relied mainly on the actions of their parents. In previous studies, changes in the means of establishing joint attention are recorded.

It is important to emphasize that the deficit of joint attention in children with hearing impairment may be associated with the peculiarity of their use of means of establishing episodes of joint attention, the nature and degree of their communication with adults (Peterson & Slaughter, 2003), communication modality preferences and approaches to the education of a child with hearing impairment in the family (Dunn & Brophy, 2005), the presence of sensorimotor exchange and pre-linguistic communication between a child and an adult (Meins et al., 2002).

Thus, the parenting style contributes to the various patterns of joint attention of children with hearing impairment. Studies also indicate that mothers of deaf children use higher levels of directive parenting style, which leads to less success in speech development (Musselman & Churchill, 1992). The maternal directive is described as a tendency to prompt, prevent, or prohibit certain behaviors, elicit reactions, and control the course and topics of conversation. Verbal imperatives, such as non-verbal control behavior (for example, removing toys), were observed more frequently in mother-child dyads with hearing impairment. Mothers could use controls in attempts to control auditory and visual attention (Meadow-Eagles, 1997). Hearing parents of deaf babies tend to be more directive, less responsive, less flexible, less consistent, and use plainer language than mothers from all other dyads (e.g., Chen et al., 2019; Fagan et al., 2014; Meadow-Orlans, 1997).

Other studies show that mothers of children with hearing impairment are overly responsive in communicating with them compared to those mothers whose children hear, this is described as a "nonvariative response to the demand for attention". They are about six times more likely to be ready to respond to the child's demands of attention and strive to respond instantly to signals, not allowing attempts to attract attention to form sufficiently.

From the research point of view, a group of children with hearing impairment with a cochlear implant is of particular interest to us. Cochlear implantation is a complex system of measures to restore auditory sensation by electrical stimulation of the fibers of the auditory nerve, aimed at full-fledged social adaptation and mental correction of children with profound hearing loss.

After cochlear implantation, the state of the children changes. Children with a cochlear implant are able to perceive sound signals, perceive nonspeech sounds, and react to them. However, the child continues to rely on the skills and abilities formed earlier in conditions of severe hearing impairment. Visual supports and habitual means of speech perception and communication are still significant for him: lip reading, written speech, dactylology, sign language, the habit of controlling pronunciation using kinesthetic supports, etc. Until the initial stage of rehabilitation is completed, that is, until there is a restructuring of communication and interaction of the child, he retains this special (transitional) status.

However, only a few studies are devoted to the joint attention of cochlear-implanted children with hearing impairment and the ability to trace changes in the means of establishing joint attention after cochlear implantation.

The prerequisite is the previous data, which confirms that the synchronicity, complexity, and orientation in the interaction of mothers with infants change before and after cochlear implantation (Fagan et al., 2014). For example, mothers' utterances more often overlapped the vocalizations of infants with hearing loss before cochlear implantation than after it. Mothers used fewer complex ones with infants with cochlear implants compared to their hearing peers. Together, mothers and babies adapted relatively quickly to infants' access to cochlear implants. They demonstrated improved interaction synchronicity, more active use of words by infants, and levels of maternal language complexity compatible with the use of words by infants, all within seven months after activation of the cochlear implant (Fagan et al., 2014).

Although maternal control decreased over time, the changes were minimal and did not correspond to children's speech development (Musselman & Churchill, 1992). It is significant for us to confirm the changes in the way of interaction (namely, the means of establishing joint attention) and synchronicity necessary for joint attention skills development after cochlear implantation.

Thus, the study of dyadic interaction in connection with cochlear implantation will be important in establishing patterns of joint attention, which have been shown to persist over time (Meadow-Orlans, 1997). The same patterns of joint attention will manifest when teaching this group of children.

The transitional status of the sample of children with hearing impairment after cochlear implantation, in our opinion, opens up new research opportunities for considering the scientific question of the role and consequences of the violation of individual sensory systems in the formation of joint attention skills.

After cochlear implantation in the motor-sensory development process, the child learns to use auditory sensations to perceive events at a distance, pronounce speech sounds and present them to the environment, and recognize speech signs. Through phonological development, a child learns how to select, modify, and combine basic sounds and patterns of speech movements to create meaningful utterances. This specificity of correction and education of children with hearing impairment also forms specific means of establishing joint attention.

Moreover, it is noted that children with hearing and visual impairment have unsystematic inaccurate ideas about their sensory-perceptual capabilities, external signs, structure, and functional purpose of the sense organs. It does not allow a child with pathology to actively engage in the process of compensating for his defect. Only some preschoolers realize the need to use preserved sensory organs, which directly affects the specifics of joint attention skills in this group of children.

Also, the problem of access to typical social and behavioral signals about the mental state of other people is related to the fact that children's knowledge of the syntax, semantics and morphology of sign and spoken languages correlates with their indicators of the skills of initiating and responding to joint attention (de Villiers, 2005; Lohmann & Tomasello, 2003; Ruffman et al., 2003; Schick et al. al., 2007; Woolfe et al., 2002; Milligan et al., 2007).

The highlighted scientific problems show that the main problem for our study is the problem of studying the deficit of joint attention of children with hearing impairment in the learning process.

Joint attention plays a unique role in the learning process of children with hearing impairment in terms of the ability to maintain visual attention. It is due not only to the later formation of skills to use the means of organizing awareness, and managing it, including a later transition to internal means, but also to a lag in the development of speech that contributes to the organization and management of one's behavior. Arbitrary attention is mediated by the communication of the child with adults. The pointing gesture and the speech instruction of adults distinguish a concrete object from the surrounding world – all these are means of maintaining the child's joint attention. At the same time, for children with hearing impairment, these tools are modified.

The unavailability of all means of establishing joint attention and the instability of maintaining joint attention will be specific for children with hearing impairment. Under the influence of sensory deprivation and upbringing, the patterns of initiation and reaction of joint attention change and the non-variability of the response to the initiation of joint attention is formed.

In this regard, it is significant to study how, to establish joint attention with the help of safe analyzers, the orientation of a child with a violation of individual systems occurs and subsequently consolidates and develops this ability to navigate in the presented educational material, for example, a sample.

Given the difficulties in establishing joint attention, the underdevelopment of skills and means of communication, the difficulties of arbitrary organization of the child, and the instability of combining attention on one object with an adult, it is necessary to find a combination of direct, arbitrary, and indirect ways of organizing the learning and development of children with hearing impairment.

The mechanism of joint attention ensures the formation of base learning functions (reading, writing, and counting) in interaction with an adult. When learning, joint attention contributes to the processing of auditory, kinesthetic, visual, and visual-spatial information presented to adults. The attention of children with hearing impairments depends more on the expressiveness of the material than that of hearing people. In this regard, when teaching children with impaired hearing, various means of visualization are used: some – to attract involuntary attention (for example, a bright picture), others – to develop arbitrary attention (diagrams, tables). In addition, the peculiarities of the attention of children with hearing impairments are related to the fact that visual perception is more important to them and that the main burden of processing incoming information falls on the visual analyzer. For example, the perception of verbal speech by reading from the lips requires full concentration on the face of the person speaking, and the perception of dactyl speech is on the positions of the fingers. Children with hearing impairment rely on multisensory functioning (coordination of visual, language, and motor signals) to exchange social experiences/interests (Yu & Smith, 2017a).

The main task is to display the logic of the functioning of joint attention in the learning process in children with hearing impairment. In particular, it will be possible to identify the destruction of the processes involved in joint attention, which reduces the effectiveness of the child's learning.

The solution to this problem will allow us to identify ways, means and ways of compensating for developmental disorders in children with hearing impairment, to develop "workarounds" of learning and the organization of the educational environment in accordance with the capabilities of the child.

At the same time, previous methods of studying joint attention are based on the observation of behavioral manifestations and a rating system, and in most cases involve video recording with subsequent evaluation by experts (such as the ESCS (Early Social Communication Scales) test developed by P. Mundy). These methods do not allow fully objectively trace the accuracy of observation of a glance or object in episodes of joint attention and to identify critical points in changes in general focus within an episode of joint attention or perception of educational material.

The eye movement recording technologies development has opened up new opportunities for the study of joint attention, and eye tracking as a potential diagnostic tool is gaining popularity. Episodes of shared attention can be studied using eye movement registration paradigms, and such assessments can provide new insights into the relatively atypical development of shared attention.

At the same time, for a long time, there were no research tools to display how a child and an adult perceive the world when they act synchronously in it. With the development of eye tracking technology, it has become possible to trace the transformation of a child's perceptual processes more objectively under the influence of learning (Shvarts, 2018; Chen et al., 2021).

The eye movement analysis method has been used to study the learning process, for example, in several studies related to children's perception of visual materials in the learning process. It was studied which of its characteristics contribute to improving understanding and comprehension of the material and how the child's perception is reconstructed under the influence of learning (Abrahamson & Sánchez-García, 2016; Duijzer et al., 2017).

The method of tracking the direction of gaze in comparison with other methods will improve the measurement of less accessible markers of violation of joint attention, including a detailed analysis of the routes and time of fixing the gaze on the training goal, which will allow you to identify what allows you to maintain joint attention to an object or event in the learning process.

The dynamics of gaze in the learning process is crucial for establishing episodes of joint attention and it is the method of tracking eye movement that makes it possible to fix it.

The novelty lies in the fact that in previous studies spatial coordination (fixation in a specific area of interest) was often used as a criterion (Richardson et al, 2007; Shvarts, 2018) in other studies they looked for evidence that the child knew about the direction of adult attention only on the basis that the child looked into the partner's face for coordinated visual attention to the same object (Baron-Cohen & Cross, 1992; Brooks & Meltzoff, 2005; Mundy et al., 2007). However, the fact that a child does not look at an adult's face does not mean that a child is unaware of the direction of an adult's attention. That is, not only spatial characteristics (zones of interest) are important for establishing episodes of joint attention, but also the characteristics of fixation time (Shvarts, 2018; Yu & Smith, 2017a).

Therefore, in our opinion, it is necessary to use not only the spatial characteristics of fixation (determinants of stimuli on which fixation occurs), but also a more objective measure. It is a degree to which an adult and a child directed their gaze at the same object at the same time, and how long this fixation lasted. As some studies show, this criterion is more suitable for the analysis of the natural conditions of interaction (Yu & Smith, 2017a).

Moreover, in our opinion, it is required to analyze two main categories of gaze fixation durations: short glances, less than 300 ms (the threshold for sustained attention used in previous studies) (Yu & Smith, 2017b; Ruff & Lawson, 1990), long gazes, lasting from 300 to 500 ms. The second category is generally considered to be permanent attention. Additionally, it is planned to use gaze fixations of 300 ms or longer, associated with joint attention or moments when an adult also looked at a selected area.

That is, *the primary purpose* is to identify, using the eye movement tracking method, the features of oculomotor activity of children with hearing impairment in the independent and synchronous with an adult performance of a learning task, which can reliably predict learning difficulties associated with a lack of joint attention.

Methods

Experimental situations were created based on a child's learning.

In *the first phase* of the experiment, a visual sample with a pattern was placed in front of a child. A child had to draw exactly the same pattern according to the visual sample. During the instruction, an adult experimenter explained the task of drawing exactly the same pattern. The phase assumed the independent implementation of the action program by a child.

In *the second phase* of the experiment, a child was given verbal instructions for a graphic dictation: they had to draw a pattern without a visual sample. The task was performed only according to the verbal instructions of an adult. In the second phase, a child performed an action following only verbal instructions. That is, the phase assumed the joint synchronous execution of a program of actions and step-by-step control by an adult. Planning and control were shared between an adult and a child. The child was given the instruction: "Now we will draw a pattern. You must listen to me carefully. I will say how many cells and in which direction you should draw a line. Only the line that I will say is being drawn. The next line must be started where the previous one ends, without lifting the pencil from the paper. Are you ready? We begin to draw the first pattern. Put the pencil on the highest point. Draw a line: one cell down. We do not take the pencil off the paper. Now one cell to the right", and so on.

In our opinion, it is in the second phase of the experiment that intersubjective sensorimotor coordination of an adult and a child appears by anticipating and carefully tracking each other's perceptions and actions. It becomes possible to trace episodes of joint attention: an adult controls a child's perceptual activity in stages and contributes to the emergence of new sensorimotor circuits. This is where the synchronism or mismatch of perceptual systems is important to maintain joint attention in the learning process.

Additionally, as *the third phase*, the correction task was used to fill in figures (according to the "Pieron–Ruser" method). On the form that was given to a child, various blank figures are depicted,

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arranged in several rows. To fill in the figures, a special "key-sample" was offered separately. It is a similar set of figures, but on a separate sheet, on the example of which the rule for completing the task was explained to a child in a different form.

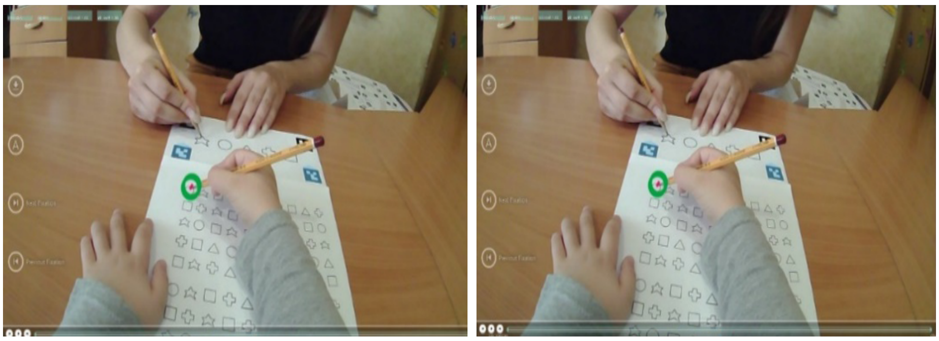
Figure 1

The example of processing and visualization of thermal maps of images obtained from the stage camera of the eye-tracker placed on the head of a child with hearing impairment

a) performance according to the sample *б) synchronous perfomance with an adult*

Figure 2

The example of processing and visualization of thermal maps of images obtained from the stage camera of the eye-tracker placed on the head of a child with hearing impairment



Equipment

The main method was the method of eye movement registration using a portable tracker Pupil Headset – PLabs – an eye-tracker in the form factor of glasses, binocular version. Camera delay – 4.5 ms. Processing latency depending on a central processor > 3 ms.

The following indicators of oculomotor activity were used as the main indicators: duration of fixations, frequency of fixations, distribution of fixations, areas of interest, area of fixation. Fixations on the area on which the task was performed and on the sample with the training task were analyzed as target zones.

The most important parameters for analysis were the duration of target and non-target fixations, and the duration of the first target and non-target fixation. We analyzed fixations with a duration of less than 300 ms, in the range of 300–500 ms, longer than 500 ms. Separately, we analyzed the degree to which an adult and a child directed their gaze at the same object at the same time and how long this fixation took place. These are fixations with a duration of less than 300 ms, in the range of 300–500 ms, longer than 500 ms, fixed simultaneously with an adult.

Empirical study sample

To understand the normative and deficient manifestations of joint attention, a comparative study of a sample of typically developing children (n = 16) of preschool age with hearing impairment with cochlear implants (n = 16) was planned. It was supposed to study children with hearing impairment (sensoneural hearing loss, class H90 according to ICD-10).

Results

Using the Student's t-test, the parameters of the oculomotor activity of children with hearing impairment were compared in the 1st phase of the experiment, where they independently acted according to a visual sample after the instruction of an adult, and the 2nd phase of the experiment, where the instruction was carried out step by step synchronously with an adult (table 1).

Table 1

Comparison of oculomotor activity in 2 phases of the experiment

Oculomotor parameter	1st experiment phase	2nd experiment phase	t	Signif. (two-tailed)
Duration of fixations	17355.38 ± 1729.02	21841.96 ± 2568.91	–2.511	0.024
Duration of target fixations	12505.80 ± 1241.65	18831.64 ± 2714.97	–3.428	0.004
Duration of non-target fixations	4849.57 ± 842.55	3010.32 ± 812.94	2.685	0.017
Duration of the first target fixation	64.28 ± 2.66	100.2571 ± 11.00279	–2.861	0.012

It was found that in the 2nd phase of the experiment, when the task was performed synchronously with an adult, children with hearing impairment showed a statistically significant increase in the average duration of fixations, the duration of the first target fixation, and the time of target fixations. At the same time, the duration of non-target fixations decreased. That is, the synchronous performance of a learning action led to the fact that in children with hearing impairment, the time spent on distinguishing target stimuli becomes less, fixation on target areas becomes more stable, and non-target fixations decrease.

The comparison was made of the frequency of occurrence of fixations, indicating sustained attention – in terms of duration from 300–500 ms and longer than 500 ms (table 2).

Table 2

Comparison of oculomotor activity in 2 phases of the experiment

Oculomotor parameter	1st experiment phase	2nd experiment phase	t	Signif. (two-tailed)
Number of fixations, less than 300 ms	139.87 ± 12.78	192.87 ± 24.89	–2.710	0.016
Number of fixations, 300–500 ms	1.25 ± 0.30	2.50 ± 0.67	–2.298	0.036
Number of fixations, longer than 500 ms	0.12 ± 0.085	0.62 ± 0.17	–3.873	0.002

With simultaneous performance and guidance of an adult, in contrast to independent work with a sample, children with hearing impairment increase the number of fixations indicating constant attention (from 300 ms and longer).

The moments of the video were selected separately and the fixations of a child were selected, which occurred simultaneously with the fixations of an adult on the same stimulus material (training sample and training area) – moments of joint attention. These are not just moments of simultaneous visits to the visual area, but the synchronism of the visual attention of a child and an adult. The comparison was made of the frequency of such simultaneous fixations of an adult and a child, indicating stable attention – from 300–500 ms and longer than 500 ms (table 3).

Table 3

Comparison of oculomotor activity in 2 phases of the experiment

Oculomotor parameter	1st experiment phase	2nd experiment phase	t	Signif. (two-tailed)
Number of fixations, less than 300 ms, simultaneous with an adult	60.25 ± 7.90	122.87 ± 16.49	–4.421	0.0001
Number of fixations, 300–500 ms, simultaneous with an adult	0.50 ± 0.18	1.87 ± 0.58	–2.515	0.024
Number of fixations, longer than 500 ms, simultaneous with an adult	0.125 ± 0.085	0.62 ± 0.17	–3.873	0.002

It was revealed that in the 2nd phase, when the task was performed synchronously with an adult, at the moment of joint attention, the number of fixations increased, indicating constant attention. Moments of looking at the same target area at the same time with a fixation of 300 ms or longer were observed in both a child and an adult.

Comparison of fixations on the working field, where the child drew a pattern, shows that when working according to the instructions with an adult, a child fixes on it more often and longer (table 4).

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Table 4

Comparison of oculomotor activity in 2 phases of the experiment

Oculomotor parameter	1 sample	2 sample	t	Signif. (two-tailed)
Number of fixations on the area	111.75 ± 10.56	180.50 ± 24.51	–3.534	0.003
Duration of fixations on the area	9945.58 ± 1084.94	17491.05 ± 2681.60	–3.913	0.001
Average duration of fixations on the area	86.78 ± 3.08	91.58 ± 4.32	–2.105	0.053

Further, to determine the specifics of the group of children with hearing impairment, the comparative analysis of this sample was made with a sample of typically developing children. Analysis of variance made it possible to identify significant differences in oculomotor activity during the training of two contrast groups (Levene's test > 0.05) (table 5).

Table 5

Comparison of oculomotor activity of children with hearing impairment and typically developing children

		Mean ± standard error	F	Significance
Duration of fixations	Typically developing children	27714.35 ± 5076.46	6.609	0.025
	Hearing impaired children	17355.38 ± 2531.03		
Duration of the first fixation	Typically developing children	81.19 ± 7.11	12.368	0.004
	Hearing impaired children	61.14 ± 3.60		
Duration of the first target fixation	Typically developing children	81.08 ± 7.206	7.886	0.016
	Hearing impaired children	64.28 ± 3.89		
Number of fixations shorter than 300ms	Typically developing children	229.0 ± 28.51	11.126	0.006
	Hearing impaired children	139.87 ± 18.71		

		Mean ± standard error	F	Significance
Number of all fixations	Typically developing children	270.00 ± 21.22	4.670	0.052
	Hearing impaired children	198.62 ± 23.66		
Duration of target fixations	Typically developing children	24266.70 ± 2979.79	12.608	0.004
	Hearing impaired children	12505.80 ± 1817.59		
Number of fixations on the sample	Typically developing children	63 ± 6.69	5.562	0.036
	Hearing impaired children	30 ± 10.94		
Duration of fixations on the sample	Typically developing children	5640.71 ± 512.25	6.421	0.026
	Hearing impaired children	2665.33 ± 933.99		
Duration of fixations on the area	Typically developing children	18383.83 ± 3473.37	5.822	0.033
	Hearing impaired children	9945.58 ± 1588.19		

Compared to typically developing children, children with hearing impairment have a shorter average duration of fixations, the duration of the first fixation, as well as the duration of the first target and target fixations in general. That is, there is a change in the fixation time. One can draw a conclusion that that in children with hearing impairment, attention is focused less time on target stimuli, but they need less time from the beginning of the presentation of an instruction to the start of viewing (according to the duration of the first fixation). However, the reduced duration of the first fixation on target stimuli indicates their low interest value and visibility for a child. The data reflects the difficulties of processing the target information feature, its selection.

In hearing impaired children, the number of total fixations, the number of fixations on the sample, and the duration of fixations on the sample are lower than in typically developing children. That is, according to the oculomotor activity of children with hearing impairment, the specificity of visual attention to educational material is confirmed.

Further, to answer the question of what parameters of oculomotor activity are associated with errors in the performance of the training task, regression analysis was applied. As a dependent variable, the number of all filling errors in the correction task in the third phase was chosen. The parameters of oculomotor activity were used as independent variables.

It was found that the number of mistakes made by children with hearing impairment depends on the number of fixations lasting longer than 500 ms (R^2 = 0.336, β = 0.580, p = 0.003). It is this duration of fixations that indicates the presence of sustained visual attention. Joint attention as a continuous alignment of fixing the attention of an adult and a child on an object, which lasted longer than 500 ms, may be shorter than 300 ms, same with the authors (Yu & Smith, 2017a). The main evaluation criterion is the time required to determine the location of the target. On the one hand, the mistakes made by children with hearing impairment are associated with the ability to maintain sustained visual attention, and on the other hand, with the speed of information processing.

Moreover, as a dependent variable in the regression analysis, the parameters of the number and duration of fixations on the sample were taken as a measure of maintaining visual attention by a child with hearing impairment in the learning process.

The number of fixations on a sample in a child with hearing impairment depends on the duration of the first non-target fixation (R^2 = 1, β = 0.486, p = 0.0001), the number of fixations (R^2 = 1, β = 0.629, p = 0.0001), the duration of non-target fixations (R^2 = 1, β = 0.069, p = 0.0001), the duration of the first fixation (R^2 = 1, β = –0.815, p = 0.0001) and the number of fixations longer than 300–500 ms (R^2 = 1, β = –0.085, p = 0.0001), synchronous with an adult less than 300 ms (R^2 = 1, β = –0.493, p = 0.0001). If non-target fixations are long, the hearing impaired child needs a large number of fixations on the sample. Attention to the sample is reduced if there was a long first fixation, and a child fixed on it for a long time, including the ones longer than 300 ms, and if these fixations occurred synchronously with an adult.

The duration of fixations on the sample in a child with hearing impairment depends on the duration of the first non-target fixation (R^2 = 0.998, β = 1.233, p = 0.0001), the duration of non-target fixations (R^2 = 0.998, β = 1.176, p = 0.0001), the number of fixations with duration less than 300 ms (R^2 = 0.998, β = 0.243, p = 0.0001), the duration of the first fixation (R^2 = 0.998, β = –0.769, p = 0.0001), the number of fixations lasting longer than 300–500 ms (R^2 = 1, β = –0.690, p = 0.0001), number of fixations (R^2 = 0.998, β = –0.199, p = 0.0001), duration of fixations (R^2 = 0.998, β = –0.004, p = 0.0001). That is, the duration of fixations on the sample depends on how long a child lingers in a non-target area, and directly on the duration of fixations and the ability to maintain visual fixations longer than 300–500 ms. It also depends on the number of fixations – as a parameter of the cognitive complexity of processing.

Discussion

In our study, the specificity of oculomotor activity in children with hearing impairment during synchronous with an adult and independent performance of a learning task was highlighted.

The change in oculomotor activity during independent and synchronous performance of the task confirms the assumption about the change in perceptual actions in episodes of joint attention. Joint attention during the synchronous performance of a task by an adult and a child helps to sustainably maintain the joint attention of children with hearing impairment. An adult gradually controls the perceptual activity of the child and contributes to the emergence of sustained visual attention.

In case of independent performance of the task, a longer time for the selection of target stimuli and a decrease in the duration of fixations on target stimuli will be specific. It is confirmed that, when performing the task synchronously with an adult, in oculomotor activity there is a greater relevance of fixations and an increase in the duration of joint attention and sustained maintenance of visual attention to training samples. A child with a hearing impairment, when performed synchronously with an adult, makes fixations on the training sample, on the working area (where a child drew a pattern). The child maintains constant attention for a longer and more often, including joint attention with an adult.

In episodes of joint attention in a learning situation, the synchronicity of interaction between a child with a hearing impairment and an adult is achieved through fixations that indicate constant attention – these are fixations lasting from 300–500 and above 500 ms.

However, with normative and atypical development, the functioning of joint attention in the learning process is different. It was confirmed in the comparative analysis of typically developing children and children with hearing impairment. Hearing-impaired children have fewer fixations lasting 300–500 ms, indicating constant visual attention. Moreover, it was found that there are also fewer fixations with 300–500 ms long, synchronous with an adult, indicating joint attention.

In children with hearing impairment, the speed of information processing changes: fixations are shorter in duration in both relevant and non-relevant areas.

One can draw a conclusion that the main specificity of oculomotor activity in children with hearing impairment is the change in the time of fixations. The gaze fixation time marker will be crucial for understanding the mechanisms of establishing joint attention in a learning process. That is, in a learning process in children with hearing impairment, the average time of fixations is shorter, the first fixation is shorter, including the first target fixation and target fixations in general. The time period when a child's eyes are focused on the target object decreases. Including children with hearing impairment, the time and number of fixations on the sample with the task decreases.

A decrease in the average duration and number of fixations can be considered as a measure of a decrease in the speed of information processing and an unstable involvement of the attention of a child with hearing impairment. A decrease in the time of fixation on target and non-target stimuli also indicates the cognitive complexity of the selection and priorities of information processing in the course of learning, a decrease in the involvement of the attention of a child with hearing impairment. Hearing impaired children make fewer fixations, while typically developing children process information in more detail (in terms of time and number of fixations) in both relevant and irrelevant areas.

These features of oculomotor activity in the process of learning in children with hearing impairment can be interpreted as the consequences of deprivation of sensory experience in the early stages of ontogenesis, associated with a violation of the auditory analyzer. It reveals the specifics of the functioning of the mechanism of joint attention and the possibility of compensation.

To understand the development of strategies for improving the perception of material in various areas of study, it is necessary consider that, compared with typically developing children, children with hearing impairment make fewer fixations on the training sample. Moreover, their duration on a training sample is shorter, and the duration of fixations on working training area is shorter. This requires special means of maintaining the attention of a child through synchronous performance with an adult and joint attention hold.

Our data help to capture the necessary conditions for adult-child interaction strategies to organize developmental conditions, learning and accumulation of social experience for typically developing children and children with hearing impairment. Among them are synchrony and the use of different ways to increase the duration of target fixations, maintain constant visual attention and joint attention with a child.

Through the indicators of impaired dyadic interaction between a child and an adult, the main difficulties that disturb a learning process were identified: measuring fixation time, search time, and changes in the frequency of saccades (fixation speed) in episodes of joint attention as a predictive marker of impaired joint attention and learning difficulties (for example, temporary delay or advanced reactions in a learning situation).

The task of forming joint attention in preschool children with hearing impairments is solved with the help of properly organized educational activities. This is possible through the use of various means of influence, explanation of material and an increase in the time of synchronous maintenance of a child's visual attention, the use of the direction of gaze as a hint, the initiation of joint attention (gestural guidance and showcase).

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Psychological Determinants of Adaptability at the University in First-Year Students of the Faculty of Medicine During the COVID-19 Pandemic

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Abstract: **Introduction**. The successful adaptation of university students determines their participation in educational activities, their effectiveness, and a positive attitude toward the chosen profession. The novelty of the research is to study the adaptability of students in the transition to new, often unusual, forms of education (online, distance) against the backdrop of an increase in the general level of anxiety during the COVID-19 pandemic. Such difficulties significantly affected students of medical specialities, the development of which implies the formation of competencies in practical activities. **Methods**. The study involved students of medical (N = 93) and economic (control group, N = 111) faculties. The following methods were used: "Method of Research of Students Adaptability in the Higher Educational Establishment" by T. D. Dubovitskaya, A. V. Krylova, "The Satisfaction with Life Scale" by E. Diener, "Test of neuropsychic adaptation" by I. N. Gurvich, "Educational strategies" by S. N. Kostromina, T. A. Dvornikova, "Students' educational motivation diagnostic inventory" by N. C. Badmaeva, "The Big Five Inventory" adapted by D. P. Yanichev, "The State-Trait Anxiety Inventory (STAI)" adapted by A. P. Bizyuk et al. (Part 2). **Results and Discussion**. The psychological characteristics of the Faculty of Medicine first-year students, contributing to the adaptability at the university during the COVID-19 pandemic, include a high level of extraversion, willingness to cooperate, the presence of professional motives for learning and motivation to achieve success, a high level of neuropsychic adaptation, orientation to memorizing educational material and a disinclination to planning educational activities. For students of the Faculty of Economics, such predictors were a great life satisfaction, a high level of extraversion, a low level of anxiety, motives for creative self–realization and a desire for planning in training. Students of the Faculty of Medicine with a high level of adaptability, in comparison with highly adapted students of the Faculty of Economics, have more pronounced professional motives and more often resort to the strategy of repeating educational material. Such differences may be due to both the peculiarities of the organization of the educational process and the specifics of the chosen speciality.

Keywords: COVID-19 pandemic, university adaptability, information and communication technologies, university students, learning motivation, learning strategies, life satisfaction, neuropsychic adaptation, anxiety, medical education

Highlights:

➢ The psychological determinants of adaptation at the university during the COVID-19 pandemic specific for first-year students of the Faculty of Medicine (in comparison with the Faculty of Economics students) are: professional motives for learning, motivation for success, willingness to cooperate, assimilation of educational material through repetition, avoidance of planning educational activities.
➢ The psychological characteristics that determine the high level of adaptability of students at the university (regardless of the field of study) are emotional well-being and a high level of extraversion.
➢ Higher adaptability at the university during the COVID-19 pandemic was revealed in students of the Faculty of Medicine compared with Faculty of Economics students.

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Introduction

Adapting to study at the university is a significant stage in every student's life on the way to mastering the profession. It includes both familiarity with new rules and responsibilities, training load, regime, and new environment, team, and forms of training (Siomichev, 1985). All of this requires a certain level of independence and activity of the student, emotional stability, and the ability to cope with the stress associated with information overload. The result of adaptation is the achievement of a balance between the social and personal characteristics of the student and the new conditions of the university environment (Grishanov & Tsurkan, 1990).

The satisfaction of students with the university, their immersion in studies, and the success of their studies depend on how successfully this stage is passed (Shcherbakov et al., 2018; Xie et al., 2019; Raza et al., 2021), as well as a positive attitude toward the chosen profession (Rubin & Kolesnikov, 1968). A low level of adaptation, manifested in the presence of academic problems, anxiety, and even depressive states, leads to a drop in academic performance (Iglesias-Benavides et al., 2016) and increases the risk of further expulsion of a student from a higher educational institution.

It is especially significant to provide better conditions for students to adapt to learning activities during the COVID-19 pandemic because a tense situation can increase their overall level of anxiety, leading to a decrease in learning outcomes and adaptive abilities (Baloran, 2020; Rajab et al., 2020; Son et al., 2020; Okado et al., 2021). In addition, applicants who entered higher education institutions in 2021 found themselves in a situation of blended learning, when classes were held simultaneously both in classrooms and online or remotely, which is specific to the already established traditional (offline) education system.

The use of distance learning technologies in medical universities causes a unique discussion.

On the one hand, studies show that online lectures have proven themselves well in medical education (Cardall et al., 2008; Remtulla, 2020). In addition, there are mobile applications that allow you to study human anatomy using 3D computer models. Virtual reality technologies are also actively being introduced into the educational process, allowing the reconstruction of the clinical environment in which students can examine, diagnose, and treat patients in situations simulated by the program. A review of studies on the use of virtual reality in medical training has shown that such tools contribute to improving learning outcomes (Samadbeik et al., 2018). However, given the specifics of the profession, the format of distance learning (DL) may not always be productive or appropriate in a medical university (Timofeeva, 2021). Virtual reality technologies still cannot replace practice and should act only as an additional teaching method (Walsh et al., 2012; Khan et al., 2014; Moghaddasi et al., 2016). This conclusion is also reached by Krasnoselskikh et al., as a result of a survey of medical university students and teachers devoted to their attitude to the introduction of DL in the professional training of doctors – "it is advisable to use distance learning technologies in combination with traditional educational and methodological tools" (Krasnoselskikh et al., 2020, p. 111). According to the students themselves, DL should be combined with real communication with teachers and cannot be an alternative to some traditional forms of education (ibid.). However, considering the physical distancing of students from some educational resources (for example, laboratories) forced during the pandemic, scientists urge not to abandon the use of online resources if they can provide active learning (Sandrone & Schneider, 2020).

In the context of the forced transition to online and distance learning during the COVID-19 pandemic, it becomes significant to consider factors that help students adapt to a new form of work. The conducted research in this area indicates that successful adaptation is ensured by the presence of students' self-regulation skills and socio-emotional competencies (the ability to relieve tension and reduce the intensity of experiencing social and emotional loneliness) (Händel et al., 2020; Flores et al., 2022). These skills of first-year students have not yet reached a high level, increasing the risk of unsuccessful adaptation to distance and online learning. As was shown in a comparative study of medical university students conducted by Timofeeva (2021), junior students experience a lack of adaptability, which increases in the third year and decreases again in the fourth year of study.

Studies devoted to the search for factors and resources that contribute to the adaptation of first-year students to higher education were conducted long before the pandemic. Such factors include low levels of stress, availability of social support (from friends and family), adequate self-esteem (Friedlander et al., 2007), lack of communication difficulties, the ability to manage time, the availability of learning skills (Ababu et al., 2018), autonomous motivation and self-efficacy (Girelli et al., 2018; Sadoughi, 2018). Personality characteristics determine the ability of students to adapt. For example, perfectionism and the "impostor phenomenon" (the tendency of people with high achievements to chronically doubt their abilities and fear that others will discover that they are "intellectual scammers") (Henning et al., 1998) negatively affect the adaptability of students.

In several studies, it has been observed that motivation for learning plays an important role in adaptation. Students who have expressed cognitive and professional motives adapt to learning more successfully (Lokatkova, 2012). Unmotivated students, on the contrary, have a low level of psychosocial adaptation to higher education (Baker, 2004). Regarding distance learning, it was also revealed that educational motivation and formed learning strategies are positively associated with the success of students' learning activities, which, according to the authors, contributes to their adaptation to higher education (Wang et al., 2008). As a result of the study of psychological, motivational and behavioral factors influencing the academic adaptation of students, Raza et al. (2021) conclude that the greatest contribution to this process is made by motivation for learning and self-regulation skills.

Therefore, numerous studies emphasize the role of both the personality characteristics of students in the process of adaptation to higher education and the presence of certain social and environmental factors that contribute to its success.

In this study, we addressed the question of what role these factors play in the adaptation process of first-year medical students who begin their studies at a university in a blended format (including classroom, online or distance classes). Based on the analysis of scientific sources presented above, in order to identify individual psychological characteristics that determine the success of the adaptation of first-year students to study at a university during the COVID-19 pandemic, we selected the following variables: subjective life satisfaction, neuropsychic adaptation, learning strategies (cognitive and metacognitive), learning motivation and some personal characteristics of students, including anxiety.

A control group included the first-year students of the Faculty of Economics, who also began their studies in similar conditions – in a blended learning – caused by the epidemiological situation in the country and the world, was included in the study to detect the determinants of adaptability at the university, specific to medical students.

Methods

The study was conducted in the spring semester of 2021 at St Petersburg State University. The main group of the study included 93 first-year students of the Faculty of Medicine. The control group included 111 first-year students in the Faculty of Economics. Respondents agreed to participate in the study.

The study participants filled out psychodiagnostic methods presented in Google Forms format and aimed at identifying adaptability in higher education (the psychodiagnostic technique "Method of Research of Students Adaptability in the Higher Educational Establishment" (Dubovickaya & Krylova, 2010)), mental state ("Test of neuropsychic adaptation" by I. N. Gurvich (Ovchinnikov et al., 2005) and "The State-Trait Anxiety Inventory (STAI)", Part 2 (Bizyuk et al., 2005)), life satisfaction (E. Diener's "The Satisfaction with Life Scale" (Osin & Leont'ev, 2020)), learning motives ("Psychodiagnostic technique for diagnosing students' educational motivation" in the adaptation by N. Ts. Badmaeva (Badmaeva, 2004)), educational strategies (questionnaire "Educational strategies" (Dvornikova, 2017)), personality characteristics ("The Big Five Inventory" in the adaptation by D. P. Yanichev (Yanichev, 2006)).

Statistical data processing was carried out using stepwise regression and comparative (Mann–Whitney U test) types of analysis in the SPSS Statistics 26.0 program.

Results and Discussion

As a result of processing empirical data, it was revealed that the level of adaptation of medical students at the university is mainly medium or high. Therefore, the high level was recorded in 39 people, which is 42 % of the total number of subjects (1st subgroup), the average – in 43 people (46 %) (2nd subgroup), the low – in 11 people (12 %) (3rd subgroup).

Based on the results of the comparative analysis, we also found differences in individual psychological characteristics of students with high, medium, and low levels of adaptability in the university. Thus, students in the 1st subgroup, compared to students in the 3rd subgroup, have statistically higher life satisfaction ($p = 0.001$), level of extraversion ($p = 0.003$), self-awareness ($p = 0.002$), willingness to consent and cooperate (agreeableness) ($p \leq 0.001$), emotional stability ($p = 0.003$), personality resources (openness) ($p = 0.017$), the level of neuropsychic adaptation ($p \leq 0.001$), as well as a more developed strategy for mastering educational material, such as repetition ($p = 0.04$). At the same time, they have a lower overall indicator of trait anxiety ($p = 0.002$), a phobic component of anxiety ($p = 0.001$) and a component of "anxious perspective assessment" ($p = 0.002$), as well as avoidance motives ($p = 0.003$).

It is significant to note that such personality characteristics as extraversion ($p \leq 0.001$) and level of conscientiousness ($p = 0.017$) are also statistically significantly higher in students of the 1st subgroup compared to students of the 2nd, with statistically lower rates of ineffective adaptation ($p = 0.013$) and avoidance motives ($p = 0.023$).

The following differences are observed between students from the 2d and 3rd subgroups. Students with a medium level of adaptability are more satisfied with their lives ($p = 0.05$), are willing to cooperate ($p = 0.013$), have greater emotional stability ($p = 0.034$) and have personality resources to solve problems ($p = 0.05$), and more often resort to repetition strategies in training ($p = 0.022$). At the same time, they generally show lower trait anxiety ($p = 0.02$), have less pronounced phobic manifestations of anxiety ($p = 0.021$) and symptoms of misadaptation ($p = 0.01$) and are less anxious about their prospects ($p = 0.014$).

Thus, students in the 1st year of the Faculty of Medicine who are less adapted to the university are more likely to worry about upcoming events, negatively assess their chances of success, have more pronounced symptoms of neuropsychiatric misadaption, study to avoid censure and condemnation from others, and not to gain new knowledge. Such students are less satisfied with their lives, more withdrawn, and tend to cope with difficulties on their own without seeking help. Perhaps this is due to their greater neuroticism (or low emotional stability), closeness to new experiences, and fewer personality resources to overcome stressful situations.

Regression analysis was performed to identify psychological predictors of students' adaptability at the university. The dependent variable was the level of adaptability at the university, the scales of other questionnaires were independent variables. The significant regression model ($R^2 = 0.57$) included the following variables: 'extraversion' ($\beta = 0.29$, $p \leq 0.01$), 'agreeableness' ($\beta = 0.39$, $p \leq 0.001$), 'neuropsychic adaptation' ($\beta = -0.06$, $p \leq 0.05$), 'avoidance motives' ($\beta = -2.43$, $p \leq 0.001$), 'professional motives' ($\beta = 1.45$, $p \leq 0.05$), cognitive learning strategy 'repetition' ($\beta = 0.32$, $p \leq 0.05$), metacognitive learning strategy 'planning' ($\beta = -0.20$, $p \leq 0.05$). Thus, those students who show interest in other people are ready for cooperation and discussion while being in an optimal, healthy mental state, motivated to obtain professionally necessary competencies, ready to memorize and repeat the material, tuned to action and not just planning, will be better adapted at the university. These data correlate with the results of studies obtained before the pandemic – pronounced professional motives (Lokatkova, 2012) and a focus on communication (Ababu et al., 2018) generally contribute to better adaptation of first-year students at the university.

More than half of the students included in the control group (first-year students of the Faculty of Economics) have an average level of adaptability at the university (65 people, 59 %), almost a quarter of students have a low level (27 people, 24 %), and the smallest group consisted of students with a high level of adaptability at the university (19 people, 17 %).

Students of the Faculty of Economics with a high (subgroup 1), medium (subgroup 2) and low (subgroup 3) level of adaptability also have the statistically significant difference in some individual psychological characteristics. That is, students in 1st subgroup have higher indicators of life satisfaction ($p = 0.02$), conscientiousness ($p = 0.05$), personality resources (openness) ($p = 0.015$), their professional motives for learning activities are more pronounced ($p \leq 0.04$), as well as metacognitive learning strategies ($p = 0.038$), observation strategy in particular ($p = 0.024$); at the same time, self-doubt, a feeling of an uncertain, vague threat ($p = 0.011$), and symptoms of neuropsychic maladjustment ($p = 0.034$), are less pronounced, compared to students of the 2nd subgroup.

The differences are clearly observed when comparing subgroups of economics students with a high and a low level of adaptation. Students in the 1st subgroup have significantly higher life satisfaction ($p = 0.001$), extraversion ($p = 0.003$), conscientiousness ($p = 0.025$), emotional stability ($p = 0.01$), personality resources (openness) ($p = 0.01$), motives for learning activities such as prestige ($p = 0.024$), professional ($p = 0.036$), educational and cognitive ($p = 0.002$) motives, motives for creative self-realization ($p = 0.003$), cognitive ($p = 0.01$), and metacognitive ($p = 0.001$) learning strategies. Trait anxiety ($p \leq 0.001$), and all its components ($p \leq 0.05$), are statistically significantly lower. However, its 'social protection' component ($p = 0.118$) is higher, as well as neuropsychic adaptation ($p = 0.001$).

The psychological predictors of university adaptation in the control group were ($R^2 = 0{,}38$): 'life satisfaction' ($\beta = 0.16$, $p \leq 0.075$), 'extraversion' ($\beta = 0.26$, $p \leq 0.01$), 'general level of anxiety' ($\beta = -0.28$, $p \leq 0.01$), motives for creative self-realization ($\beta = 0.17$, $p \leq 0.05$), and metacognitive learning strategy 'planning' ($\beta = 0.14$, $p \leq 0.092$). In other words, students who are satisfied with their lives, open to new experiences and other people, less anxious, able to realize their creative potential and to plan their educational activities, will adapt more successfully at a university. It is of interest that the cognitive learning strategy 'planning' negatively affects the adaptability of medical students and positively affects the adaptability of economics students. This may be due to the specifics of the academic disciplines and the organization of the learning process in these areas of vocational education. The first year of education at the faculty of medicine is based on the development of practical professional skills (work in laboratories, on mockups, simulators, and the like; Isaeva & Gabidullina, 2018; Kamyshnikova et al., 2019; Shanks et al., 2010). Its success will be determined to a greater extent by the ability to quickly navigate and take active steps to master the course of study and not by the ability to long-term plan own educational activities.

When comparing the individual psychological characteristics of the students in two faculties, the following differences were discovered. Students in the Faculty of Medicine are better adapted to a university than students in the Faculty of Economics ($p \leq 0.001$), to their study group ($p = 0.01$), and to the learning activity itself ($p \leq 0.001$). Furthermore, they have a higher level of conscientiousness ($p = 0.005$), and the motives for learning are more pronounced: professional ($p \leq 0.001$), educational and cognitive ($p \leq 0.001$), social ($p \leq 0.004$), creative self-realization ($p = 0.034$); cognitive ($p \leq 0.001$), and metacognitive ($p \leq 0.001$) learning strategies, are more developed. One can assume that these values indicate greater motivation for learning in students of the Faculty of Medicine, as well as their better instrumental readiness for the educational process. Indeed, according to some data, medical students are attracted by the social significance of their chosen profession; therefore, most make a choice in its favor on their own (not under the influence of their immediate environment, which are parents or friends) (Karabinskaya et al., 2010).

However, the comparative analysis of the individual psychological characteristics of the subgroups of students with a high level of adaptability at a university did not reveal any differences between them. It is, except for the greater expression of professional motives among medical students ($p = 0.004$), and the learning strategy of repetition ($p = 0.023$). It may be due to their initially more pronounced professional motivation, as well as the specifics of educational activities, in which students in the medical faculty spend more time preparing for classes, studying the basics of various disciplines, during which it is important to memorize a large amount of information. According to Meermanova et al. (2017), the teaching load in the medical field is higher than, for example, in technical universities. It forces students to spend more time repeating studied material. In this regard, it may lead to the predominance of this learning strategy in them.

Among students with a low level of adaptation in a university, there are more differences: medical students, compared to economics students, have more pronounced social ($p = 0.014$), educational and cognitive ($p = 0.002$), avoidance ($p = 0.049$), prestige ($p = 0.004$) motives. They also have better developed various learning strategies ($p = 0.016$). Additionally, students in the faculty of medicine have a higher indicator of anxiety assessment of prospects ($p = 0.041$), and a lower indicator of agreeableness ($p = 0.041$).

The data obtained indicate the versatility of psychological parameters characteristic of well-adapted students, in the presence of specific individual characteristics, depending on the professional orientation of students.

Findings

The results of the study of the level, characteristics and predictors of the adaptability of first-year medical students in a university after the transition to a blended learning format due to the COVID-19 pandemic allow one to formulate the following conclusions and recommendations:

1. First-year students of the faculty of medicine are generally characterized by a sufficient level of adaptation at a university (88% of respondents). The indicator in this group is higher than in the group of students of training direction. Successful coping with a stressful (and new) situation of studying at a university, including associated with a blended format of education during an unfavorable epidemic situation, can be due both to the peculiarities of the organization of the educational process, which contributes to increasing the adaptability of students, and to the specifics of this contingent of students – their personality traits, level of stress resistance and frustration tolerance, mature motivation, and self-organization skills.

2. Comparison of the psychological characteristics of students of various areas of training with a high level of adaptation at a university allow one to draw a conclusion that a number of such characteristics are of a universal nature, while some of them are specific to different contingents of students. That is, students successfully adapted in a university are characterized by a higher level of life satisfaction, extraversion, conscientiousness, emotional stability, personality resources (openness), and neuropsychic adaptation. In this group, the indicators of trait anxiety and a diseased neuropsychic state are also significantly lower. The specific characteristics that distinguish highly adapted first-year students of the medical faculty (compared to students of the economic direction) include a greater expression of professional motives and more frequent use of the repetition strategy in educational activities.

3. Psychological determinants of university adaptability of first-year students during the

COVID-19 pandemic are different depending on the field of study. For first-year students of the faculty of medicine, such determinants are: willingness to cooperate, agreeableness, a high level of extraversion and neuropsychic adaptation, the presence of professional motives for learning activities and the motivation to achieve success, and an orientation towards memorizing educational material. Moreover, they are not characterized by planning educational activities. Among students of the faculty of economics, the psychological characteristics that determine adaptability at a university are: the presence of motives for creative self-realization, a high level of extraversion, life satisfaction, a low level of anxiety, and a desire for planning in learning. Therefore, the level of extraversion is the only characteristic included in the predictive models of student adaptation at a university, both in the group of students studying medical and economic specialties.

4. The stressfulness of situation when starting studies at a university, especially during an unfavorable epidemic situation associated with a constant change in the format of education and other organizational, social and psychological difficulties, leads to the need to consider the possibility of providing students with prompt and qualified psychological support. Currently, many universities are implementing programs of free psychological assistance for students, contributing to their rapid adaptation to the new educational environment. This type of psychological work can be conducted in various formats: psychological support, psychological counseling, psychological intervention – depending on the needs of students themselves.

5. The results of the study allow one to formulate the main targets of psychological counseling in the group of students with a high risk of maladaptation at a university: 1) it is necessary to pay attention to the severity of symptoms of low adaptation, general psychological distress of students, including physical and emotional ones, associated with sleep problems, vegetative-somatic disorders, emotional lability, and dysthymia; 2) the object of diagnosis and correction, if necessary, can be a high level of trait anxiety, including the one associated with increased physical and mental fatigue, with an anxious assessment of the prospect, with unstable self-esteem against the background of increased demands on oneself, and an increased need to control the situation; 3) special attention should be paid to the low level of students' personality resources for coping with stressful situations, including low agreeableness, closeness to new experience, low self-organization, unwillingness to accept and positively evaluate changes, unwillingness to seek social (emotional) support from other people, withdrawal into oneself.

In addition to psychological support programs for students, there is an additional resource to increase their adaptability in a university. It is training programs aimed at optimizing learning strategies, teaching self-organization skills and coping with learning difficulties, increasing awareness of activity and learning motivation.

Conclusion

The success (efficiency) of activities, including educational ones, the sense of one's own competence, the level of adaptation (at a university and life in general) are associated with a wide range of factors: external, situational (circumstances of a particular situation and its requirements), and internal, which include individual characteristics of a student: personality traits, value-motivational characteristics, features of emotional response, and existing experience in implementation of activities. Factors as a whole should be considered in the correctional and development work with students.

As a result of the study on the contingent of students in the medical field, certain personality characteristics of students and the learning strategies they use were revealed to be associated with a greater probability of successful adaptation in a university during the period of change in education format due to the COVID-19 pandemic. Students characterized by a low severity of these traits can be considered as a risk group prone to low adaptability at a university, especially during critical periods of increased workload, sudden changes, and specific requirements. They need special attention and, if necessary, psychological counseling.

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Author Contributions

D. S. Gnedykh developed the study design and methodology, conducted statistical analysis of the data, prepared the text of the article, and performed the final editing of the text of the article.

M. A. Tikhomirova participated in the selection and preparation of methodological tools, collected empirical data, performed primary data processing, analyzed the results and described them, and performed the final editing and formatting of the text of the article.

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Students' Motivation for Success while Teaching Music in Small Groups

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Abstract: **Introduction**. The scientific novelty of the research lies in the description of the phenomenology of small groups, which is understood as a description of the main phenomena that arise in the field of relationships and are characteristic of small groups, the psychological characteristics of the success motivation development, as well as a comparative analysis of the results of a survey on the motivation development among Russian and Chinese students. **Methods**. The survey was conducted using a methodology designed to assess the motivation for success among students in small groups. The adapted questionnaire consists of questions from A. V. Sidorenkov's methodology for socio-psychological research of small groups and of questions from foreign authors' questionnaires devoted to the research of social loafing in a small group. The respondents were Chinese and Russian students, which made it possible to carry out a comparative analysis. The aim of the study was to obtain two arrays of experimental data on the studied indicators, on the basis of which an analysis of the differences between them was carried out. Statistical analysis of the data included the calculation of average values of indicators, as well as statistical significance of the differences assessment is identified. **Results**. A comprehensive experimental and diagnostic study was carried out on the motivational process development of students when working in small groups in the process of teaching music. The results of the study revealed socio-psychological contradictions, but it was also proved that all three groups of respondents have positive relationships within the group and equally need social support. The second part of the empirical research assessed the level of social loafing in group participation in music classes and showed a relatively low level of social loafing in small groups among Chinese students, and a higher one among Russian students. **Discussion**. As a result of the research, a comparative analysis of the psychological diagnosis of students' motivation development for success while working in small groups in the process of teaching music at the Shenzhen College of International Education (China), Rostov State Conservatory named after. S. V. Rachmaninov and Taganrog College of Music (Russia).

Keywords: motivation for success, learning strategy, motivation assessment, small groups, educational environment, social loafing, teacher-facilitator, work efficiency, music learning, success achievement

Highlights:

- When working in small groups, many students experience psychological discomfort, prefer autonomy, i.e. study individually.
- The introduction of new strategies for teaching in small groups in the musical educational environment of traditional learning may be resisted by students, teaching staff and administrative staff due to the phenomenon of the so-called social loafing, when each member of a small group makes less effort working in a group than in the mode of individual learning.
- The motivation to achieve success is one of the key aspects not only in the learning process, but also in the process of student's self-identification as a musician.

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Introduction

In modern psychology, motivation is seen as a complex multi-level regulator of human life (behavior, cognitive activity, creativity), which includes needs, motives, interests, ideals, aspirations, attitudes, emotions, norms, values, etc. "The hierarchical structure of the motivational sphere determines the orientation of a student's personality, which has a different character depending on which motives have become dominant in their content and structure" (Zimnyaya, 2010, p. 52).

Research conducted within the framework of educational activities confirms the importance and significance of supporting the motivational behavior of students. The positive aspects include an increase in intrinsic motivation for the activities performed (Gordeeva & Shepeleva, 2011; Moiseeva & Sannikova, 2018; Makarova et al., 2019a; Makarova & Denisov, 2021), a better understanding of the material being studied (Ulyanova & Svinareva, 2015; Konovalova, 2013), greater thinking flexibility (Byzova & Perikova, 2015), more active information processing (Zainiev & Karomatov, 2017; Makarova et al., 2019b), creativity (Ilyin, 2012; Borovinskaya, 2016), a high assessment of one's own competence (Kulikova et al., 2021; Ryan & Deci, 2017), positive emotions (Khanevskaya, 2016), higher academic achievement (Glazkova & Glazkov, 2021), as well as an increase in overall involvement in the learning process (Andreassen & Makarova, 2018), where "involvement" means a certain motivational construct that includes various behavioral patterns (persistence in the face of obstacles, diligence and intensity, immersion in what is happening, reflection of what is happening), usually associated with increased emotionality and positive emotional states (passion, enthusiasm, pleasure), as well as with cognitive abilities (initiation of the thinking and learning process, attention to detail, lack of detachment). Engagement can be viewed as an important resource for achieving success, as well as a psychological characteristic of the degree to which the student and the educational environment fit (Skinner et al., 2009; Pavlova & Krasnoryadtseva, 2021).

In our research context, it is worth pointing out that satisfaction of the student's need for autonomy plays a crucial role in the development of intrinsic motivation for creative activity, while intrinsic motivation itself is one of the key aspects in the process of identifying oneself as a musician (Hallam, 2006). Unfortunately, most young musicians beginning the learning process need various reinforcements from outside (Howe & Sloboda, 1991), as activities based on personal interest in a musical instrument or in the process of learning music are rare. Therefore, the teacher must plan and design the educational process in such a way that the activity, initiated and regulated initially due to external stimuli, gradually acquires independent significance and arouses interest. In general, autonomy support is a specific set of methods used in class planning or delivery by which educators first identify and then gradually develop students' intrinsic motivational resources in such a way that students eventually come to perceive themselves as the initiators of their own actions and regulators of their own behavior (Reeve & Jang, 2006).

The importance of autonomy is emphasized in the self-determination theory of Edward L. Deci and Richard M. Ryan (Ryan & Deci, 2017), according to which agency and choice are more significant motivating factors than control through threats and manipulation. Autonomy also depends to a large extent on the dynamics of relations in the group, on the involvement of trainees both in the organization of the learning process and within study group relationships. The more involved, the more autonomous they feel. Sharing responsibilities and encouraging peer learning in groups promotes engagement, which in turn leads to increased intrinsic motivation of students to succeed. This psychological approach to understanding academic motivation is logically related to the psychology of small groups.

Small group psychology is one of the oldest and most developed areas of social psychology. The increased interest in it has a simple explanation: it is the basic cell of society, the immediate sphere of the formation, development and self-identification of the individual, the psychological means of communication between the individual and society, their mutual influence. The problem of a small group has long been a leading one for Russian psychologists (Andreeva, 2016; Gaidar, 2013; Zhuravlev, 2005; Zhuravlev & Nestik, 2012; Krichevsky & Dubovskaya, 2009; Petrovsky, 1977; Sarychev, 2008; Sidorenkov & Sidorenkova, 2011a; Tretyakova, 2020; Umansky, 2001; etc.), but even now it does not lose its relevance despite the large number of studies in this area (Pronenko & Bunyaeva, 2018).

The need to belong is a strong psychological motivation. In different societies and even eras, people have consistently sought inclusion rather than exclusion, membership rather than isolation, acceptance rather than rejection. As R. Baumeister and M. Leary concluded, people have a need to belong: "the ubiquitous desire to form and maintain at least a minimum number of long-term, positive and effective interpersonal relationships" (Baumeister & Leary, 1995, p. 497).

"Small groups can be different in size, in the nature and structure of the relations that exist between their members, in individual composition, in the characteristics of values, norms and rules of relationships shared by the participants, in interpersonal relations, in the goals and content of the activity. The quantitative criterion of a group in the language of science is called the size, and the individual criterion is called the composition" (Nemov, 2003, p. 529).

Defining the concept of small groups, some authors propose to consider the upper and lower limits of a small group size, which, in their opinion, can resolve the contradictions that arise between representatives of different theoretical approaches to this problem.

In majority of researches, the number of small group members ranges between 2 and 7 with a modal number of 2 (mentioned in 71 % of studies). This count is consistent with the widely held notion that the smallest group is a group of two, the so-called "dyad". However, in the "dyad" it is almost impossible to single out the type of communication that is represented by joint activity, it is the appearance of the third subject that brings this type of relationship out of interpersonal interaction, forming a group.

For a long time, in determining the upper limits of the group size, Russian authors relied on the "magic number" (7 ± 2), discovered by J. Miller in research on working memory. Over time, the data were not confirmed empirically, and the attention of psychologists switched to the sociometric studies of J. Moreno indicating the group size from 20 to 30 people, based on social studies of school classes.

In the future, considering the small group primarily as a real one, mediated by social relations and activities, the upper limits will be taken as the number of members of the small group that satisfies this range and is necessary for the implementation of joint educational activities (Andreeva, 2016).

Thus, from the view point of Russian scholars, "a small group in its composition is a small social unit whose members are united by common activities and are in direct, stable contact with each other, which is the basis for the emergence of both emotional relations in the group and special values and norms of group behavior" (Sidorenkov & Sidorenkova, 2011b, p. 33).

In foreign researches, a small group for learning is defined as a group of students with three main characteristics: active participation, specific task and reflection (Agnihotri & Ngorosha, 2018). Effective learning requires that the small group has a specific task at which the group activity is directed. This task must be clearly understood and accepted by all small group members. Although individual members of a group may not be equally involved in achieving the goal, successful learning in small groups requires all members' active involvement and participation. The need for reflection as part of effective learning was highlighted in a long-term study (Rossokhin, 2010). Small groups allow students to reflect on their own experiences as well as the experiences of others, thus contributing to a deep understanding of the learning material during the learning process. A skilled facilitator can guide this reflection so that it leads to the desired learning outcomes.

In a small group, students can be encouraged to talk, reflect on the problems and share opinions much more easily than in a large group. Communication with the teacher and with each other is a fundamental factor in any small group learning, a critical first step is the willingness of students to communicate. It makes sense to identify the goals of a small group and explain the value of communication in terms of personal and intellectual development of students (Kolb, 1984).

The phenomenology of small groups is understood as the representation and description of the main phenomena that arise in the sphere of human relationships and are characteristic of small groups. Special attention is paid to trust as "the selective attitude of one subject to another, based on an assessment of certain qualities of another, a willingness to interact with them in a certain way, and on a sense of personal security (well-being) during interaction" (Sidorenkov & Sidorenkova, 2011a, p. 95).

The socio-psychological basis of all relations that develop in a group is the values and norms adopted in it. The term "values" means what is valued by the members of this group, what is most significant and important for them, including the general and individual goals that the members of the group strive for. The values are followed by the behavior norms, relationships that are developed and operated in a given social group, general rules that guide members of the group in their actions and relationships with each other.

As a result of the research, problems associated with learning and teaching in small groups were identified:

1. The introduction of new approaches to teaching in small groups in the educational environment of traditional learning may meet students, teaching staff and administrative staff resistance.
2. Small groups usually require additional investment in key resources, including additional staff and specially equipped classrooms.
3. Most small group activities are best performed with the help of qualified facilitators (who are often in short supply) rather than through traditional teaching methods use.
4. Many students feel psychological discomfort when working in small groups, they prefer to study individually or in large groups (in the class).

Music education, like other areas of education, needs to rethink the way information is communicated and to promote changes in students' development that meet the new society demands for future professionals' education. Among the factors contributing to this cultural change are the epistemological beliefs and concepts held by various actors in music education – students, teachers, and/or scholars conducting research in this field. Teaching music in small groups requires a complete understanding of each participant in the educational process, respect for student's personality. Each student is an autonomous person pursuing their own goals, but they are also members of the group – this circumstance limits, directs and supports their activities in the educational process. Individual students do not always achieve their goals by working autonomously, but when group members learn to work together as a cohesive team; their learning becomes effective, aimed at achieving success. Many human activities are more successful in groups, people also turn to group members when they need to make an important decision, and this choice is justified as long as groups avoid problems such as group polarization and group thinking.

Just as each student affects all people in the group, so does the group change each of its members. Joining a group satisfies the student's need for belonging, support, gaining information and understanding through social comparison, defining a sense of self and social identity in achieving goals that might escape attention if students work alone. Groups are also of practical importance, since most tasks in the world are fulfilled by groups rather than individuals.

Methods

At the first stage of research students' motivation for success while working in small groups in the process of learning music, data were collected on a selection of Chinese students of the Shenzhen College of International Education, Shenzhen (China), and Russian students of the Rostov State Conservatory named after S. V. Rachmaninov, Rostov-on-Don, and the Taganrog College of Music, Taganrog.

The age of the subjects varied from 16 to 18 years (n = 96). The average age of the subjects was 17.2 ± 1.3 years, and the median age was 17 years. The criterion for dividing the subjects

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into two groups was the place of residence: the 1st group – in China (n1 = 50 people), and the 2nd group – in Russia (n2 = 46).

Realization of the research purpose implies the need to obtain two main arrays of empirical data. Based on the division of the subjects into two groups, an analysis of the differences between them in terms of the studied indicators was carried out. Mathematical processing of the obtained empirical data included the determination of the average values for the researched indicators, as well as the procedure for assessing the statistical significance of the differences identified.

To diagnose students' motivation for success while working in small groups in the process of learning music, questionnaires were developed for students and teachers in Russian and English, taking into account the mentality of Chinese students, for whom English is a second language.

The first part of the student questionnaire consists of twelve statements based on the adaptation of A. V. Sidorenkov's methodology for the socio-psychological study of small groups (Sidorenkov et al., 2012). Agreement with the statements is assessed on a five-point Likert scale.

The second part of the questionnaire includes ten statements and is based on foreign studies on the perception of social loafing in a small group (Zhu et al., 2019). Agreement with statements is also assessed on a five-point Likert scale, which allows you to indicate the degree to which each item corresponds to the subjective experience of the survey participant.

The third, final part of the questionnaire is devoted to assessing the motivation for success of students while working in small groups in the process of learning music and consists of thirty two statements, each of which must be answered "yes" or "no": T. Ehlers' questionnaire was taken as the basis for determining motivation to success (Ehlers, n.d.).

The second stage of the research was an expert assessment of the small group as a whole and students' motivation in the process of teaching music by these groups' teacher-facilitators. At this stage, the processing of the results was performed with a breakdown into small groups, which shows the subjective vision of students for motivation for success development during the process of learning music and teacher's objective assessment of the psychological climate in the group as a whole.

The questionnaire consists of 15 statements and is intended for a general expert assessment of the learning effectiveness in each small group. Agreement with the statements is assessed on a 5-point Likert scale, which allows indicating the degree of correspondence for each item to the objective, also on teacher's expertise.

Results

Both selections coincide in terms of the main demographic indicators (gender, age, level of education, professional orientation, and marital status) and are close in size.

The first part of the empirical research is devoted to the identification of socio-psychological contradictions (interpersonal, individual-group, motivational-activity, activity-organizational, status and intergroup contradictions) in small groups when learning music. On average, the results of groups in China (G1W = 1.75; G1X = 2.164; G1Z = 2.097; G2X = 1.843; G2Y = 1.964) show a low level of socio-psychological contradictions in small groups; in Rostov-on-Don these indicators are somewhat higher (RD1W = 2.229; RD2X = 2.292; RD3Y = 2.250; RD4Z = 2.208),

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and in Taganrog, respectively (T1W = 2.104; T1X = 2.396; T2Y = 2.133; T2Z = 2.154). In general, students in a small group socio-psychological contradictions’ research in the process of learning music showed that the groups have much in common in terms of personal interests and ideas, they experience positive relationships with each other, but they need the attention and support of the group and the teacher-facilitator. Students in small groups in China and Russia are satisfied with the purpose and content of the activities performed and the setting of tasks, but they want to receive more attention and social support from the teacher and compete with other groups.

The second part of the empirical research assesses social loafing in a group. On average, the results of groups in China (G1W = 1.936; G1X = 2.613; G1Z = 1.833; G2X = 2.556; G2Y = 2.295) show a relatively low level of social loafing in small groups, in Rostov-on-Don these indicators are slightly higher (RD1W = 2.859; RD2X = 3.180; RD3Y = 2.843; RD4Z = 2.625), and in Taganrog, respectively (T1W = 2.813; T1X = 3.125; T2Y = 2.625; T2Z = 2.625). Social loafing, despite its clearly negative character, makes a positive contribution to non-learning aspects of group functioning. Collaboration, content acquisition, and choice provide small group educators with an excellent foundation to manage and improve teaching and learning. As follows from the above three strategies6 not only the teacher, but also small group members can make an important contribution to fight against social loafing and social facilitation.

Evaluation of social loafing in a small group can be made using the “transparency” of individual efforts and results in the overall group effectiveness. The perception of the result will be negative if the “transparency” of the work in the group is low; students are less motivated to make an effort when they believe that their individual efforts are indistinguishable from the efforts of others and are not visible to the teacher; they will be socially lazy, knowing that there will be no reward or punishment.

The third, final part of the questionnaire is devoted to assessing the motivation for success of students when working in small groups and is presented in more detail in Table 1 and Figures 1–3.

Table 1

Evaluation of students’ motivation for success when working in small groups in the process of teaching music (T. Ehlers questionnaire)

Group name	Small group size	Min.	Max.	Median	Average	Standard deviation	Dispersion
				China			
G1W	12	5	20	16	16.83	5.306	28.15
G1X	10	12	21	18	17.2	2.600	9.511
G1Z	6	13	21	18.5	18	3.000	12.000
G2X	8	9	22	16.5	15.38	3.531	19.411
G2Y	12	9	21	20	17.86	4.073	16.593

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Group name	Small group size	Min.	Max.	Median	Average	Standard deviation	Dispersion
Rostov-on-Don, Russia							
RD1W	8	8	25	18.5	17.5	5.154	26.571
RD2X	4	13	18	15.5	15.5	2.081	4.333
RD3Y	4	15	21	17	17.2	2.872	8.25
RD4Z	3	16	18	17	17	1	1
Taganrog, Russia							
T1W	4	12	22	17	17	4.163	17.333
T1X	4	13	19	15	15.5	2.516	6.333
T2Y	5	7	19	12	13.4	5.029	25.3
T2Z	15	10	20	16	16.46	3.583	12.838

Figure 1

The indicators' severity of motivation for success of Shenzhen College of International Education (Shenzhen, China) students when working in small groups in the process of music learning

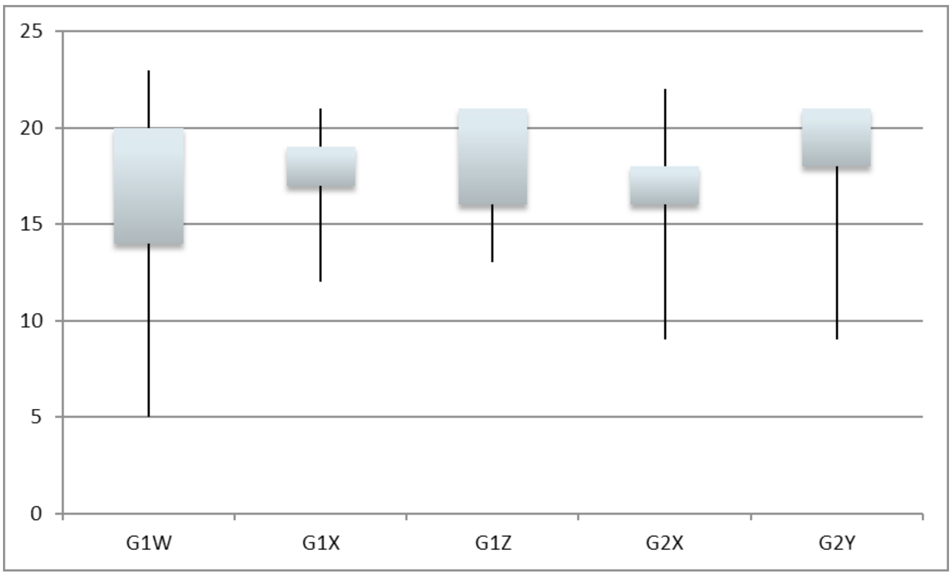

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Figure 2

The indicators' severity of motivation for success of Rostov State Conservatory named after S. V. Rachmaninov (Rostov-on-Don, Russia) students when working in small groups in the process of music learning

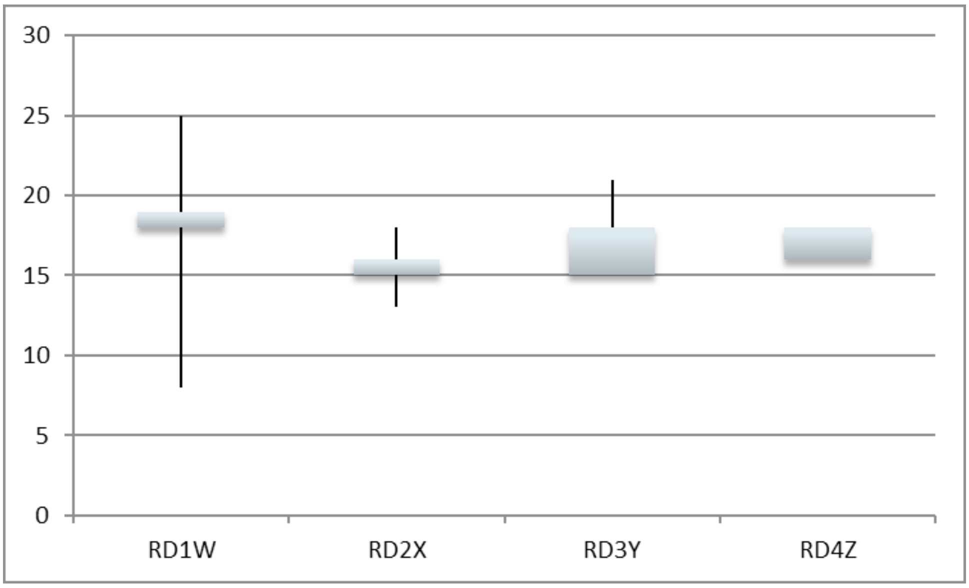
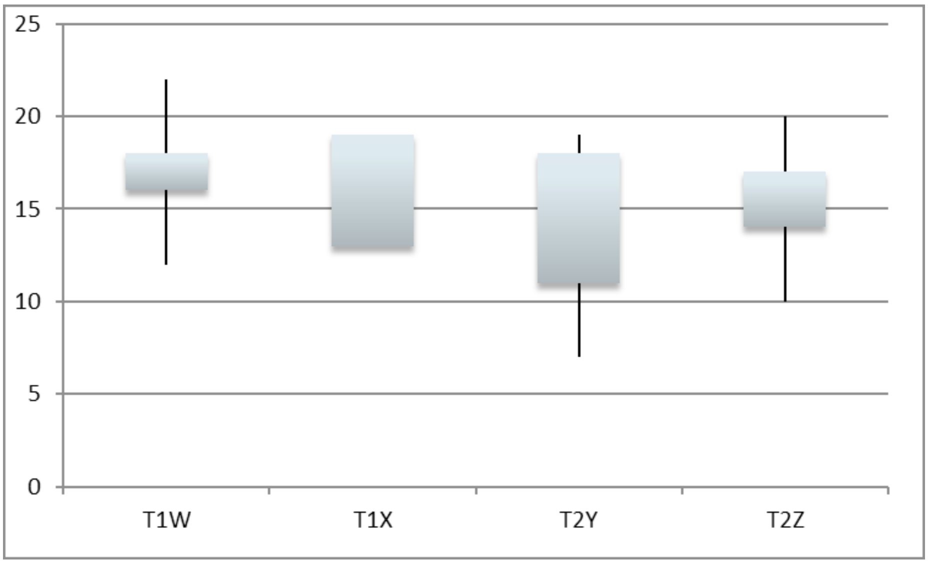


Figure 3

The indicators' severity of motivation for success of Taganrog Music College (Taganrog, Russia) students when working in small groups in the process of music learning



The observations of the expert teacher in each group confirm the research results.

Discussion

Research in the psychology and education sciences has shown that small group learning (compared to competitive and individual learning) improves academic performance, relationships with other students in the group and teachers, and contributes to the psychological well-being of each group member. The following is a summary of these benefits based on a meta-analysis of small group learning (Davidson et al., 2014).

Academic benefits: Compared to competitive and individual learning, students are better at problem solving and better understanding of the material when working in small groups. Regardless of the subject, students learn more and retain learning material longer when learning in small groups than when presented with content in other teaching methods. Attendance, performance and perseverance are improved.

Social benefits: Students develop social and leadership skills, such as learning how to communicate with other people who dominate the group and making sure all members contribute their efforts. Students who process information and work together on a problem in groups are also more likely to keep learning and are more likely to integrate into diverse ethnic, cultural, linguistic, class, creative, and gender groups successfully.

Psychological benefits: teaching in small groups helps to draw attention to those students who usually do not like to answer in front of the whole class. It also contributes to increased self-esteem, compared to competitive or individual training.

The effectiveness of small group learning and teaching is evidenced by its long history, and it remains a key method of teaching and learning in modern educational environment.

The benefits of learning and teaching in small groups can be classified according to the following criteria:

– Learning in small groups corresponds with modern educational theory because education is best when studying is an active rather than a passive process.
– Group participation allows students to test and refine their understanding of concepts, test hypotheses, evaluate ideas, and consider possible outcomes (Crosby, 1996).
– For individual members of small groups there is more likely to identify what they do not know, clarify what they do not understand and correct during education process (Exley & Dennick, 2004). This great opportunity arises because it is often difficult for a student working in isolation to comprehend what he or she does not understand.
– Members of small groups have better control over their learning activities, have more opportunities to self-manage their individual learning, and are also inclined to develop the skills of introspection and self-discipline necessary for lifelong learning (Glaser, 1991).
– Studying in small groups gives students the opportunity to work collegially and acquire the social skills necessary for their future profession. These skills include prioritizing selected tasks, teamwork, time management, establishing and maintaining professional interpersonal relationships, communicating effectively, developing leadership skills, monitoring group dynamics, and building self-confidence through the need to express and defending ideas (Reynolds, 1994).
– Working in small groups promotes self-motivation through active participation and greater satisfaction with learning, as well as the application of many principles of independent learning.

– Learning in small groups promotes deeper, more thoughtful, rather than superficial learning. Deep learning leads to long-term changes, more developed cognitive abilities and a deeper understanding of the subject of study; superficial learning tends to be limited and short-lived.

Conclusions

The research results of the psychological characteristics' study and the motivational behavior of students when working in small groups in the process of teaching music are presented. Based on the results of the empirical study, it can be concluded that in China, working in small groups is better organized, students are highly motivated, actively participate in the learning process; the level of social laziness is low, but they need attention and social support from the teacher, other students and their parents.

In Russia, studying in small groups is not so well organized, therefore, socio-psychological contradictions and social laziness are higher, and the motivation to achieve success is lower. The organization of training in small groups allows you to structure the work on mastering the educational content, correcting errors and discussing the results. The use of group learning strategies has been proven to promote a lifelong learning experience that is effective in developing social interaction skills and can be recommended to improve student learning, memorization and retention of learning materials by students, as well as to increase academic performance and improve attitudes towards teamwork.

The use of structural modeling methods has shown that the development of conscious self-regulation makes a significant contribution to the enthusiasm for work and prevents the appearance of specialists' professional deformations. At the same time, regulatory flexibility and reliability are of great importance. These personal-regulatory resources not only directly affect professional well-being, but are also mediators of the influence of cognitive-regulatory resources on it, such as goal planning, modeling of significant conditions, action programming, and results' evaluation.

Education in small groups demonstrates broad prospects for a resource approach to the consideration of conscious self-regulation to study the problems of human well-being in various environments, including the inevitably increasing anthropogenic pressure on the environment, which exacerbates the need to develop subjectivity and awareness of human being in order to maintain its activity and realize the need in activity, communication and self-realization in life in general.

The materials obtained as a result of our empirical research can be used to build and refine a program for studying various subjects in small groups, to develop a learning strategy, to develop the motivational sphere for students and the development of social interaction skills.

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E. L. Makarova organized the empirical research, analyzed and interpreted the obtained empirical data, designed and edited the manuscript of the article.

B. V. Denisov collected the empirical data of the research, analyzed and interpreted the obtained empirical data, contributed to the manuscript of the article, worked with resources.

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Designing the Educational Environment of the University for the Development of Entrepreneurial Skills of Students

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Abstract: **Introduction**. One of the university's educational environment priorities is the formation of students' skills related to the ability of professional development in conditions of socio-economic uncertainty. Entrepreneurial skills can significantly increase the value of students of all specialities in the labor market and the effectiveness of their professional activities. The purpose of the study is to design the university's educational environment for the development of students' entrepreneurial skills development on the example of Sevastopol State University (SevSU). **Methods**. Based on the methods of systematization and classification of domestic and foreign experience of entrepreneurial education in universities, the principles of design thinking (using focus groups) and visualization were used to design the educational environment. Assessment of students' entrepreneurial preferences was carried out by a survey of 821 SevSU students of various specializations, followed by a frequency semantic analysis of responses. **Results**. A model of the educational environment for students' entrepreneurial skills development has been made with the designation of target results and the recommended composition of the necessary organizational and pedagogical conditions. Entrepreneurial preferences were revealed in 29.4 % of the students, regardless of their professional specialization. **Discussion**. The theoretical aspect of the performed research novelty lies in the concretization of the students' entrepreneurial skills as a form of their personal and environmental professional interaction factor. In the applied aspect, the author's model of the educational environment for the development of students' entrepreneurial skills has been developed, which is ready for adaptation and use in the universities to design organizational and pedagogical infrastructure for teaching students regardless of their professional specialization. The main stages of designing the educational environment are identifying the key experiences of students using the principles of design thinking; determining the target results of mastering the entrepreneurial track with modelling the composition of the necessary organizational and pedagogical conditions of the educational environment; identification and research of the contingent of various specialities students interested in the development of entrepreneurial skills.

Keywords: entrepreneurial skills, educational environment, environment design, personal development, professional development, organizational and pedagogical conditions, design thinking, personal and environmental interaction, entrepreneurial education, educational track

Highlights:

- Students' entrepreneurial skills, regardless of their professional specialization, increase their competitiveness in the labour market in conditions of socio-economic uncertainty.
- The design of the educational environment of the university for the development of entrepreneurial education can be carried out using the approach of design thinking.
- About a third of all students can effectively develop entrepreneurial skills in the university educational environment.

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Introduction

Modern society is at the stage of renewal, the review of principles, development priorities, and the search for new models and tools to improve the effectiveness of existing social processes. One of the main areas of improvement of such processes is the formation of conditions for cooperation, partnership, and cooperation of organizations and people (Worsley et al., 2021). The university, as one of the mandatory participants in the socio-economic development of society, creates an environment for students to establish reliable and, at the same time, flexible links of joint productive activities (Klemeshev et al., 2019).

Studies of foreign and Russian experiences of cooperation between universities, business, and government institutions demonstrate several advantages: activation of the introduction of innovative technologies in the activities of organizations; improvement of the quality of satisfaction of labour market demands; increasing students' interest in professional development; providing conditions for maintaining a high level of professionalism of lifelong learning (Shabaeva & Kekkonen, 2017).

This position is shown in the third mission of universities, which positions the university as a powerful driver of socio-economic development in the region through active participation in the formation of the main characteristics of human capital (Compagnucci & Spigarelli, 2020). For its implementation, each university chooses its path, considering the peculiarities of the external and internal environment, including the socio-cultural context (Shishlova, 2021). But the general directions of the programs are most often: continuous/continuing education; participation in the life of society through the upbringing of socially responsible youth; technology transfer and innovation development for the region through the formation of an ecoenvironment of entrepreneurship, support for youth technological entrepreneurial initiative (Kudryashova & Sorokin, 2020).

Effective activity in conditions of uncertainty requires the development of skills related to the ability to quickly and efficiently organize activities to achieve the desired results, analytics and multi-scenario forecasting when carrying out activities with a high risk of failure (Makhmutova, 2021a; Kleimola & Leppisaari, 2022). A set of such skills can be formed in professional educational institutions due to the choice and implementation of an entrepreneurial model of students' education. The need for universities to master the concept of "University 3.0" determines the objective need for entrepreneurial skills formation among all participants in the educational process (Voronina et al., 2021, Abdrakhmanova & Litvinova, 2020).

Entrepreneurial education is growing in steam every year (Zobnina et al., 2019). The conditional start of an active discussion of methodology, concepts, and technologies in this matter can be associated with 2008 when at the World Economic Forum, an educational initiative for training entrepreneurs was announced as one of the significant components of ensuring sustainable social development and economic recovery (Tranchet & Rienstra, 2009). The main approaches for the formation of entrepreneurial skills are the development of leadership skills and possession of personal development tools, the use of the cross-disciplinary principle of mastering the basics of entrepreneurship, and the use of modern psychological, pedagogical, and digital technologies. Several Western studies confirm the practicability of targeted entrepreneurial education not only for students becoming business owners, but also for the formation of personal and business qualities of students for successful professional implementation in various fields. The problem of employment of graduates of educational institutions is considered in connection with teaching flexible skills of independent decision-making, active creative thinking, personal responsibility for one's choice (Hardie et al., 2020), teamwork, objective assessment of the labour contribution of each of the participants, a constant search for opportunities to implement tasks in conditions of high uncertainty, self-reflection in the case of successful or negative experience for improving activities at subsequent stages, generating and testing new business ideas (Penaluna, 2018). In this regard, the importance of entrepreneurial education is emphasized.

In the Russian Federation, entrepreneurial education issues are of high relevance today. According to experts Sorokin et al. (2020) and other researchers, several conditions can ensure an increase in the effectiveness of entrepreneurial education:

1) The importance of a teacher's experience in entrepreneurship, consulting, and training to help students master the course and advance on the project (market analysis, generating ideas, drawing up a portrait of a consumer, etc.) (Klarin, 2019).

2) The presence of business contacts with the external environment (companies, laboratories, invited speakers) – business partners of the university.

3) Formation of infrastructure for student self-determination regarding the importance of mastering entrepreneurial skills (Lazareva & Kolycheva, 2020).

4) Emphasis on the applied nature of knowledge in combination with modern psychological and pedagogical approaches and methods (Makhmutova, 2021b; Klarin, 2018).

5) Designing and implementing a set of digital solutions for the educational environment that provide the opportunity for learning and access to materials in a convenient format (Cheung et al., 2021; Araka et al., 2022) can be used as a communication platform and implement an assisting function of support and decision-making support on professional development issues students (Chuganskaya, 2020).

It is also worth noting that a high level of importance for the effective development of entrepreneurial skills has a factor associated with providing such educational conditions that allow maintaining a high level of student participation throughout the study time (Korchagina et al., 2017). The study of emotional aspects, expectations, and problematic issues that accompany students in professional and personal development at the university contributes to the design of a more comfortable educational environment. It is possible to use a design thinking approach to solve such a problem. Foreign and domestic authors confirm the effectiveness of using this approach in teaching students (Panke, 2019; Buzhinskaya & Vaseva, 2021; Fazylzyanova et al., 2020).

Thus, in the field of scientific research, there is a great interest in the issues of entrepreneurial education. However, there is no clear understanding of the related problems, such as requirements for the necessary educational infrastructure, the composition and structure of the educational program for teaching entrepreneurship, the methodology for assessing the intermediate and final effectiveness of the educational process, the level of formation of entrepreneurial skills of students, etc.

The purpose of our study is to consider the main issues of designing the university educational environment for the formation and development of students' entrepreneurial skills from the organizational and pedagogical conditions point of view.

Methods

Based on Russian and foreign scientific sources, various approaches and experiences in the implementation of entrepreneurial education in universities were systematized and classified. The principles of design thinking methodology and visualization of key elements were used to design an entrepreneurial educational environment. The study of the motives, requests and expectations of students from entrepreneurial education was carried out by the method of focus groups: 2 groups of 15 people – students of Sevastopol State University (SevSU) of the second and fourth courses, various specializations (7 areas of study). The evaluation of the effectiveness of the application of the tool to identify entrepreneurial preferences was carried out by a survey of 821 SevSU students of various specializations (21 areas of study), followed by a frequency semantic analysis of the responses.

Results

Currently, a new model of the educational process is being introduced at SevSU "2 + 2 + 2", which assumes a certain choice of professional development trajectories upon completion of the 2nd and 4th courses.

After the second year, each student of any speciality must determine the priority direction of the three proposed tracks.

– Research related to the implementation of scientific activities in parallel with the development of the main specialization of training.

– Professional, providing opportunities to strengthen specialization through the development of innovative skills of the future (FutureSkills).

– Entrepreneurial – for those students who see a high potential for the development of their entrepreneurial skills in parallel with the development of a bachelor's degree program in the main field of study.

The next decision points for students come after the end of the 4th year of a bachelor's degree in connection with admission to the master's program and after its completion, with possible entrance to doctoral school.

When designing an educational environment for the implementation of such a model, it is proposed to use the principles of design thinking aimed at studying the needs of infrastructure users. Based on the identified requests, emotions, and experiences of the student during the entire time of study during the development of the bachelor's degree program, it is possible to design organizational and pedagogical elements of the educational environment, which allow for increasing the overall effectiveness of the process by increasing the level of student involvement (Belan, 2020).

According to the classical design thinking methodology (Liedtka & Ogilvie, 2011), in the first stage, it is necessary to study the problems of users and understand their true feelings and motivation. The second stage is related to focusing – determining the priority range of tasks. The third stage aims at developing options for appropriate solutions. The fourth stage involves designing a prototype (model) of the object, considering the identified needs and priorities. The final stage includes testing the generated design solution to develop a strategy for further work with it.

In connection with the purpose of the study, the interests of students who chose an entrepreneurial educational path were identified with the help of focus groups and analyzed. Typical emotional experiences and requests for each period of students' education were identified, and tasks of student support have formed that echo their needs and contribute to the conscious identification of priorities for further professional development (Makhmutova & Litvinova, 2021). Considering the data obtained, the main tasks of supporting students in the process of implementing an entrepreneurial educational track for each course of study are the following:

– In the 1st year: support in adaptation and self-determination of students; ensuring understanding of the essence of the entrepreneurial track; testing of entrepreneurial potential.

– In the 2nd year: identification of personal interests and development opportunities; ensuring the possibility of obtaining the first experience in solving entrepreneurial tasks; organization of the exchange of experience in the development of entrepreneurial skills.

– In the 3rd year: organization of conditions for gaining experience in the application of entrepreneurial skills; ensuring work in project teams; expert advice to students on entrepreneurship; assessment of personal progress in the development of skills.

– In the 4th year: facilitation of the process of generating ideas for entrepreneurial projects; support for the development, development and launch of projects; evaluation of the effectiveness of the development of entrepreneurial skills.

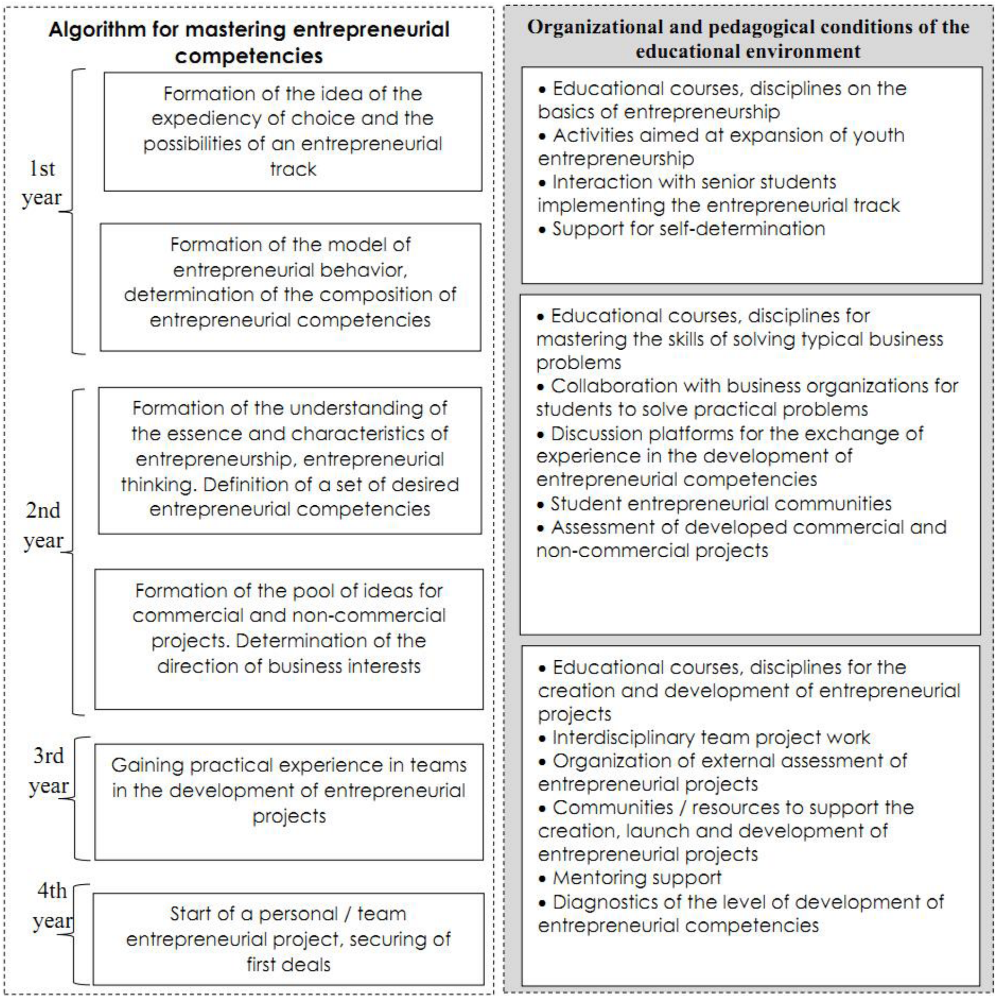
The designated tasks served as the basis for the creation of an algorithm for mastering entrepreneurial skills by students in the university educational environment and determining the expanded composition of the corresponding organizational and pedagogical conditions. Thus, a model of the educational environment has been obtained, which can serve as a basis for further refinement, approbation, and testing to assess the effectiveness of the implementation of the task set (Fig. 1).

Having mastered all the stages of the entrepreneurial track, a student, in addition to a bachelor's degree in the main speciality, can form/develop the desired set of entrepreneurial skills; create a contact base for interaction with the business community; develop and launch his entrepreneurial project.

The further design of the educational environment for the development of entrepreneurial skills development involves the next level of decomposition of the central elements, considering the characteristics of the potential contingent. In this regard, the identification task is to find those from the total number of students interested in developing entrepreneurial skills development. The most common tools for solving this problem are questionnaires that include a list of questions about certain characteristics of entrepreneurial activity (Mishurova, 2020; Ostrovskii, 2021; Pozdeeva & Nazarova, 2020; Tverdovskaya & Gnezdilov, 2022).

Figure 1

The model of the university educational environment for the development of entrepreneurial competencies from the organizational and pedagogical conditions point of view



To predict the flow of students on the proposed tracks at Sevastopol State University, the survey was conducted. An assumption was made about the uneven distribution of students' interests in the following proportion: entrepreneurship (20 %), scientific activity (10 %), and professional activity (70 %).

To identify students interested in entrepreneurship, the following open-ended statements were included in the questionnaire:

Question 1. "Describe in 2 to 3 sentences how you understand the phrase 'entrepreneurial behavior model'".

Question 2. "Describe in 2 to 3 sentences what opportunities you see for the development of entrepreneurial competencies at the university".

Question 3. "In what area would you like to implement your own business project?"

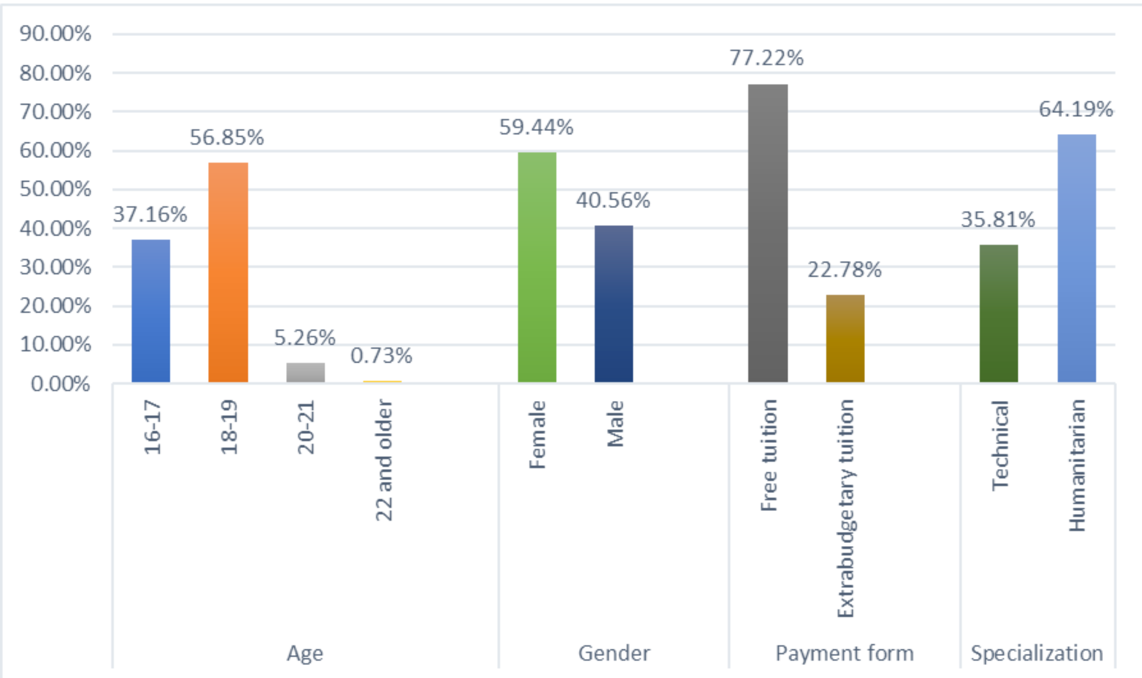
Question 4. "What entrepreneurs do you know (indicate the field of activity)?"

Question 5. "How do you feel about risks?"

The questionnaire was offered to first-year students from Sevastopol State University in the second half of the first semester of study as part of the discipline "Technologies of Personal Development". The answers were received from 821 respondents and were distributed in various proportions according to the criteria of age, gender, form of tuition fees, specialization (Fig. 2).

Figure 2

Composite portrait of students who participated in the survey



In *the first stage* of processing the obtained data, semantic analysis was conducted to determine the students' comprehensive understanding of the entrepreneurial behavior model. For Question 1, the following words are most often mentioned in the answers: 'risk' (77 answers), 'skill' (59), 'goal' (57), 'profit' (52), 'solution' (45), 'business' (42), 'benefit' (41), and so on. Among the most frequent two-word phrases, they are defined: 'making a profit' (19), 'leadership qualities' (11), 'goal achievement' (8), 'degree of risk' (7).

In response to Question 2, most students (83 %) identify the following elements of the educational environment: 'project' (76 answers), 'activity' (68), 'business' (67), and so on. It is positive that students have a clear understanding of the possibility of implementing project activities. However, the students turned out to be poorly informed about other means.

In the answers to Question 3, the list of preferred types of business for students ended up being quite wide. A chosen field more often corresponded to the specialty of study: information technology, psychology, educational services, design, food services, and so on.

In the answers to Question 4, among the well-known entrepreneurs mentioned by the students, the leaders were: Pavel Durov (107 answers), Elon Musk (73), Mark Zuckerberg (62), Aleksandr Ozhelsky (37), Fedor Ovchinnikov (20), Kirill Rodin (19), Anastasia Faizulenova (16), and others.

In response to Question 5, 8.9 % of the students showed a negative attitude towards risk and 91.1 % of the respondents understood that this factor is the mandatory characteristic of the activity.

The information obtained allows the preparation of educational content in such a way that it more closely matches the interests of students, increasing their interest in relevant educational courses.

In *the second stage* of processing the received data, students who may be interested in the entrepreneurial track were identified, according to the following criteria: 1) have their own unique opinion regarding the entrepreneurial model of behavior; 2) see opportunities for the development of entrepreneurial abilities in the educational environment of the university; 3) know in which area they want to implement their business project; 4) can list two or more representatives of the business environment with an indication of the field of activity; 5) risks are treated positively or neutrally.

The data obtained showed that 241 respondents correspond to established conditions, which is 29.4 %, of which 69 % are female, 31 % are male; 77 % are humanitarian specialties (of which 59 % are students of economic specialties), 85.7 % aged 16–18 years.

Therefore, about 30 % of students from various fields of study are interested in developing entrepreneurial competencies (in relation to the research track – 6.7 % of preferences; in relation to the professional track – 63.9 %).

Discussion

The novelty of the study has both theoretical and applied components. In theoretical terms, we have specified the factor of "personal-environmental interaction in the context of the personal-professional development of university youth" (Atamanova et al, 2021, p. 33). Such a factor is the entrepreneurial competence of students, regardless of their professional specializations. Solving the problem of personal-environmental interaction of university youth on the example of Sevastopol State University involves the identification of students by educational tracks. It helps to work purposefully with an interested audience and increase the efficiency of using resources (personnel, information, and so on). A separate task is to form the image of a student who has chosen and implemented an entrepreneurial track, in terms of a set of relevant competencies.

The main directions for the development of a set of solutions for the design of the educational environment are issues related to: implementation of the model for the formation of a target profile of students' entrepreneurial competencies; clarification of criteria and methodology for assessing the effectiveness of means, tools, technologies used at all stages of the implementation of the entrepreneurial track; development of a set of related regulatory documentation for the implementation of the entrepreneurial track in the educational environment of a university; formation of a digital infrastructure of automated software tools for entrepreneurial education using technologies of assisting systems (Voronina et al., 2021).

The formation of an educational environment that provides conditions for entrepreneurial self-determination and gaining real experience in implementing the tasks of generating, developing, and implementing business projects is a current task of professional education. As a result of studying the issues of designing the educational environment of a university for the development of entrepreneurial competencies, the following conclusions can be drawn:

– Identify the main stages in the development of the desired set of entrepreneurial competencies by students, specify the target results, modeling the composition of the necessary organizational and pedagogical tools.

– Use the principles of design thinking to identify the key experiences of students and determine the tasks of mastering the entrepreneurial track.

– Conduct special surveys to form recommendations for identifying and routing students within educational tracks and adjusting the current educational process.

The design of the educational environment of a university should focus on scaling up successful practices aimed at developing the personality and innovative competencies of students (Buravleva & Bogomaz, 2020), to which entrepreneurial competencies can be fully attributed.

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E. N. Makhmutova defined the conceptual foundations of the study, conducted methodological verification of the study, formed the review part, edited the text of the article.

R. N. Voronina formed the review part, collected empirical data, analyzed and interpreted the

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Socio-Psychological Factors and Characteristics of the Subjective Experience of Loneliness in the Student's Age

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Abstract: **Introduction**. The article analyzes a multidimensional subjective construct in terms of types and content, the experience of loneliness among university students. The idea of the loneliness dual nature as both a negative state, a resource that actualizes the social connections of the subjects, and a need-based state aimed at self-knowledge is expanded. The composition of the loneliness components, represented by three orthogonal factors, is determined. It is noted that the specifics of the experience of loneliness and the factors determining it will affect the effectiveness of educational activities and adaptation, leading to the devaluation of tasks or self-development and self-improvement of the student. **Methods**. The following methods were used: "The UCLA Loneliness Scale" by D. Russell and M. Ferguson; "Multidimensional Inventory of Loneliness Experience (MILE)" by E. N. Osin, D. A. Leont'ev; "The anxiety self–assessment test" by C. D. Spielberger – Y. L. Khanin; "Zung Self-Rating Depression Scale, (SDS)"; questionnaire by G. R. Shagivaleeva, "Diagnosis of communicative and organizational aptitudes" (COA-I); the methodology "Coping Inventory for Stressful Situations" (CISS) (authors – S. Norman, D. F. Endler, D. A. James, M. I. Parker). The study design assumed the determination of integral loneliness factors (factor analysis), followed by a z-score calculation for each respondent and the influence of additional factors identification. Using the Mann–Whitney U test and the x^2 test, the difference in loneliness experience was revealed depending on sex, nationality, and place of residence. **Results and Discussion**. Factor analysis allowed us to identify the component composition of loneliness, represented by three integral variables: depressive experience of loneliness, positive experience of loneliness, and experience of loneliness in interpersonal relationships. The content of each type of loneliness experience and its socio-psychological determinants are found. Among the personal factors of experiencing loneliness, trait anxiety, depression, and perfectionism, coping strategies are highlighted. Significant factors of socio-psychological nature were gender, place of primary residence, and nationality. The dual nature of the experience of loneliness is confirmed.

Keywords: subjective loneliness, loneliness experience, personality traits, coping strategies, perfectionism, gender, nationality, socio-psychological factors, experience characteristics, students

Highlights:

- Loneliness is perceived as a subjective construct, multidimensional in types and content, associated with the concepts of social isolation, alienation, social connectedness, and a sense of belonging, refracted through the specifics of its reflexive comprehension by a person.
- The experience of loneliness is ambivalent.
- Three types of loneliness experienced by students with the corresponding content of factors are identified: depressive loneliness experience, positive loneliness experience, and loneliness experience in interpersonal relationships.
- The determinants of the loneliness experience were personality traits (anxiety, depression, and perfectionism), leading coping strategies, gender, nationality, and the size of the primary residence settlement.

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Introduction

Structural processes that take place in various spheres of economy, politics, culture, education, and other spheres of modern society have led to a change in the current social situation. The new reality has determined the corresponding changes in the world views of today's man, associated with the transformations of personal identity, informatization, and globalization, leading to changes in the actual social reality, the specifics of human functioning. According to Andreeva (2011), the change in social reality has led to a «violation» of the processes of self-identification in the field of the social identity of the individual. There is an increase in anxiety, and depressive states, which, according to forecasts of Russian and foreign experts, will turn into the most common groups of diseases by the end of the XXI century (Boursier et al., 2020; Shmatova, 2021). In this light, the problem of subjective and objective loneliness of a person, which affects the specifics of perception of the surrounding world, his life, social behaviour, and adaptation to emerging reality, is becoming increasingly relevant (Puzanova, 2008; Rokach, 2018).

When analyzing the problem of the growth of subjective and objective feelings of loneliness, it is necessary to consider the variety of symptoms of this phenomenon, its factors, manifestations, and masking in complexes of other symptoms. The analysis of studies that consider the occurrence factors of the loneliness experience allows us to identify a complex of influences of a socio-psychological and personal nature. It is necessary to keep in mind that the experience of loneliness can be both a cause and a consequence of the deformations that occur at the individual and global levels. Therefore, deviant behaviour can be both a cause and a consequence of experiencing loneliness. They actively discuss the problems of loneliness in the context of suicidal behaviour, the prevalence of which in post-Soviet countries is of concern to specialists (Kolmakov, 2019). Other types of deviation are also associated with the pathological level of experiencing loneliness (Zadorozhnaya, 2005; Belobrykina & Limonchenko, 2017).

In the study of loneliness, we should pay special attention to young people who experience significant age-related transformations and perform several age-related tasks that force them to separate from their families to fulfil them. Such an increase in real loneliness in isolation from the family leads to an increase in the risks of a negative experience of loneliness. Again, the very experience of loneliness in adolescence is extremely ambivalent: on the one hand, it is a heavy and painful experience, a need that allows you to solve age-related problems.

Problem current state

Many philosophers and psychologists have studied the definition of 'loneliness' and identified the causes of its occurrence throughout the history of mankind, but there is still no common understanding.

Currently, there are several main approaches to the study of loneliness problems. Antonova (2010), Verbitskaya (2002), Pokrovskii & Ivanchenko (2008), Skorova (n.d.) and others consider loneliness through the inner world of a person, manifested in his style of thinking, attitudes, self-esteem and related to life experience. Authors such as Bikson & Peplo (1989), Detochenko (2014), and Kon (1996) considered the feeling of loneliness through experiences of insecurity, anxiety, and alienation resulting from the impact of social factors, including as a result of the transformation of social processes. Loneliness is often conceptualized as a subjective human experience that arises in response to general dissatisfaction with human relationships. However, many authors note the resource component of loneliness (Osin & Leont'ev, 2013; Petrash, 2021). Thus, loneliness is considered by us as a subjective construct, multidimensional in types and content, associated with the concepts of social isolation, alienation, social connectedness, and a sense of belonging, refracted through the specifics of its reflexive comprehension by a person.

Investigating the factors of the occurrence and experience of loneliness, we pay attention to the need to consider the complexity of the impact of the physical, psychological, and social parameters. Psychology offers many theoretical and empirical models where the factors of loneliness are the individual psychological and socio-psychological characteristics of a person experiencing a state of loneliness: an unsatisfied need for attachment (Konrath et al., 2014; Achterbergh et al., 2020), the discrepancy between desired and actual relationships (Matthews et al., 2019), a combination of personal characteristics (Smits et al., 2011), self-esteem (Twenge & Campbell, 2001), low level of development of communicative and organizational inclinations (Puzanova, 2008), features of motivation and others. Among the individual psychological characteristics associated with loneliness, Rubinstein and Shaver (1989) identified despair, depression, unbearable boredom, and self-deprecation. Similar components were identified in a study by Puzanova (2008). The need to avoid the negative effects of problematic loneliness involves the use of some coping behaviour strategies (coping strategy), which, according to Shagivaleeva (2007), can be both a consequence and a cause of problematic or positive loneliness.

As social causes of loneliness, Puzanova (2008) noted factors associated with the lack of real interaction, live, filled communication with friends, relatives, and spouses. Also mentioned were the specific circumstances of life that can cause this experience (experienced tragedies, betrayals, mistakes, bad luck, etc.). Perhaps a conscious desire to be in solitude, that is, to experience the virtues of positive loneliness.

Modern foreign researchers on loneliness note the need to consider cultural differences and influences when developing research because cultural and social norms certainly affect the nature, time and experience of experiencing loneliness (Rokach, 2018; Fokkema et al., 2012; McHugh Power et al., 2017).

Fokkema et al. (2012), using logistic models, explained the cross-cultural differences in loneliness experiences between European countries: in demographic characteristics, well-being, and health,

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as well as in social networks. Respondents in the countries of Southern and Central Europe, as a rule, were lonelier than their peers in the countries of Northern and Western Europe. In countries in Southern and Central Europe, loneliness was largely driven by the fact that respondents did not have spouses, as well as economic problems and poor health. Frequent contacts with parents and children, participation in public life, and support for family members were significant in preventing and alleviating loneliness in almost all countries. In another study (Schinka et al., 2012) aimed at studying loneliness in young people, the ethnicity factor did not show a significant influence, but it was revealed that loneliness is closely associated with suicidal ideas and suicidal behaviour.

Mund et al. (2020), analyzing the stability of loneliness throughout life, note that there is an ambiguous attitude to the issues of loneliness in different cultures. Depending on the place of the individual in the context of social development, the attitude toward loneliness can vary from considering it as a pathological phenomenon to elevation as a means of sacral transformation and the path of a mature personality (Lykes & Kemmelmeier, 2014).

Studies by Lasgaard et al. (2016) and Mund et al. (2020) suggest that loneliness is experienced most acutely in young, adolescence, and old age. The focus of this study is adolescence – a special stage in the individual development of personality. At the stage of adolescence, significant changes occur in the field of thinking, emotional perception of life, social contacts, and relationships, and a sense of one's uniqueness. There is a need to rethink interests and life values. All this affects the new perception of loneliness as an experience where anxiety about the real or imaginary absence of desirable social contacts is combined and, at the same time, there is a desire for solitude.

Thus, focusing on the negative characteristics of loneliness and the reasons that can lead to this experience, it is necessary to emphasize once again the ambiguity of the phenomenon and its positive potential, especially for young people. Most of the problems associated with loneliness are not rooted in itself, but in the attitude of the experiencing subject to it. In a negative aspect, loneliness can devalue the existing reality and the existing achievements and aggravate failures. At the same time, loneliness can give an additional incentive to inner activity, creative self-development, and self-improvement, which is necessary for successful adaptation to student life and conditions of university studies.

Thus, the purpose of this study was formulated, which is to identify socio-psychological factors and characteristics of experiencing loneliness by university students. Also, within the framework of the study, several assumptions were made about the influence of gender, nationality, and place of residence, where the student came to study the specifics of the experience of loneliness.

Methods

The study sample was made up of first-year students studying at universities in Novosibirsk (286 people). The composition of gender roles of the sample: male – 117 (40.9 %), female – 169 (59.1 %). The sample was differentiated by national composition, because one of the focuses of attention was nationality as a factor of experiencing loneliness. The national composition of the subjects: Russians – 124 (43.4 %), Kazakhs – 82 (28.7 %), Tatars – 26 (9.1 %), Turks – 22 (7.7 %), Uzbeks – 18 (6.3 %), Koreans – 14 (4.8 %). According to demographic characteristics, the main composition of city students is 224 (82.9 %), 62 participants come from rural areas (17.1 %). All the subjects who participated in the study were visitors from other cities and regions, so they lived in a hostel, rented apartments on their own or with friends, lived with relatives.

To conduct the study, a set of techniques was used: "The UCLA Loneliness Scale" by D. Russell and M. Ferguson (according to Raygorodsky, 2011); "Multidimensional Inventory of Loneliness Experience (MILE)" (Osin & Leontiev, 2013); "The anxiety self–assessment test" by C. D. Spielberger, Y. L. Khanin (according to Raygorodsky, 2011); "Zung Self-Rating Depression Scale, (SDS)" (according to Raigorodsky, 2011); questionnaire of G. R. Shagivaleeva (Shagivaleeva, 2013); "Diagnosis of communicative and organizational aptitudes" (COA-I); methodology "Coping Inventory for Stressful Situations" (CISS) (authors – S. Norman, D. F. Endler, D. A. James, M. I. Parker, according to Vodopyanova, 2009).

The design of the study assumed the determination of loneliness factors throughout the empirical sample (factor analysis), followed by the calculation of a z-score for each respondent, and at the next stage – the identification of the influence of additional factors that meaningfully fill the selected loneliness factors. The difference in the experience of loneliness depending on parameters such as sex, nationality, place of residence was tested using the Mann–Whitney U criterion for two independent samples and the x^2 criteria for several independent samples.

Results and Discussion

A factor analysis using the principal components method with "varimax normalized" rotation was carried out on a general sample of respondents to isolate the factor components of loneliness (integral indicators). As a result, five components were identified that explain more than 63 % of the total variance (Table 1).

Table 1

Factor analysis of the severity of integral factors of experiencing loneliness in a general sample of respondents

Variables	Factors				
	The depressive experience of loneliness	The positive experience of loneliness	The experiencing loneliness in interpersonal relationships	Desired loneliness	Avoidance of loneliness
Isolation	**0.735**	0.327	–0.242	0.071	–0.11
Self-sentiment	**0.753**	0.319	–0.125	0.034	–0.1
Alionation	**0.611**	0.398	–0.175	–0.195	0.158
Dysphoria	**0.575**	–0.478	0.096	0.007	0.156
General loneliness	**0.843**	0.462	–0.218	–0.038	0.003

Variables	Factors				
	The depressive experience of loneliness	The positive experience of loneliness	The experiencing loneliness in interpersonal relationships	Desired loneliness	Avoidance of loneliness
Positive loneliness	–0.294	**0.792**	0.456	–0.07	0.095
The joy of solitude	–0.128	**0.75**	0.334	–0.203	0.188
Seclusion resource	–0.369	**0.627**	0.41	0.08	–0.073
Communication addiction	0.484	–0.422	**0.673**	0.055	0.05
Problematic loneliness	0.428	–0.036	**0.751**	0.039	–0.078
The need for a company	0.341	–0.413	**0.628**	0.048	0.068
Desire of loneliness	0.194	0.308	–0.141	**0.758**	–0.065
Considers themself lonely	0.042	0.058	–0.001	**0.614**	0.476
Avoidance of loneliness	–0.104	–0.081	–0.137	–0.121	**0.836**

The characteristics of the variables of the selected factors determined their name. So, *the first factor*, called by us 'depressive experience of loneliness', included variables of the negative experience of loneliness with pronounced manifestations of dysphoria (0.575), alienation (0.611) and isolation (0.735). Negative and painful perceptions of loneliness (0.843), characteristic of the depressive type, avoiding interaction with others in the presence of such a need, provoke the creation of a stable image of a lonely person concerning themself (0.753). The variables included in the first factor of loneliness are probably related to withdrawal and avoidance of contact. Such isolation reveals a desire to avoid disappointment, which causes depressive feelings.

The second factor, which we called 'positive experience of loneliness', includes variables associated with a positive perception of loneliness (0.792), the joy of solitude (0.75) and the resourcefulness of loneliness (0.627). This attitude to loneliness reflects a voluntary refusal to communicate with the fixation of the subject on the inner world, from which he receives pleasure and relief from the opportunity to focus on his own experiences.

The third factor of experiencing loneliness, called by us 'experiencing loneliness in interpersonal relationships', includes the scale of experiencing loneliness as a problem (0.751), which is due to difficulties in interpersonal relationships. This factor with high loads includes variables such as the dependence on communication (0.673) and the need for a company (0.628). It suggests that students with high loads on the third factor feel the need for relationships with people around them, but at the moment they are experiencing a violation in the system of established connections. *The fourth factor*, called 'desired loneliness', includes indicators on the scales of desire for loneliness (0.614) and self-esteem as a lonely person (0.758). *The fifth factor* includes the loneliness avoidance parameter (0.836).

Analysis of the results using the Kolmogorov–Smirnov test allows us to state that the normal distribution was obtained according to three selected integral indicators. Therefore, it leads to the need to exclude the factors 'desired loneliness' and 'avoidance of loneliness' from further calculation ($p < 0.05$).

Following the design of the study, new values (z-scores) were calculated for each respondent according to integral factors: factor 1 is the depressive experience of loneliness; factor 2 is the positive experience of loneliness; factor 3 is the experience of loneliness obtained in interpersonal relationships.

The analysis of the content of the integral loneliness indicators was carried out using variance analysis with the selection of effects at a significance level $p < 0.050$ (Table 2), or using the Student's t-test, depending on the type of data. The logical sequence to determine the calculations and apply the type of analysis was selected based on the recommendations for mathematical analysis by Perevozkina and Perevozkin (2014).

Table 2

The variance analysis for the factors of experiencing loneliness by students by additional factors of influence

	State anxiety scale				Trait anxiety scale				Zung self-rating depression scale			
	Leven		ANOVA		Leven		ANOVA		Leven		ANOVA	
	F	p	F	p	F	P	F	P	F	p	F	p
Factor 1	1.36	0.24	**3.15**	**0.016**	0.74	0.51	**3.38**	**0.037**	1.16	0.33	**5.69**	**0.005**
Factor 2	1.40	0.22	1.43	0.223	0.68	0.49	0.47	0.619	0.37	0.69	1.23	0.296
Factor 3	1.26	0.27	0.59	0.555	1.13	0.35	0.01	0.988	1.22	0.31	2.16	0.08
	Problem-focused coping (PFC)				Emotion-focused coping (EFC)				Avoidance coping (AC)			
	Leven		ANOVA		Leven		ANOVA		Leven		ANOVA	
	F	p	F	p	F	P	F	P	F	p	F	p
Factor 1	1.12	0.33	0.00	0.998	0.73	0.46	**4.97**	**0.004**	1.87	0.13	**3.80**	**0.006**
Factor 2	0.74	0.53	**3.38**	**0.037**	3.72	0.06	3.06	0.08	1.46	0.24	**3.39**	**0.011**
Factor 3	0.72	0.47	0.46	0.613	3.96	0.07	1.49	0.22	1.34	0.22	0.82	0.518

	Subscale "deflection"				Subscale "social deflection"				General coping			
	Leven		ANOVA		Leven		ANOVA		Leven		ANOVA	
	F	p	F	p	F	P	F	P	F	p	F	p
Factor 1	1.38	0.26	**3.14**	**0.018**	0.13	0.89	0.48	0.628	2.62	0.06	**3.83**	**0.013**
Factor 2	1.16	0.31	**5.69**	**0.003**	0.82	0.48	**2.34**	**0.046**	0.32	0.842	**3.92**	**0.011**
Factor 3	1.20	0.30	1.19	0.330	1.11	0.36	2.19	0.091	1.27	0.31	2.28	0.08
	Perfectionism scale				Socially prescribed perfectionism				Perfectionism integral scale			
	Leven		ANOVA		Leven		ANOVA		Leven		ANOVA	
	F	p	F	p	F	P	F	P	F	p	F	p
Factor 1	1.12	0.32	1.53	0.176	2.11	0.08	**2.51**	**0.034**	2.08	0.09	0.51	0.76
Factor 2	0.08	0.96	1.40	0.221	0.56	0.58	0.28	0.756	2.51	0.06	1.83	0.15
Factor 3	2.03	0.05	**3.22**	**0.028**	1.07	0.40	0.16	0.873	0.04	0.976	**9.20**	**0.001**

Significant effects at p < 0.05000 were noted.

The influence of the dichotomous variable "are there people in the environment with whom you feel at ease?" studied using the Student's t-test. There is a significant difference in the sample for factor 3 'the experience of loneliness obtained in interpersonal relationships' (p = 0.027).

The analysis of additional variables allows us to highlight the following content of the types of experiences of loneliness selected by students. *Factor 1 'the depressive experience of loneliness'* is substantively determined by the following parameters: 'state anxiety scale', 'trait anxiety scale', 'Zung self-rating depression scale', 'emotion-focused coping (EFC)', 'avoidance coping (AC)', subscale 'deflection', 'general coping', 'socially prescribed perfectionism'. This allows us to conclude that the depressive type of experiencing loneliness is characteristic of students with a high level of trait and state anxiety. Anxiety may possibly be actualized by social changes associated with the need to move to study at a university, isolation from family and friends. Furthermore, this experience is characterized by a high level of depression. The leading coping strategies for the depressive type of experiencing loneliness are emotion-focused coping, which includes strategies for avoiding a problem, escaping into fantasies, or some actions that allow one to experience (to live) an affect, distract oneself from negative emotions, or involve others in one's experiences. In this case, an individual does not take specific actions to solve their problem. The problem is worsening by the presence of a scale of socially prescribed perfectionism, which characterizes the subjects as believing that society imposes unrealistically high demands and expectations on them.

Factor 2 'the positive experience of loneliness' is content-wise determined by the following parameters: 'problem-focused coping (PFC)', 'avoidance coping (AC)', subscale 'deflection', subscale

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'social deflection', 'general coping'. Therefore, the leading coping strategies with the positive experience of loneliness and the ability to find resources in it are the ability to focus efforts on solving emerging problems. However, subjects may also be characterized by strategies such as distraction from the problem, self-realization in social interactions, and various forms of social activity. For example, such students begin to study more passionately, join circles and student clubs, and live the scientific life of a university.

Factor 3 'the experiencing of loneliness in interpersonal relationships' is content-wise determined by the following parameters: 'perfectionism scale', 'perfectionism integral scale', and the dichotomous variable 'are there people in the environment with whom you feel at ease?'. The experience of loneliness obtained in interpersonal relationships is associated with extremely high demands on oneself and others, which prevent the formation of new connections at a university, causing interpersonal tension.

Therefore, we have identified three types of student experience of loneliness with the corresponding content of factors. The determinants of the loneliness experience were personality traits (anxiety, depressiveness, and perfectionism), leading coping strategies, the social situation of isolation from the family for learning purposes.

Furthermore, the task was to identify the loneliness characteristics that depend on the following parameters: sex, nationality, and the size of the primary residence settlement. To identify differences in experience according to these parameters, the Mann–Whitney U test for two independent samples and the x^2 test for several independent samples were used.

The study of the difference in the experience of loneliness depending on the sex was carried out using the Mann–Whitney U test. Data are presented in Table 3.

Table 3

Differences in the experience of loneliness depending on the sex of the respondents

	Need for company	The joy of solitude	Seclusion resource	Communication addiction	Positive loneliness	State anxiety scale	How much time do you spend among people?	Are you trying to avoid loneliness?	Perfectionism integral scale
The Mann–Whitney U test	5336	6080	5336	5700	5658	6052	6412	5806	6014
Z	–3.535	–2.159	–3.523	–2.846	–2.927	–2.2	–3.408	–3.132	–2.267
Asymptotic significance (2-sided)	0	0.031	0	0.004	0.003	0.028	0.001	0.002	0.023

Analysis of the data obtained allows us to draw conclusions about the following differences in the experience of loneliness. Females are significantly more likely to feel the need for company and tend to spend more time among people. They show significantly higher data on the scale of trait anxiety and the perfectionism integral scale. However, the joy of solitude and the seclusion resource and the assessment of solitude as positive are also significantly more likely to be experienced by them. For males, the desire to avoid loneliness is significantly more often characteristic. The data obtained show the dual nature of loneliness. On the one hand, girls consider the possibility of loneliness as positive. On the other hand, when immersed in loneliness, despite anxiety and perfectionism, they feel the need for interpersonal interaction.

Comparison of groups in terms of the parameter 'national affiliation' was carried out using the x^2 test. Significant differences are presented in Table 4. The study involved six ethnic groups (Russians – 124, Kazakhs – 82, Tatars – 26, Turks – 22, Uzbeks – 18, Koreans – 14). However, due to the small number of four of them, the main comparison took place among two large ethnic groups – Russians and Kazakhs.

Table 4

Differences in the experience of loneliness depending on nationality

	Self-sentiment	Alienation	Dysphoria	The joy of solitude	General experience of loneliness	State anxiety
Chi-square	16.393	19.804	11.256	12.905	18.08	13.369
Asymptotic significance	0.006	0.001	0.047	0.024	0.003	0.02

	Zung self-rating depression scale	How much time do you spend among people?	Are there people in the environment with whom you feel at ease?	Do you consider yourself lonely?	Do you try to avoid loneliness?	Organizational inclinations assessment scale	Other-oriented perfectionism
Chi-square	15.197	13.596	13.592	13.833	26.509	13.107	16.998
Asymptotic significance	0.01	0.018	0.018	0.017	0	0.022	0.005

The data obtained allow us to conclude that there are a number of significant differences according to the scales presented in the table, which are of a probabilistic nature. Generalizing the results obtained, one can note that the subjects of Uzbek nationality experienced the maximum difficulties in adapting to a university. They expressed feelings of loneliness, assessed as negative, which can be explained both by the difference in cultures and by the low level of Russian language proficiency. The subjects of this group tend to experience loneliness in interpersonal relationships, which is confirmed by tension in communication and the desire for isolation.

Probably, the positive experience of loneliness is the most often characteristic of Korean nationality subjects. On the one hand, they value loneliness as an opportunity to turn to the inner world. On the other hand, when experiencing loneliness in the adaptation period, they are included in various forms of social activity. Likewise, the positive perception of loneliness is typical for students of Tatar nationality. The pronounced feelings of isolation and alienation in this case are rather associated with separation from home, the loss of direct family support. It should be noted that students in this group need to communicate and demonstrate attitudes that aim to accept others and seek support. Students of Tatar nationality also tend to experience the joy of solitude. The subjects in this group are not prone to active contact with others. They experience tension in interaction. Students of Russian nationality are significantly less likely than students of other groups to experience the joy of solitude and are significantly more likely to feel the need for communication. The negative experience of loneliness in this case occurs when it is impossible to participate in a company. Kazakh students, despite the perception of loneliness as a resource, are characterized by a morbid dysphoric perception of it, leading to the actualization of depressive tendencies and alienation from others.

The study of the difference in the experience of loneliness depending on the place where a student came from was carried out using the Mann–Whitney U test. Data are presented in Table 5.

Table 5

The difference in the experience of loneliness depending on the place where the student came to study

	Loneliness as a problem	The joy of solitude	Positive loneliness	Consider oneself lonely	Other-oriented perfectionism
The Mann–Whitney U test	3010	3320	3310	3774	3464
Z	–3.06	–2.311	–2.327	–1.984	–1.956
Asymptotic significance (2-sided)	0.002	0.021	0.02	0.047	0.05

The analysis of the data obtained allows us to conclude that the subjects who came to study in cities do not consider loneliness a problem. They have higher requirements for others and, at the same time, evaluate themselves as lonely people. There is a duality of attitudes toward loneliness among subjects from rural settlements: on the one hand, they are more inclined to consider loneliness that occurs during training as a problem, on the other hand, they have significantly higher scores in the parameters 'the joy of solitude' and 'positive loneliness'. That being said, despite the negative assessment of emerging loneliness, they tend to find positive aspects in it.

Conclusion

In the study, we determined the composition of the loneliness components, represented by three orthogonal factors: the depressive experience of loneliness, the positive experience of loneliness, the experience of loneliness obtained in interpersonal relationships.

The study of the content of orthogonal factors allowed us to conclude that depression, coping strategies and perfectionism have a differentiated effect on the specifics of experiencing loneliness. That is, the depressive experience of loneliness is characterized by the presence of depressive or subdepressive states, emotion-focused coping strategies, and the feeling that society makes unrealistically high demands. The positive experience of loneliness is determined by both constructive coping strategies (problem-focused coping), inclusion in various forms of social activity, and non-constructive ones (avoidance coping). The experience of loneliness obtained in interpersonal relationships is determined by pronounced perfectionism in relation to oneself and others, tension in interpersonal relationships.

The study of the difference in the experience of loneliness depending on sex, nationality, and the size of the settlement where the students came from also allows us to identify a number of patterns. For males, avoidance of loneliness is significantly more common. Females are significantly more likely to consider loneliness as a positive state, in the presence of a dual nature of experience. On the one hand, the appeal to loneliness acts as a resource, on the other hand, it plays a mobilizing role in the activation of interpersonal contacts. That is, the assumption about the presence of sex specificity in experiencing loneliness is confirmed.

The study of the role of nationality of the subjects undoubtedly requires further study with the allocation of uniform samples for the study of large groups. However, in small groups, a number of patterns are observed that can be designated as probabilistic.

The difference in the experience of loneliness by the subjects who came to the university from cities and rural areas was revealed. That is, students who come to university from rural areas have duality in experiencing loneliness, on the one hand, assessing it negatively and, on the other hand, finding resources and joy in solitude.

The dual nature of loneliness as a complex and multidimensional phenomenon allows us to consider it both as a negative state, leading to a number of emotional consequences, and as a resource that actualizes the social ties of the subjects, and as a need state aimed at self-knowledge. The factors of a socio-psychological nature that determine the specifics of its experience by first-year students are identified.

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Money Attitude Among Older Adolescents With Different Levels of Personal Maturity

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Abstract: **Introduction**. A literature review devoted to the study of adolescents' economic socialization patterns allows us to assume that the attitude of adolescents to money (conscientiousness of the attitude to money and confidence in their financial rights) is mediated by the characteristics of their personal maturity. The article presents the novel results of an empirical test of this hypothesis. **Methods**. The study involved 1.145 adolescents aged 13–17 years (725 girls and 418 boys) who do not have independent sources of income. Empirical data were collected using the "Scale self-assessment of personal maturity" (A. V. Miklyaeva) and the "Adolescent money attitude scale" (I. Beutler, C. Gudmunson). **Results**. The indicator of financial conscientiousness increases with age ($F = 4.17$ at $p < 0.01$), and the financial rights indicator undergoes less pronounced changes ($F = 1.34$ at $p > 0.05$). The indicator of financial conscientiousness is significantly higher in the sample of girls ($F = 17.16$ at $p < 0.001$). Throughout older adolescence, the indicator of financial rights is positively associated with the regulatory maturity indicator ($F = 3.11$ at $p = 0.05$), the financial conscientiousness indicator is positively associated with the indicator of reflexive maturity ($F = 9.92$ at $p = 0.001$) and negatively – with the indicators of regulatory ($F = 7.92$ at $p = 0.001$) and cognitive ($F = 3.50$ at $p = 0.03$) maturity. **Discussion**. The results are interpreted in the context of a socio-psychological approach to personality formation in the growing-up process. The conclusion is made that the recorded change in the money attitude in adolescence is closely associated with the assessment by adolescents of their personality potential, in particular, those aspects of it that allow them to make independent financial decisions. Proposals are formulated for the development of programs of activities aimed at promoting constructive economic socialization of adolescents.

Keywords: money attitude, financial rights, financial conscientiousness, adolescents, personal maturity, cognitive maturity, regulatory maturity, reflexive maturity, moral maturity, economic socialization

Highlights:

➢ As far as they grow up, the financial conscientiousness of adolescents who do not have independent earnings grows faster than their confidence in their financial rights.

➢ Teenage girls show higher indicators of financial conscientiousness compared to boys.
➢ Higher indicators of financial conscientiousness are demonstrated by adolescents who highly assess their reflexive maturity against the background of low assessments of cognitive and regulatory maturity.

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Introduction

Money is a significant element of social and economic relations in any historical period of society development, including in the modern world. In addition to performing their traditionally inherent functions, money has a significant impact on people's worldviews, behavior, relationships and status (Zhuravlev & Kupreichenko, 2007).

The study of money attitudes is one of the most relevant areas of social and economic psychology. The money attitude is thought of as an attitude of a personality reflecting its subjective perception of money as an object of socio-cultural reality (Fofanova, 2017), expressed in needs and motives (Steinhart & Jiang, 2019; Ong et al., 2021) and acting as a regulator of financial behavior of the individual (Deineka, 2000; Khashchenko, 2005). Thus, it is shown that the money attitude mediates the effectiveness of financial education (Bocchialini et al., 2022) and the level of financial capability (Hahn & Abe, 2021), determines the methods of money management (Sundarasen & Rahman, 2017) and is closely related to the ability to manage income and expenses (Khalisharani et al., 2022), anticipate financial shocks and recover from them (Sabri et al., 2022). It is noted that the money attitude is a regulator of financial behavior, regardless of how closely a person's professional activity relates to economic relations, and it can be traced both among people working in the economic sphere (Talwar et al., 2021) and among a wide range of people whose profession does not involve direct involvement in economic relationships (Baker et al., 2019). Studies demonstrate close links between money attitudes and subjective financial well-being (Sabri et al., 2020; Rimple, 2021), which is one of the primary predictors of the subjective well-being of an individual (Netemeyer et al., 2018), which determines the relevance of studying attitudes to money as a psychological phenomenon.

To date, the specifics of the money attitude of various social groups have been studied in some detail (Kapustin, 2001), the value-semantic aspect of the money attitude has been described (Mahrina, 2006), the motivational aspect of the money attitude (Yamauchi & Templer, 1982), a personality typology has been created in order to money attitude (Lewis et al., 1995). At the same time, the issues of the formation of the money attitude of children and adolescents, and especially the identification of the age dynamics of changes in this attitude and the factors that determine it, remain insufficiently studied.

According to available data, adolescents' money attitude includes a wide range of ideas about them as an instrument of power or dominance, a way to impress people, as well as a source of anxiety and a tool for coping with it (Mulyani et al., 2018). At the same time, it is shown that the money attitude in adolescence has a gender specificity (Lai, 2010; Bonsu, 2008). It also changes as they grow up, during which money ceases to be associated exclusively with independence and begins to be increasingly associated with ideas about the future (Mironova, 2012).

The social situation of development in adolescence is characterized by predominant financial dependence on parents (Gryaznova et al., 2020). At the same time, adolescents need to have their own money and manage it independently, which in modern culture is associated with reaching adulthood (Luhr, 2018). Such a social situation of development creates favorable conditions for an internal conflict attitude to money. In particular, in studies conducted on samples of Russian adolescents, the contradiction of adolescents' money attitudes has been steadily noted for several decades (Filinkova, 2010; Mironova, 2012; Zhikhareva, 2015; Gryaznova et al., 2020). At the same time, it is shown that adolescents with experience in paid work have a significantly lower degree of conflict in their attitude to money than adolescents without experience in independent earnings (Golubeva & Grishacheva, 2014). The ways and sources of obtaining money from various types of attitudes and behavioral strategies (Zelizer, 2004), while their regulator can be the characteristics of the processes of economic socialization in the family (Furnham, 1999). Foreign researchers have found that a significant role in the conscious and responsible attitude of adolescents toward money played by parents, who become significant agents of economic socialization (White et al., 2021; Luhr, 2018; Kim & Torquati, 2021), simultaneously being a source of financial resources and exercising control over their spending.

The contradictory attitude of adolescents towards money, associated with the ambiguity of their status in economic relations, was reflected in the concept of I. Boitler and K. Gudmunson (Beutler & Gudmunson, 2012). These authors consider financial socialization in adolescence as the deployment of two interrelated processes – the formation of financial *conscientiousness* and the *entitlement* to one's own financial rights, both of which results in a certain attitude to money. Financial law is defined as teenagers' idea that their parents are obliged to provide and pay for what they need or for what they think they deserve. Financial conscientiousness is the antithesis of financial law, is associated with financial self-discipline, deliberation of financial actions and their moral mediation and is a reflection of the constructive way of economic socialization of adolescents. It has been found that the predominance of financial rights over financial conscientiousness is more likely in high-income families in which parents support the corresponding representations of children (Brown & Jaffe, 2011). On the contrary, families with low-income parents may have more favorable attitudes towards money (Nano et al., 2015).

Research shows that the formation of an attitude to money in adolescence is closely interrelated with the processes of personality formation. Thus, a longitudinal study found that financial rights have indirect negative links with prosocial behavior and positive ones with aggression (Fu & Padilla–Walker, 2019). A conscious attitude to money is associated with self-efficacy (Engelberg, 2007). In addition, it was found that fixation on money is negatively associated with the internal locus of control (Grishina & Kostsova, 2021). Researchers found connections between the money attitude and/or financial behavior determined by it and personal maturity, which are recorded in studies of the younger generation (Kamneva & Annenkova, 2014) and adults (Semenov, 2004). Considering the peculiarities of the socio-age status of children and adolescents, it is proposed to use the term "economic and psychological maturity" of the individual, which is understood to mean integrative education, including the phenomena of personal and economic maturity, determining the content of the economic identity of the individual and the value-normative system of economic behavior regulation (Drobysheva, 2016).

It should be noted that in adolescence, the level of personal maturity can become a factor that will determine financial well-being at the next stages of life. In particular, there is evidence that people's money attitude during adolescence contributes to their financial satisfaction (Wilhelm et al., 1993) and well-being during adulthood (Kasser et al., 2014). Thus, works that study the relationship between the money attitude of adolescents and the characteristics of their personal maturity are undoubtedly relevant. At the same time, there is a shortage of research in the relevant subject field. The above has determined the purpose of our study, which was to study the attitude toward money in adolescents aged 13–17 years with different levels of personal maturity.

Methods

The study was organized cross-sectional. The sample consisted of 1.145 adolescents aged 13–17 years (15.01 ± 1.10), including 725 girls and 418 boys, students of schools and institutions of secondary vocational education from several regions of Russia, living with parents/relatives and having no independent sources of income.

To collect empirical data, the "Scale self-assessment of personal maturity" (Miklyaeva, 2018) was used, including the parameters 'cognitive maturity', 'reflexive maturity', 'regulatory maturity' and 'moral maturity', as well as the "Adolescent money attitude scale" (Beutler & Gudmunson, 2012), translated and tested in in this study. The factor structure of the Russian version of the questionnaire (exploratory factor analysis with Varimax rotation, screening criterion – 2) is similar to that given by the developers (Table 1) and allows us to distinguish two factors – 'financial rights' (factor 1) and 'financial conscientiousness' (factor 2), forming the subscales 'financial rights' (min = 6, max = 24) and 'financial conscientiousness' (min = 0, max = 16) with a Cronbachs alpha of 0.84 and 0.79 correspondingly.

Table 1

Factor structure of the questionnaire "Money attitude scale"

Questionnaire statements	Factor 1	Factor 2
1. I believe it is my parents' responsibility to pay for my daily needs	0.73	0.01
2. My parents have to give me pocket money	0.75	0.00
3. I think parents should pay for my purchase, even if they don't consider it important or necessary	0.76	–0.16
4. I believe my parents should pay for my college/university education	0.69	–0.05
5. I deserve to get all the things I want	0.62	–0.04
6. I believe my parents should help me get the things I want	0.70	0.11

7. I help my parents save money through my thrift and modesty	0.00	0.83
8. When my parents buy me things, I try to "recompense" by helping them	–0.05	0.79
9. I'm careful when I spend my parents' money	0.00	0.87
10. I feel personally responsible when I spend my parents' money	–0.03	0.84
Expl.Var	3.04	2.82
Prp.Totl	0.30	0.28

Statistical processing of the results was carried out by calculating descriptive statistics (M ± S), correlation (Pearson's r) and variance (F) analysis using the Statistica 10.0 software package.

The research program was approved by the Ethics Committee of the Herzen State Pedagogical University of Russia (IRB00011060 Herzen State Pedagogical University of Russia IRB #1), protocol № 19 of 01/26/2021.

Results

According to empirical data, in older adolescence, as they grow up, the indicator of financial conscientiousness increases statistically significantly. The indicator of financial rights shows similar dynamics, but its changes are less pronounced and do not reach the level of statistical significance (Table 2).

Table 2

Dynamics of adolescents' money attitude (M ± S)

Age	Financial rights	Financial conscientiousness
13 y. o.	11.84 ± 3.49	10.67 ± 4.04
14 y. o.	12.26 ± 3.91	11.34 ± 3.40
15 y. o.	12.56 ± 3.77	10.61 ± 3.64
16 y. o.	12.72 ± 3.37	11.33 ± 3.08
17 y. o.	12.83 ± 3.70	11.45 ± 3.45
F	1.34	4.17**

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*** – p ≤ 0.01.*

The values of the financial rights indicator in the samples of boys and girls do not differ, the financial conscientiousness indicators are significantly higher in the sample of girls (Table 3).

Table 3

Money attitude in samples of boys and girls (M ± S)

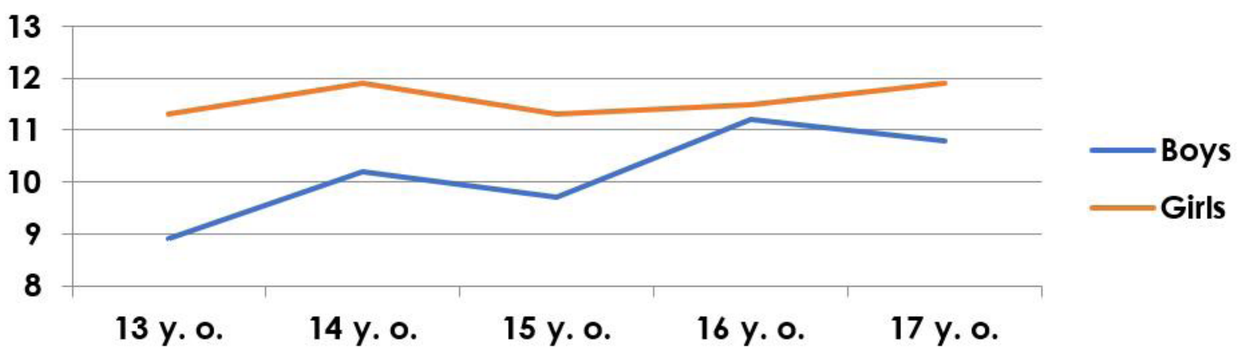
Indicators	Girls	Boys	F
Financial rights	12.46 ± 3.70	12.46 ± 3.71	0.61
Financial conscientiousness	11.52 ± 3.28	10.35 ± 3.71	17.16***

**** – p ≤ 0.001.*

Two-factor analysis of variance ("age * gender") showed that the main contribution to the age dynamics of the financial conscientiousness indicator is made by a sample of boys, in which there is a consistent increase in this indicator in the period from 13 to 17 years, while in the sample of girls the level of financial conscientiousness during this period is quite stable (Fig. 1, $F = 2.72$ at $p = 0.03$). A similar interaction of the factors "age * gender" for the indicator 'financial rights' was not found.

Figure 1

Age dynamics of the financial conscientiousness indicator in samples of boys and girls



The correlation analysis showed that indicators of financial rights and financial conscientiousness are in inverse relationship to each other. Meanwhile, the 'financial rights' indicator is positively related to the 'regulatory maturity' indicator and negatively related to the 'reflexive maturity' indicator. The indicator of financial conscientiousness is positively related to the 'reflective maturity' indicator and negatively with indicators of regulatory, moral, and cognitive maturity (Table 4).

Table 4

Correlation analysis results (correlation matrix)

Indicators	1	2	3	4	5	6
1. Financial rights	1.00	–0.12**	–0.06*	0.09**	0.03	0.00
2. Financial conscientiousness		1.00	0.19**	–0.12**	–0.08**	–0.07**
3. Reflexive maturity			1.00	0.23**	0.28**	0.22**
4. Regulatory maturity				1.00	0.39**	0.36**
5. Moral maturity					1.00	0.36**
6. Cognitive maturity						1.00

** – $p \le 0.05$; ** – $p \le 0.01$.*

In any of the cases, the interactions of the factors "age * sex * achieved level of personal maturity" were not found. However, regardless of sex and age of adolescents, the 'financial rights' indicator is determined by the self-assessment of regulatory maturity: the higher the self-assessment of regulatory maturity, the higher the indicator of financial rights ($F = 3.11$ at $p = 0.05$). On the contrary, the 'financial conscientiousness' indicator has inverse relationships with the indicator of the self-assessment of regulatory maturity ($F = 7.92$ at $p = 0.001$), as well as with the indicator of the self-assessment of cognitive maturity ($F = 3.50$ at $p = 0.03$). That being said, it is directly determined by the indicator of the self-assessment of reflexive maturity: higher indicators of financial conscientiousness are observed in adolescents who were assessed themselves as reflexively mature ($F = 9.92$ at $p = 0.001$).

Discussion

The attitude towards money in adolescence is mediated by the peculiarities of their social developmental situation. It combines the desire for financial independence, which is one of the "markers" of adulthood in modern culture (Luhr, 2018), and financial dependence on the parental family (Gryaznova et al., 2020). In this sense, it seems viable to use methodological tools to study the attitude of adolescents towards money, considering the characteristics of their social and age status. The approach proposed by I. Beutler and K. Gudmunson (Beutler & Gudmunson, 2012) seems to be quite appropriate in solving this problem. It allows assessing the adolescents' attitude towards money through the analysis of their ideas about their financial rights and responsibility for the use of financial resources provided by parents, which is relevant to the actual life situation of most adolescents (Gryaznova et al., 2020).

Approbation of the Russian version of the "Adolescent Money Attitude Scale", proposed by I. Beutler and K. Gudmunson, which allows assessing the attitude through an analysis of the relationship between adolescents' ideas about their financial rights and their financial conscientiousness (Beutler & Gudmunson, 2012). Subscales identical to the ones proposed by the authors of the original methodology in content were identified. In addition, satisfactory indicators of the consistency of the items that make up the subscales were obtained. Considering the negative relationship between the indicators of financial rights and financial conscientiousness found in the course of the correlation analysis, corresponding to the theoretical construct that forms the basis of the Scale, and the empirical data obtained by its authors, this gives grounds to consider the results obtained using the Russian version of the Scale as sufficiently reliable.

The present study showed that there is a consistent increase in the 'financial conscientiousness' indicator in older adolescence, as the growing goes. It indicates an increase in the responsibility of adolescents associated with growing up for the use of financial resources provided by their parents. The 'financial rights' indicator also increases slightly with age. However, its dynamics is less pronounced and does not reach statistical significance. Given the different dimensions of the scales of financial rights and financial conscientiousness, one can conclude that financial conscientiousness prevails over financial rights in the structure of attitudes towards money in older adolescence. As they age, this trend intensifies. This is probably one of the aspects of the process of formation of the economic and psychological maturity of an individual (Drobysheva, 2016). The trend towards greater financial conscientiousness during older adolescence is more pronounced in the sample of boys. By the beginning of this stage, girls, as a rule, are already sufficiently aware of the responsibility for the use of parental financial resources. This is probably due not only to the gender-specific attitude towards money noted in the literature (Lai, 2010; Bonsu, 2008), and also shows a higher degree of reflexivity in adolescent girls compared to their boys at the same age (for example, Miklyaeva, 2018). These conclusions expand the ideas presented in the literature. In particular, in older adolescence, the attitude towards money undergoes substantial changes (Mironova, 2012). According to the theoretical foundations underlying the diagnostic methodology used to collect empirical data (Beutler & Gudmunson, 2012), one can state that the constructive attitude of adolescents towards money increases as they grow older.

Analysis of the relationship between indicators of adolescents' attitude towards money and personal maturity achieved by the time of participation in the study showed that indicators of financial rights and financial conscientiousness are not only negatively interconnected with each other, but also have opposite (in sign) correlations with indicators characterizing various components of personal maturity. That is, for the 'financial rights' indicator, a positive relationship with the indicator of regulatory maturity and a negative relationship with the indicator of reflexive maturity were revealed. On the contrary, the 'financial conscientiousness' indicator showed a positive relationship with the indicator of reflective maturity and a negative relationship with the indicator of regulatory maturity, as well as with the indicators of moral and cognitive maturity. Analysis of variance confirmed the results of correlation analysis for such components of personal maturity as regulatory maturity (for 'financial rights' and 'financial conscientiousness' indicators), cognitive and reflective maturity (only for the 'financial conscientiousness' indicator). These results indicate that the growth of conscientiousness of the attitude towards money is associated, first of all, with the development of their reflexive potential. This can be interpreted as a sign of the constructiveness of the economic socialization of adolescents. The absence of interaction between the factors of age, sex, and the achieved level of personal maturity, established using analysis of variance. It indicates that this trend is gender-universal and persists throughout old adolescence, not undergoing significant changes as they age.

When interpreting the results, it is necessary to take into account the self-assessing nature of the indicators of personal maturity obtained in our study (Miklyaeva, 2018). In this regard, it can be assumed that the formation of a constructive attitude towards money in adolescence is not associated with a regulatory, cognitive (in accordance with the theoretical construct of the "Scale of Self-Assessment of Personal Maturity" – associated with the assessment of one's own "experience") or moral potential, but with the subjective perception of adolescents that the appropriate resources are not enough to make financial decisions on their own. Based on the results of our previous studies (Miklyaeva, 2018), we can assume that a relatively low assessment of the components of personal maturity indicates that adolescents realize that 'adulthood' has not yet been achieved, thereby defining a perceived "zone of proximal development" in the context of personal development. At the same time, this result determines one of the areas of work within a matter of the psychological and pedagogical support of the adolescents' economic socialization. On the one hand, it should create prerequisites for differentiation in the mind of a teenager of ideas about the economic status of the family and oneself as a subject of the family financial system, using the financial resources of their parents. On the other hand, it is the idea about individual economic status based on financial rights secured by actual or assumed future self-employment.

In this regard, of interest is the subsequent participation in similar studies of adolescents who have experience of self-employment. This is one of the most important "markers" of adulthood and is expressed in their attitude towards money, as noted by the researchers (Golubeva & Grishacheva, 2014). Additionally, it seems promising to implement such studies in a longitudinal design. In our opinion, it will help more accurately, in comparison with the cross-sectional method used in our study, to analyze the age dynamics of attitudes towards money and the factors that determine it. In general, this may contribute to a better understanding of the role of attitudes towards money in the development of a personality of adolescents, in particular, in mastering the social role of an adult.

Conclusion

The study found that such aspects of the attitude of adolescents towards money as 'financial rights' and 'financial conscientiousness' have age and sex specifics. They are also mediated by the level of personal maturity achieved, according to the adolescents themselves, by the time they participated in the study. Financial conscientiousness, considered as a more constructive variation of the attitude towards money in adolescence, is associated with a high self-assessment of reflective maturity against the background of underestimation of other components of personal maturity (cognitive, moral, regulatory). The results obtained must be considered when developing measures aimed at helping the economic socialization of adolescents. The limitations of the study lie in the fact that the sample consisted of adolescents with no experience in self-employment, as well as using the cross-sectional method to assess the age dynamics of the content of attitudes towards money in adolescence. The immediate prospects of the study are related to overcoming the limitations formulated above. In particular, an expansion of the sample is considered by including adolescents with experience in self-employment.

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S. A. Bezgodova wrote the text of the article, designed the article according to the editorial rules.

M. V. Zharova collected empirical data.

A. V. Miklyaeva planned and managed the study, analyzed and interpreted the obtained empirical data, wrote the text of the article.

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Features of Modern Man Hardiness in the Pandemic Era

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Abstract: **Introduction**. The article raises the actual problem of instability and uncertainty in the modern world associated with the pandemic and the social restrictions that followed it. In particular, the influence of the levels of resilience components on the effectiveness of the behavior of representatives of helping professions in the era of VUCA has not been studied before. The experimental study aimed to analyze the hardiness characteristics of various population groups in a pandemic situation. **Methods**. The study used the original Maddy Hardiness Survey adapted by D. A. Leont'ev and E. I. Rasskazova. The experimental study was conducted in Yelets, Lipetsk region, and 360 people (girls and women) participated. The sample was made up of representatives of different social groups: students, teachers of educational organizations, social workers, and healthcare workers (an equal number from each group). Statistical analysis of the results was carried out using single-factor analysis of variance, Student's t-test using the SPSS-21 software package. **Results**. The study results showed that most of the students and teachers who participated in the experiment have a high level of hardiness, while a third of the residents of these groups have a low level; medical workers are equally characterized by high and medium levels, and social workers demonstrated almost identical indicators of high and low levels. The data obtained allow us to conclude about more developed indicators of hardiness in medical workers. However, statistical analysis of the results shows that the level of resilience does not depend on the type of employment of the respondents. **Discussion**. Analysis of the degree of one or another component of the manifestation of hardiness in the respondents showed that "control" is dominant. It indicates that most respondents are convinced that the mobilization of internal forces will allow them to adapt to a situation of uncertainty and cope with stressful circumstances of life.

Keywords: hardiness, vitality, engagement, control, risk taking, coping with stress, coping strategy, resilience, personality, pandemic era

Highlights:

- The levels of hardiness of representatives of various social groups under the conditions of a pandemic have been revealed. Most of them have high and medium levels, indicating readiness and ability to cope with stressful situations.

➢ Among the residents of various social groups who participated in the experiment, the dominant component of hardiness is control – this indicates their conviction that "struggle" and the choice of an activity strategy will help to influence the result of the negative influence of stressful situations.
➢ A third of the respondents demonstrated a low level of hardiness, suggesting their inability to withstand stressful influences and adapt to changing circumstances in a situation of uncertainty.

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Introduction

Currently, the abbreviation VUCA or VUCA-the world, derived from the English 'instability', 'uncertainty', 'complexity' and 'ambiguity', is becoming increasingly popular – these concepts can briefly describe the modern world (Luthans & Broad, 2022; Alkhaldi et al., 2017). It is impossible not to agree with this because today's realities significantly change the life of a modern person. Recent calls to get out of the 'comfort zone' are now unclaimed. Almost the entire modern population is experiencing an era of large-scale changes. The complex epidemiological situation, the associated social restrictions and regulatory requirements, the unstable international situation, and many other factors seriously influence the human psyche (Hagger & Hamilton, 2022). The current trends mentioned above in the development of society have renewed interest in the study of the psychological mechanisms through which a person can not only resist changes (often negative) but also develop a constructive strategy of behavior. A modern member of society just needs to be more adaptable, be able to adapt easily, and be flexible and mobile. In the context of all the above, it is advisable to turn to the study of such a personality trait as *hardiness*.

Hardiness as a psychological phenomenon, in the aspect of its scientific development, in a certain sense, can be called some 'by–product', which was the result of practical interest in other tasks, namely, coping with stress, the problem of which is quite relevant today. It should be noted that the study of this phenomenon is not new: this term came into use in the 70s of the XX century in the West. Examining in 1975 the employees of one of the companies, S. Maddi and S. Kobeisa found the presence of high-performance indicators in only a third of employees in the presence of distressed manifestations in all others. The authors of the study concluded that this third of the 'stable' (it is how the word 'hardiness' is translated from English, originally used by S. Maddi) has many personal characteristics that allow them to cope with stress and recover quickly enough after it (Fominova, 2012; Odintsova et al., 2020; Fedotova, 2020). In Russian psychology, D. A. Leont'ev introduced his own version of the word 'hardiness' into the Russian language, additionally 'anchoring' the meanings 'life' and 'resilience' already contained in the root anchor words, gave their combination an additional meaning: a belief system that prevents the emergence of tension in difficult life situations (Leont'ev & Rasskazova, 2011; Egorova et al., 2019; Bragina, 2014).

Maddi's concept of 'hardiness' received the deepest response from humanistically oriented psychologists. S. Maddi himself based his concept on Tillich's (P. Tillich) – 'existential courage' (to assert one's being and accept life as it is, despite circumstances). In this context, he presented it as a variant of reducing ontological anxiety (Duganova, 2010). It should be noted that the idea of a person's ability to withstand the negative effects of the environment was somehow identified in the number of concepts put forward by other authors (not in 'hardiness'), including 'courageous despair' by S. Kierkegaard, and 'vitality' by B. G. Ananyev, and 'acceleration in being' by M. Heidegger, and 'courage to create' by R. May, and 'maturity' by G. Allport, and 'transcendence' by S. L. Rubinstein and A. Maslow, and 'presence' by J. Byugental (Nikitin, 2017; Pankov, 2019) and others. Nevertheless, S. Maddi included "his" 'hardiness' in his own theory of personality – the theory of activation, according to which a person can establish an active, cognitively, and emotionally conditioned connection with the environment and not act with fully relying on the innate or biologically determined nature of his behavior (Bragina, 2014; Kobasa, Maddi, & Kahn, 1982). S. Maddi says, first of all, that hardiness manifests itself; firstly, in stressful situations and other moments of life, it does not manifest itself; secondly, hardiness is not just a belief in one's own future and not simple optimism, but is an attitude (as S. Maddi emphasizes) to use all (even negative) options that a person's life situation provides, to be able to extract wise experience from it for oneself, and use this experience to transform your life. Third, 'hardiness', according to S. Maddi, differs very significantly from coping strategies, which S. Maddi considered a rigid-stereotyped response of the subject to the environment, but hardiness is still close to transformational coping, even being productive and active (Nikolaeva, 2013; Franchuk & Gavryuchenko, 2015).

Analyzing the concept of 'hardiness', one should ask the question: "Do such attitudes arise to act in a stressful situation only as an experience of acting in a stressful situation?". The answer is ambiguous because some people 'give up' under stress when others show miracles of heroism, i.e. such attitudes of action in difficult life situations are, in a sense, both 'blurred' and 'consolidated' attitudes for the individual to live and behave in a very specific way. And it is impossible not to agree with S. Maddi, who actually 'deduces' hardiness from the Self-concept of personality and believed that it necessarily considers "a system of beliefs about oneself, the world, and relationships with it, which prevents the emergence of internal tension in stressful situations, and also contributes to coping with stress" (Egorova and others, 2019, p. 23). That is, hardiness reflects the psychological vitality of the individual in the adaptive aspects of its psychological effectiveness in various, especially difficult, life situations. But this is not the only characteristic of the phenomenon being studied.

It can be said that hardiness is not only the general position of a person, only 'acutely' realizing himself in stress, but also vitally active in all other manifestations of life (Southwick & Charney, 2018). It should be particularly noted that hardiness, reflecting the psychological maturity of the individual, cannot be considered outside of universal spiritual and moral categories. Otherwise, the question should be raised about the survivability of the individual or his desire to survive at any cost, even at the expense of others. In this case, the focus of attention is no longer psychological aspects but biological ones as the basis for the continued existence of an individual.

In the context of the study of hardiness, many authors refer to the concept of 'resilience'.

As already noted above, the weak predictability of changes in modern society, combined with gross interference in the nature of humanity, obviously opposes a certain balance of stability and dynamism of the environment, both external and internal, in their obvious interconnectedness. In this regard, the status of axiomatic phenomena that relate to the external conditions of human life (the environment as a whole, climate, geophysical living conditions, spatial terrain, etc. as

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the conditions of his life that are available and not so quickly and strongly changed as a result of human activity) and the purely ‘human’ conditions of his life (from his mentality, lifestyle as a whole of a separate population, and to his purely individual adaptive characteristics), human resilience can be attributed as an extremely complex and multidimensional phenomenon, but before in total, as a “form of manifestation of activity and adaptability of the system” (Makhnach, 2012, p. 84).

The term ‘resilience’ was originally interdisciplinary but, in the Russian language, it was first used by A. A. Bogdanov in the mid-20s of the last century in the general theory of systems, in the 60s – by B. G. Ananyev in psychology, in the concept of the holistic study of human, in the 50s and 60s. he has already met in cybernetics, synergetics and the analysis of social objects, in the 80s – in medicine, pedagogy, biology, psychology (Tolochek, 2021; Makhnach, 2020). A. V. Makhnach is considered to be the Russian ‘luminary’ of the resilience study.

A. V. Makhnach (Makhnach, 2012), in his justification of the legality of using the term ‘resilience’ along with ‘hardiness’, analyzes the biological and social understanding of this phenomenon. According to A. V. Makhnach, resilience is a measure of a person’s adaptation to environmental conditions, his medical characteristics (individual plasticity as an indicator of health, reflecting the conservatism of the internal environment with a feeling of full strength (integral attribute of health) in response to changing conditions).

A. V. Makhnach also analyzes the differences in understanding of the ‘hardiness’ and ‘resilience’ concepts, agreeing that the concept of ‘resilience’ in the Russian language is extremely amorphous, and in the scientific language is still vague. He focuses on the fact that such aspects as preserving one’s life, existing and developing, being adapted to life, and literally ‘being alive’ are more acceptable for resilience, while the author interprets hardiness as the ability to possess vitality and endure unfavorable conditions of existence (Makhnach, 2012, p. 94). In other words, in this context, the emphasis can be placed as follows: for resilience – first of all, biological, for hardiness – psychological (Luthar & Suchman, 2000; Masten, 2011).

However, in the context of studying the characteristics of building a constructive behavior model that promotes effective functioning in an unstable situation, the term ‘hardiness’ is more acceptable. This postulate is confirmed by many studies. In particular, hardiness was considered as a personality trait that helps cope with uncertainty (Rivera et al., 2021; Santilli et al., 2020; Schwarz, 2018), as a mechanism that allows you to recover quickly after exposure to stressful factors (Cooper et al., 2020), as a protective mechanism that allows you to maintain health, including mental health (Li & Hasson, 2020; Walker & Cooper, 2011), as a personality trait that helps to cope with social isolation in conditions of forced social restrictions (Labrague et al., 2021; Nagi et al., 2021; Linkov & Trump, 2019).

So, we can conclude with full responsibility that hardiness is a system of personal beliefs that allows a person to function effectively in an era of change.

Thus, the study of the hardiness level of a modern member of society does not lose its relevance. On the contrary, the social instability inherent in actual life indicates the need for a detailed study of psychological mechanisms that allow a modern person to effectively cope with rapidly changing living conditions and develop a constructive behavior pattern. In this regard, *the purpose of our study* was to study the resilience of various population groups. The coverage of various segments of the population will provide a more complete picture of the level of ability to withstand instability.

Methods

To examine the characteristics of the hardiness of various population groups, we used the original version of the Hardiness Survey by S. Maddi, adapted by D. A. Leont'ev, E. I. Rasskazova (Leont'ev & Rasskazova, 2006) (using Google Forms). 360 people (girls and women) participated in the study. The respondents were representatives of different social groups of Yelets, Lipetsk region: students of I. A. Bunin YSU (20 ± 2.3 years, n = 90), teachers (43 ± 20 years, n = 90), social workers (43 ± 20 years, n = 90) and medical workers (43 ± 20 years, n = 90). The student sample consisted of students studying pedagogy, psychology, social work and medicine. The group of medical workers included both nurses and doctors. It should be particularly noted that the medical workers involved in the treatment of COVID-19 did not act as respondents because the medical personnel who provide support to such patients are in special working conditions and affect their psychological state. The main criterion for sample formation was the massive impact on study participants of social restrictions and other innovations relevant to modern society due to the need to counteract the spread of a new infection caused by the coronavirus COVID-19. The pandemic imposed quite serious restrictions on the daily life and the performance of the professional and educational duties of all participants in the study (this is the constant use of individual protective equipment, restriction of movement, and the technologization of significant areas of life). The sample was randomly collected with 90 residents of each group. Quantitative and qualitative data processing was performed using the SPSS-21 software package.

Results

According to a generalized analysis of all the data obtained during the diagnosis, it is shown that 53 % of teachers, 56 % of university students, and 44 % of representatives of the social sphere and medicine demonstrate a high level of hardiness. The average level is 45 % of medical workers. 46 % of representatives of the social sphere, 33 % of teachers and 31 % of students have a low hardiness level. The medical workers were divided almost in half into people with high and medium hardiness and social workers – the majority with low or high hardiness (the results are presented in Table 1).

Table 1

The different social groups respondent's hardiness level

Hardiness level	Teachers		Students		Social workers		Medical workers	
	(people)	%	(people)	%	(people)	%	(people)	%
Low	30	33	29	31	42	46	10	11
Average	12	14	11	13	9	10	41	45
High	48	53	50	56	39	44	39	44

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The table above shows that most of the respondents with a high level of hardiness were observed in the group of teachers and students. It is more than half of the representatives of these groups. However, about a third of both groups of teachers and students have a low level of hardiness. One can see that this is not a small number. The significant notion that the fewest participants in the study with a low level of hardiness were observed in the medical workers group. Most of the representatives have a high and medium level of hardiness precisely in this group. It allows one to state that medical workers are the most resilient among teachers, students, and social workers.

Most of the representatives with a low level of hardiness were observed in the social workers group. Almost half of the respondents in the group show this level. Meanwhile, nearly the whole other half has a high level of hardiness.

However, in our sample, the level of hardiness (final value) does not depend on the area of activity of the subjects (the data were confirmed using a one-way analysis of variance F = 0.091). Therefore we should turn to a more detailed approach using a one-way analysis of variance, and Student's t-test.

As mentioned above, hardiness as a personality characteristic consists of three main components:

– *Challenge* is considered as "a person's conviction that everything that happens to them contributes to their development through knowledge derived from experience, positive or negative all the same" (Leont'ev & Rasskazova, 2006, p. 4).

– *Control* is considered as "a person's conviction that the struggle allows one to influence an outcome of what is happening, even if this influence is not absolute, and success is not guaranteed" (Leont'ev & Rasskazova, 2006, p. 4).

– *Commitment* is considered as "the conviction that everything that happens creates a chance to find something worthwhile and interesting for personality development" (Leont'ev & Rasskazova, 2006, p. 4).

An analysis of the expression of various components among representatives of groups of respondents with different types of employment will allow us to understand what resources the study participants of a particular group use to cope with stress inducing factors abounded in their actual living activities. In this case, to determine the statistical significance of the differences in the mean values, we used Student's t-test as a mathematical method. Hardiness indicators were compared among social group representatives with different types of employment.

Table 2

Hardiness components indicators in different social group representatives (mean value, standard deviation)

Hardiness indicators	Teachers	Students	Social workers	Medical workers
Commitment	6.5 ± 4.2	6.7 ± 4.8	4.8 ± 3.7*	8.3 ± 4.4

Hardiness indicators	Teachers	Students	Social workers	Medical workers
Control	8.6 ± 3.5	7.9 ± 3.2	8.2 ± 3.4	8.2 ± 2.8
Challenge	5.1 ± 4.2*	3.4 ± 4.0*	3.3 ± 4.0*	5.3 ± 3.6*
Hardiness	16.7 ± 10.6	16.9 ± 10.9	14.7 ± 10.2	19.4 ± 10.1

** – significance at $p \leq 0.05$ according to Student's t-test.*

An analysis of the results presented in Table 2 suggests that the dominant hardiness component in the representatives of all social groups participated in the study is 'control'. That is, teachers, students, social workers, and doctors are convinced that it is the 'struggle' that will allow them to function effectively in the situation of uncertainty and instability. According to the respondents, it is due to the mobilization of all internal forces, that it is possible to influence current events and achieve some result, regardless of its completeness.

In contrast, representatives of all groups showed low results in the hardiness component 'challenge'. The results obtained can be interpreted as follows: the participants in the study are nowhere near convinced in the benefit of what is happening at the moment in their lives. They do not consider that the social situation in which they live and function contributes to their development. Of great importance is that students and social workers are the least ready to accept the current situation. Moreover, if the position of students can be explained by youthful maximalism, then low indicators for this component among social workers cause concern.

Indicators in different social groups range significantly in the third hardiness component 'commitment'. Among medical workers, 'commitment' is at a quite high level, which shows that the respondents in this group believe that everything that happens is valuable, interesting and stimulates development. However, among social workers, this indicator is not at a high level. That is, they do not see anything positive or interesting in the current situation that could affect their development. For teachers and students, the indicators for this component are essentially identical. This appears to be surprising, because for students this indicator should certainly be higher than for the older generation representatives.

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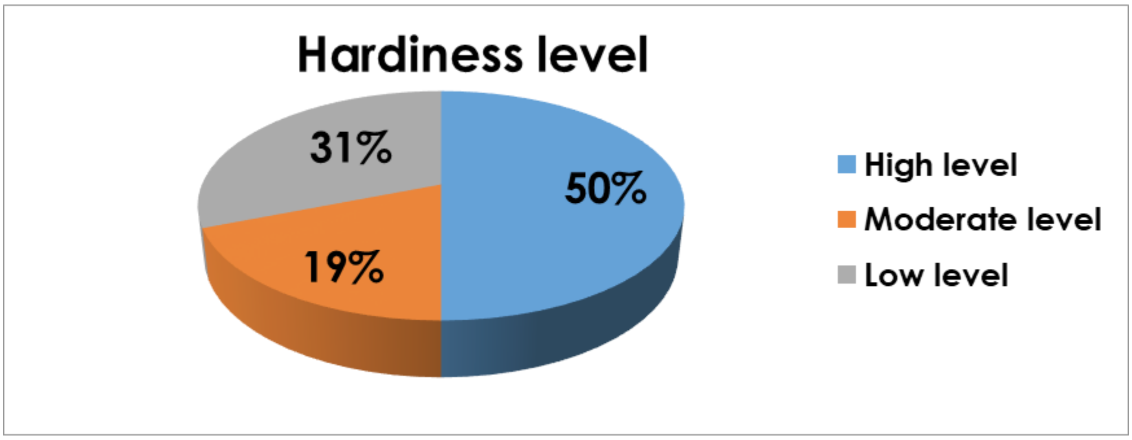
As mentioned above, based on the data obtained in the course of statistical data processing (one-way analysis of variance and Student's t-test), we can conclude that the level of hardiness does not depend on the type of employment. That is, the sample can be conditionally divided into three groups: the first group is resilient (50 % of the total sample), the second group is not resilient (31 %), and the third group is moderately resilient (19 %). The data are presented in Figure 1.

Figure 1

Level analysis of population hardiness



The first group is characterized by high commitment (F = 4.12), that is, a pronounced interest in life: they enjoy their life activities, always ready to discover something new for themselves, to learn, to develop themselves, demonstrate an active life position, easily make contact, treat the world as generous. Their 'control' (F = 17.62) is at a high level: they are ready to struggle, have a clear confidence that it is not worth fending off difficulties, the result of their activity depends directly on their personal efforts, and they are not afraid to solve the appearing tasks. They are diagnosed with a high level of challenge (F = 3.13), that is, people are ready to implement new ideas; they believe that they have made the right choice of their professional activity, and life troubles and problems are perceived by them as one of the stages of the life cycle; any experience, both positive and negative, fills their life with meaning.

The second group is characterized by low commitment (F = 3.47), that is, they lost interest in life and do not enjoy it, do not want to discover something new for themselves, learn, self-develop; for them, it is difficult to make contact. Their level of control (F = 13.83) is low, that is, people are not ready to struggle, they have a clear confidence that nothing good can be expected from life, the result of their activities does not depend on their efforts, they are afraid to solve the problems that confront them. They are diagnosed with a low level of 'challenge' (F = 2.24), that is, people are not ready to implement new ideas; they believe that they made a mistake in the choice of their profession, they strive for comfort and security, the world seems hostile to them.

The third group is characterized by moderate commitment (F = 2.84), that is, interest in life is not lost, but they do not enjoy their activities in life, do not want to discover something new for themselves, learn, develop themselves, to establish contact if they are interested in the subject of communication. Their level of control (F = 10.11) is low. They were diagnosed with an moderate level of challenge (F = 2.97), that is, people are ready to implement new ideas when they are sure of success; they believe that the choice of their profession is justified, the accumulated knowledge and experience help them in their professional activities; they seek comfort and security, the world often seems hostile to them.

Therefore, a statistical analysis (a one-way analysis of variance) of the data showed that the level of control most clearly affects hardiness of the respondents.

Discussion

The analysis of the problem of hardiness of the respondents selected from various social groups was carried out in the studies of domestic and foreign scientists: medical workers (Alhawatmeh et al., 2021; Lagodich et al., 2020), students (Rivera et al., 2021; Karaman et al., 2020; Özbey et al., 2014; Shereshkova, 2019), social workers (Pharris et al., 2022), teachers (Mayasova et al., 2019; Frizen, 2018). Analysis of these works showed that the hardiness of these social groups was studied in various aspects: comparative characteristics by gender, conditions (Mayasova et al., 2019), in relation to personal qualities (Frizen, 2018), with life satisfaction (Özbey et al., 2014), hope for the future, meaning in life (Rivera et al., 2021), place of residence and participation in management activity (Frizen, 2018), emotional burnout (Lagodich et al., 2020), and others. During the pandemic, hardiness aspects were studied only in relation with certain social categories of the population and are reflected in a limited number of works (Labrague et al., 2021; Alhawatmeh et al., 2021; Rivera et al., 2021).

The present study shows the level of hardiness of various population groups (in our sample, of representatives of helping professions and students – future teachers, psychologists, social and medical workers), exposed to stress in a pandemic situation, in changing living conditions and their professional and/or educational activities, and their comparative features.

The data obtained indicate that a greater number of respondents participated in the study have either a high or moderate level of hardiness. However, a third of the participants showed a low level of hardiness. This draws especial attention, since this category of people is characterized by loss of interest in life, lack of pleasure from professional activities, unwillingness to discover something new, reluctance to implement new ideas, and other characteristics. The further development and consolidation of the 'symptom complex' described above can lead to significant negative consequences. Namely, there is a chance of developing an inability to resist negative trends. People with these characteristics will not be able to build a constructive strategy of behavior in the current stress inducing world. It is of great interest that most of the respondents with the above set of characteristics are social workers.

The vast majority of the study participants cope with current trends (instability, abundance of stress, uncertainty, ambiguity, and others) due to 'control', one of the components of hardiness. However, it may well lead to such negative consequences as emotional burnout.

All of the above indicates the necessity of studying in more detail the hardiness level of modern population, of assessing the level of formation of each of the components of this personal characteristic. Presumably, it is the adequate level of hardiness that will allow a modern person to function effectively in the era of VUCA.

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O. E. Elnikova conducted a theoretical analysis of scientific literature on the research problem, wrote a review part of the article; planned and conducted the research; wrote the conclusion and findings of the article; conducted a critical overview of the content of the article.

A. N. Pronina worked with the references, wrote a review part of the article; wrote the «Discussion» section.

I. V. Faustova conducted the experiment; interpreted and described received quantitative and qualitative results; wrote the abstract and conclusions; conducted a critical overview of the content of the article.

L. Yu. Komlik conducted the experiment; conducted the quantitative and qualitative processing of the received data using the SPSS-21 software package; interpreted and described received quantitative and qualitative results; designed the results in figure and table forms.

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Innovativeness, Regulation of Vital Activity and Value Orientations of Young Men and Women: The Effect of the COVID-19 Pandemic

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Abstract: **Introduction**. The pandemic was a challenge to our contemporaries and focused the attention of researchers on psychological resources that facilitate its overcoming. Empirical studies of the psychological regulation system of the personality's vital activity during this period, reflected in the special aspects of the innovative, value and regulatory characteristics of representatives of various social groups, are quite limited, which led to the relevance and novelty of this study. **Methods**. The scale "Self-Assessment of Personality's Innovative Qualities" by N. M. Lebedeva and A. N. Tatarko was used, which allows for studying the psychological components that determine innovative human behaviour. Regulatory characteristics were studied using the "Personal Readiness for Activity (PRA)" scale by S. A. Bogomaz, I. V. Atamanova and I. A. Filenko. Value orientations were determined using the Schwartz's questionnaire "Portrait Value Questionnaire-Revised (PVQ-R)", modified by K. V. Sugonyaev. To evaluate the studied variables concerning the pandemic influence, the authors used such criteria as a test of differences and network analysis of partial correlations using the EBICglasso regularization method. **Results**. The results of the study showed significant changes in several innovative, value and regulatory characteristics in the conditions of the pandemic, most of which were associated with the gender factor. The restructuring of the network structure of psychological indicators during the pandemic is going in opposite directions in groups of young men and women. The female sample shows attenuation of moderate and strong network relationships during the transition from 2019 to 2020, which means the network structure becomes more amorphous. For the male sample group, the opposite trend is observed – in 2020, initially, the amorphous network structure becomes multiconnected, structured, and clearly expressed. **Discussion**. The non-specific and specific effects of the pandemic on the psychological characteristics that ensure the regulation of vital activity in young men and women aged 17 to 28 years are discussed.

Keywords: innovativeness, creativity, risk for the sake of success, value orientations, readiness for activity, regulation of vital activity, student youth, gender differences, pandemic, network analysis

Highlights:

➢ The nonspecific effects of the pandemic on young men and women were manifested in the growth of such variables as creativity and openness to change.
➢ The specific features of young men in the conditions of a pandemic show their orientation towards proactive behaviour due to the need to solve life tasks through actions aimed at taking risks while reducing personal security.
➢ For young women, the specific effects of the pandemic are associated with a shift in life priorities from the future to the present, with a decrease in life satisfaction, an increase in the value of security, avoidance of proactive behaviours, a weak focus on innovation with a simultaneous increase in creativity.

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Introduction

The global coronavirus pandemic has exposed as much as possible the existing contradictions between the need of modern society to respond effectively to rapidly changing conditions and a person's readiness for appropriate transformations in the context of his life (Zinchenko et al., 2020). Both the transformational processes themselves and the new conditions of human life that arise at the same time require a deep understanding of their psychological content.

The accelerating development of modern civilization is largely due to scientific and technological achievements, based on which it becomes possible to implement numerous innovations in the practice of social and economic activities, as well as in the daily life of most of our contemporaries. Innovation is defined as the successful implementation of new ideas in an organizational environment or "as the intentional introduction and application of ideas, procedures, processes or products that are new to the relevant unit of adoption and designed to significantly benefit the individual, the group, the organization and the wider society" (Schmidt & Lebedeva, 2014, p. 5). Innovation requires employees with innovative behaviour or the ability to implement their new ideas and improve technological processes. Innovations can be incorporated into everyday life only through the innovative behaviour of specific people, which is characterized as "individual actions directed at the generation, introduction and or application of beneficial novelty at any organizational level" (Kleisen & Street, 2001, p. 285).

Since innovative behaviour in the modern world is the source of social systems development, researchers focused on personal, organizational, and sociocultural factors directed at supporting innovation or inhibiting their implementation. At the same time, the phenomena of creativity and risk-taking are also included in the studied problem field, without which the description of the phenomenon of innovativeness will obviously not be complete. The following psychological factors influencing the innovative behaviour of people are considered: individual cognitive characteristics (creativity (Slåtten et al., 2011; Hussain & Wahab, 2021); divergent and convergent thinking (Kenworthy et al., 2021); cognitive styles (Miron-Spektor et al., 2011); personality traits (extraversion, openness to experience, courage, wisdom, originality, optimism, hope, self-efficacy, resilience (viability) (Sameer, 2018), rigidity (Zalevsky, 2004; Pavlova, 2020)); emotional states (positive and negative affects, flow state (Kumar & Bharadwaj, 2016)); regulatory (Bykova, 2017; Pavlova, 2020; Perikova et al., 2020) and intentional processes (motivation, value orientations, socio-psychological attitudes) (Lebedeva et al., 2020; Pavlova, 2020).

The above psychological factors in Russian psychology are united by the concept of 'human innovation potential', which includes three main blocks: personality traits, competence (project competence, communicative competence, information competence), vitality (features of the value-sense organization of the life world, resilience, sovereignty, ability to work, mobilization potential, level of self-regulation, the orientation of a person to a certain quality of life) (Klochko, Galazhinsky, 2009). In foreign psychology, the concept of 'psychological capital' is used to describe such phenomena, which, by forming a focus on innovative behaviour, contributes to improving the efficiency and competitiveness of an organization, as well as ensuring the quality of an employee's working life (Ratnaningsih et al., 2016). These psychological indicators may be culturally conditioned and have varying degrees of severity in certain social groups, which makes it hard to generalize empirical studies of the phenomena under consideration and the results obtained in this direction are characterized by fragmentation and sometimes inconsistency.

Value orientations significantly influence people's goals and actions and are also the most important driving forces of behaviour in organizational conditions. Therefore, this paper will also include the study of personal values, which, according to several authors, are the most significant variables associated with innovativeness (Anderson et al., 2014; Sousa & Coelho, 2011). Modern research states that the three structural components of the value of conservation (in the model of value orientations by Schwartz), which are tradition, conformity, and security, are negatively associated with creative achievements (Dollinger et al., 2007). People who highly rate the conservation values were less creative compared to those who have the highest regard for the values of openness to change (Sousa & Coelho, 2011). These values are positively associated with innovation and creativity (Arieli & Tenne-Gazit, 2017). It was found that the values of self-enhancement of employees are positively associated with their innovative behaviour, while the values of conservation and self-overcoming are negatively associated with it (Purc & Lagun, 2019). The study of innovative characteristics and personal values of employees of firms in Vietnam allowed us to conclude that the values of universalism and benevolence positively influence innovative behaviour (Le et al., 2021). The study results of employees in Korean and Chinese organizations using the methodology of G. Hofstede showed that the value of power distance is negatively related to organizational innovation behaviour, and the value of avoiding uncertainty is positively related (Kim & Zhou, 2018).

The values of openness to change have a significant positive, and the values of conservation have a significant negative influence on the innovative behaviour of employees in Russian organizations (Schmidt & Lebedeva, 2014). A later study by the authors confirmed these results and also showed that perceived self-efficacy moderates the influence of values of openness to change on innovative behaviour in organizations (Lebedeva et al., 2020). It was found that the values of 'modesty', 'conformity – rules', 'security: personal', and 'tradition' prevent the adoption of innovations in the adult (over 45 years old) generation of Russians. And the value of 'security: public', on the contrary, stimulates the adoption of innovations (Fedotova, 2017). Among young people (up to 25 years old), the values of 'independence of thought', 'stimulation', 'achievement', 'power: dominance', and 'power: resources' stimulate the adoption and implementation of innovations and the values of 'universalism: caring for others', 'conformism:

interpersonal', 'security: public' 'security: personal', on the contrary, hinder the adoption of innovations (Fedotova, 2017).

Many studies have noted that the innovative behaviour of individuals is not self-sufficient but rather represents a response function during the continuous process of an individual's interaction with emerging situations that are characterized by organizational and social impacts. Encountering such situations in the presence of adequate resources (which include the person's psychological resources) can contribute to innovative behaviour. The increased density and intensity of non-standard life or organizational situations can have an ambiguous effect on the introduction of innovations. In this regard, the problem arises of studying the nature of the transformation of innovative behaviour in conditions of significant global changes (economic crises, pandemics, etc.), which may also be accompanied by changes in value orientations or regulatory characteristics of people.

In modern studies of personality values, it has been found that in conditions of significant social changes, their structure changes: the high conservation value intensification and the reduction of the value of openness to change directly after the peak of the economic crisis of 2008 – in 2009 and 2010, in comparison with the earlier time (Sortheix et al., 2019). It is noted that in the conditions of the COVID-19 pandemic, most people should expect a decrease in commitment to the values of self-enhancement and openness to change, as well as an increased commitment to the values of self-transcendence and conservation (Wolf et al., 2020). The results of an empirical study showed that under the conditions of the pandemic (2020), students exhibited an intensive increase in the conservation value level, the role of this variable in the structure of the psychological system of ensuring the vital activity of young people and a decrease in the role of the value of openness to change (Filenko & Bogomaz, 2022). These changes were accompanied by the transformation of the indicators of the regulatory sphere, in particular – an intensive decrease in the variables of planning, reflection, and general readiness for activity. However, in the study of Perikova & Byzova (2022), using the example of students of natural science training areas, it was shown that during the COVID-19 pandemic, there was a statistically significant increase in metacognitive awareness and intrapersonal emotional intelligence in comparison with the indicators of a similar sample in the pre-pandemic period, while reducing the degree of interpersonal emotional intelligence.

It should also be considered that certain social groups show specific reactivity concerning difficult life situations. Thus, many studies have described significant differences between men and women in emotional and behavioural manifestations during the pandemic. In particular, women are at increased risk of anxiety disorders, depression, and loneliness, which is reflected in a decrease in their mental health indicators compared to men (Gonzalez–Sanguino et al., 2020; Li & Wang, 2020). It is noted that the pandemic had a more pronounced negative influence on the levels of stress, mental health, social isolation, and academic performance of female students compared with male students (Prowse et al., 2021). It was found that female students, unlike male peers, are more likely to use unproductive strategies for coping with stress during the COVID-19 pandemic (Hagan et al., 2022). These and other works create prerequisites for the study of the specifics of changes in psychological characteristics during the pandemic in connection with the sexual differences of people.

The need to further study the role of personal and environmental factors in the formation of innovative behaviour of our contemporaries is the basis for *the purpose of this study* – to identify changes in the characteristics and informativeness, regulation of life and value orientations of students in the conditions of the COVID-19 pandemic, considering the sex factor.

Methods

The study sample included 460 students studying in Tomsk (79.5 % of the sample) and other Russian cities (Moscow, St. Petersburg, Novosibirsk, Kemerovo, and Sochi). The age of the respondents ranged from 17 to 28 years inclusive (19.8 ± 1.8 years). The sample was formed by two equal groups of 230 people: group 1 (participated in the 2019 study, before the pandemic), average age 19.4 ± 1.2 years, 40.9 % – men; group 2 (2020 study, during the pandemic), average age 20.3 ± 2.2 years, 33.5 % – men.

The following methods were used in the study: the scale "Self-Assessment of Personality's Innovative Qualities" (Lebedeva & Tatarko, 2009); the methodology of Personal Readiness for Activity (PRA) (Atamanova & Bogomaz, 2018; Filenko et al., in print) and the questionnaire "Portrait Value Questionnaire-Revised (PVQ-R)", developed by Schwartz, modified by K. V. Sugonyaev (Schwartz et al., 2012; Sugonyaev, 2018).

The scale "Self-Assessment of Personality's Innovative Qualities" includes 12 statements, the quantitative assessment of which is carried out using a 5-point Likert scale, which allows determining the following indicators: creativity (4 points); Risk for the sake of success (4 points); focus on the future (4 points), and also the general index of personality innovativeness, which is calculated as the arithmetic mean on all 3 scales. The methodology of personal readiness for activity includes five scales: 'goal setting' (4 points) and 'planning' (3 points), developed based on the methodology "Self-Organization of Activity Questionnaire" (Mandrikova, 2010), while the initial indexes were converted from a 7-point evaluation scale to 5-point; 'reflection' (developed based on the questionnaire "Differential Test of Reflection (DTR)" (Leont'ev & Osin, 2014)), includes 6 of the most informative items out of 12 primary ones, which are measured on a 5-point scale; the scale 'Life satisfaction' based on the scale of the same name by E. Diner (Osin & Leont'ev, 2020) – 4 points are used, which are evaluated on a 5-point scale; a general scale measuring the total 'personal readiness for activity index'. In the method of Schwartz (modified by K. V. Sugonyaev), the points were evaluated using a 5-point Likert scale. In this paper, the following primary variables were analyzed: 'security: public' and 'security: personal' (the 'security index' was calculated as the arithmetic mean of the mentioned scales); 'traditions', 'conformism – interpersonal', 'conformism – rules', 'modesty' (the index of the value of the highest was calculated according to them of the order 'conservation', hereinafter 'conservation metavalue'); 'independence – thoughts', 'independence – actions'; 'stimulation' (according to them, the index of the value of the highest order 'openness to change' (hereinafter referred to as the 'openness metavalue') was calculated.

Data processing was conducted in the IBM SPSS Statistics 10.0 and jasp 0.14.1 programs. Primary statistics were determined in the study, and the nonparametric Mann–Whitney U-test, parametric Student t-test, and test related to the Bayes factor calculation (Bayes factor10) were used. Network analysis of partial correlations for the studied indicators was conducted using the EBICglasso regularization method.

Results

Table 1 presents the results of descriptive statistics for the general group of respondents.

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Table 1

Descriptive statistics for the general group of respondents (N = 460)

Variables	Average mean	Median	Standard deviation	Skewness	Skewness standard error	Kurtosis	Kurtosis standard error
Creativity	3.8	3.75	0.73	–0.502	0.114	0.029	0.227
Risk for the sake of success	3.23	3.25	0.744	–0.032	0.114	–0.181	0.227
Focus on the future	3.56	3.5	0.672	–0.32	0.114	0.268	0.227
Innovativeness index	3.53	3.50	0.558	–0.031	0.114	0.277	0.227
Goal-setting	3.77	3.75	0.829	–0.628	0.114	0.163	0.227
Planning	3.23	3.33	1.14	–0.113	0.114	–0.955	0.227
Reflexion	3.98	4	0.663	–0.891	0.114	1.210	0.227
Life satisfaction	3.02	3	0.812	–0.237	0.114	–0.129	0.227
PRA index	3.50	3.54	0.590	–0.315	0.114	–0.135	0.227

Variables	Average mean	Median	Standard deviation	Skewness	Skewness standard error	Kurtosis	Kurtosis standard error
Openness metavalue	4.03	4	0.516	–0.19	0.114	–0.249	0.227
Conservation metavalue	3.57	3.56	0.488	–0.118	0.114	0.368	0.227
Security index	4.1	4	0.592	–0.526	0.114	0.487	0.227

PRA index – personal readiness for activity index.

At the first stage of statistical data analysis, the criteria of difference were applied (Student's t-test for variables with normal distribution and Mann–Whitney U-test for deviation of distributions from normal) to compare the studied variables before the pandemic (2019) and during the pandemic (2020) (Table 2). The factor was also calculated Bayes$_{10}$, which was used as an alternative measure of differences (Jarosz & Wiley, 2014; Garcia & Puga, 2018).

Table 2

Comparative characteristics of psychological indicators of groups 1 and 2 using Student's t-test, Mann–Whitney U-test and Bayes Factor$_{10}$

Indicators	Group	Average mean	Student's t-test statistics (significance of differences, p)	Statistics of the Mann–Whitney U-test (significance of differences, p)	Bayes Factor$_{10}$
Creativity	1	**3.65**		**20011 (< 0.001)**	**645.9**
	2	**3.94**			
Risk for the sake of success	1	3.26	0.878 (0.381)		0.150
	2	3.20			

Indicators	Group	Average mean	Student's t-test statistics (significance of differences, p)	Statistics of the Mann–Whitney U-test (significance of differences, p)	Bayes $Factor_{10}$
Focus on future	1	**3.49**	**–2.337 (0.020)**		**1.445**
	2	**3.64**			
Innovativeness index	1	**3.47**	**–2.39 (0.017)**		**1.62**
	2	**3.59**			
Goal-setting	1	3.81		25760 (0.627)	0.175
	2	3.73			
Planning	1	**3.40**		**22170 (0.003)**	**10.511**
	2	**3.07**			
Reflexion	1	4.04		24665 (0.209)	0.645
	2	3.92			
Life satisfaction	1	3.05	0.890 (0.374)		0.152
	2	2.99			
PRA index	1	**3.57**	**2.72 (0.007)**		**3.65**
	2	**3.43**			

Indicators	Group	Average mean	Student's t-test statistics (significance of differences, p)	Statistics of the Mann–Whitney U-test (significance of differences, p)	Bayes $Factor_{10}$
Openness metavalue	1	4.00	–1.407 (0.160)		0.270
	2	4.07			
Conservation metavalue	1	3.60	1.275 (0.203)		0.227
	2	3.54			
Security index	1	4.06		23901 (0.071**)**	0.250
	2	4.14			

The results for indicators showing statistically significant differences ($p < 0.05$) are highlighted in bold. PRA index – personal readiness for activity index.

From the results given in Table 2, it follows that during the pandemic, there is a significant increase in indicators: 'creativity' – from 3.65 to 3.94 points ($p < 0.001$); 'Focus on the future' – from 3.49 to 3.64 points ($p = 0.020$); 'innovativeness index' – from 3.47 to 3.59 points ($p = 0.017$); as well as the tendency to increase the variable 'security index' – from 4.06 to 4.14 points ($p = 0.071$). A significant decrease in indicators was found: 'planning' – from 3.40 to 3.07 points ($p = 0.003$); 'PRA index' – from 3.57 to 3.43 points ($p = 0.007$).

Since modern publications describe significant differences in emotional and behavioural manifestations during the pandemic in men and women (Gonzalez-Sanguino et al., 2020; Li & Wang, 2020; Prowse et al., 2021; Hagan et al., 2022), the second stage of the study compared the subgroups of 2019 and 2020 G. in separate samples of men and women. Sample size: men before the pandemic (2019), N1 = 94 people during the pandemic (2020), N2 = 78 people; women before the pandemic (2019), N1 = 136 people, during the pandemic (2020), N2 = 152 people. At the same time, distribution indicators were also determined for these subgroups, after which a decision was made on the application of parametric or nonparametric difference criteria. The results of this stage are presented in Table 3.

Table 3

The results of the psychological indicators comparison between "before" and "during" the pandemic, separately for young men and women

Indicators	Group	Men $N_1 = 94$, 2019; $N_2 = 78$, 2020				Women $N_1 = 136$, 2019; $N_2 = 152$, 2020			
		Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor$_{10}$	Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor$_{10}$
Creativity	1	**3.70**	**–2.088 (0.038)**		**1.232**	**3.62**		**7564**	**110.787**
	2	**3.92**				**3.95**			
Risk for the sake of success	1	3.43	0.037 (0.970)		0.166	3.14	0.782 (0.435)		0.174
	2	3.43				3.07			
Focus on the future	1	**3.51**	**2.888 (0.004)**	**2501 (< 0.001)**	**7.465**	3.48	–0.873 (0.383)		0.187
	2	**3.82**				3.54			

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Indicators	Group	Men N_1 = 94, 2019; N_2 = 78, 2020				Women N_1 = 136, 2019; N_2 = 152, 2020			
		Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor$_{10}$	Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor$_{10}$
Innovativeness index	1	**3.55**		**2799 (0.008)**	**0.945**	3.41	–1.79 (0.075)		0.593
	2	**3.72**				3.52			
Goal-setting	1	3.76	0.488 (0.626)		0.185	3.85		9989 (0.621)	0.213
	2	3.69				3.75			
Planning	1	2.99	0.251 (0.802)		0.171	**3.68**	**4.425 (< 0.001)**		**1161.976**
	2	3.03				**3.09**			
Reflection	1	3.99		3329 (0.297)	0.303	4.07		9686 (0.355)	0.479
	2	3.88				3.94			

Indicators	Group	Men N_1 = 94, 2019; N_2 = 78, 2020				Women N_1 = 136, 2019; N_2 = 152, 2020			
		Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor$_{10}$	Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor$_{10}$
Life satisfaction	1	2.80	0.821 (0.413)		0.226	**3.23**	**2.225 (0.027)**		**1.357**
	2	2.91				**3.03**			
PRA index	1	3.39	0.079 (0.937)		0.166	**3.71**	**3.68 (< 0.001)**		**73.025**
	2	3.38				**3.45**			
Openness metavalue	1	4.04	–0.379 (0.705)		0.177	3.97	–1.553 (0.122)		0.408
	2	4.07				4.07			
Conservation metavalue	1	**3.59**	**2.877 (0.005)**		**7.248**	3.61	–0.413 (0.680)		0.141
	2	**3.37**				3.63			

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Indicators	Group	Men N_1 = 94, 2019; N_2 = 78, 2020				Women N_1 = 136, 2019; N_2 = 152, 2020			
		Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor$_{10}$	Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor$_{10}$
Security index	1	3.97	1.064 (0.289)		0.280	**4.13**	**–2.395 (0.017)**		**1.961**
	2	3.87				**4,28**			

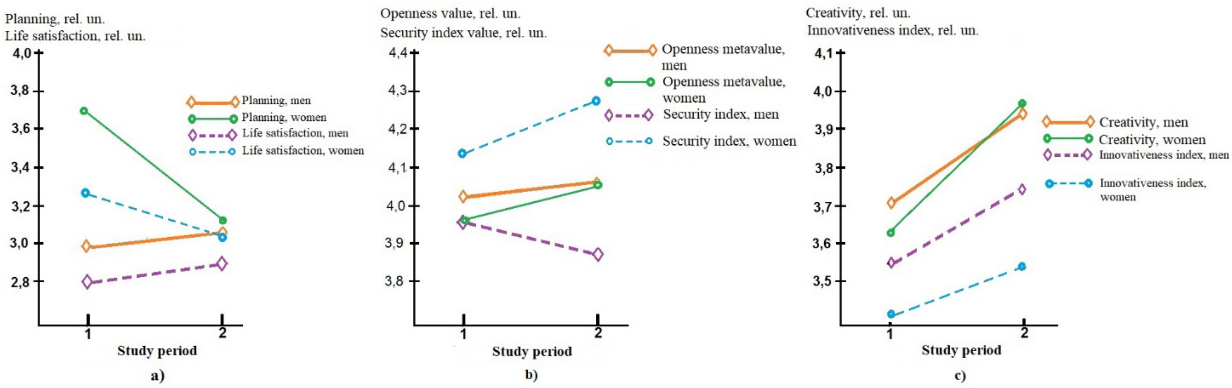
PRA index is Personal Readiness for Activity index. Bold font indicates results for variables showing statistically significant differences (p < 0.05).

Table 3 shows that in 2020, compared to 2019, both men and women had a significant increase in the 'creativity' indicator (for men, from 3.70 to 3.92 points, $p = 0.038$, for women, from 3.62 to 3.95 points, $p < 0.001$). However, other variables are characterized by specific changes in connection with sex of the respondents. In particular, for men, a significant increase is observed for the characteristics 'focus on the future' (from 3.51 to 3.82 points, $p = 0.004$), and 'innovativeness index' (from 3.52 to 3.72 points, $p = 0.008$) (for women, only a tendency to differences for this indicator was revealed – it increases from 3.31 to 3.52 points, at $p = 0.075$). In men, the indicator 'conservation metavalue' is significantly decreased – from 3.59 to 3.37 points, $p = 0.005$. In women, the following indicators significantly decrease: 'planning' – from 3.68 to 3.09 points, $p < 0.001$; 'life satisfaction' – from 3.23 to 3.03 points, $p = 0.027$; 'PRA index' – from 3.71 to 3.45 points, $p < 0.001$. An increase in the 'security index' indicator is also observed – from 4.13 to 4.28 points, $p = 0.017$.

Figure 1 indicates changes in psychological characteristics that showed the most significant differences between groups of young men and women "before" and "during" the COVID-19 pandemic.

Figure 1

Changes in psychological characteristics that showed the most distinctive differences between groups of young men and women «before» and «during» the COVID-19 pandemic: 1 – 2019-year data; 2 – 2020-year data.



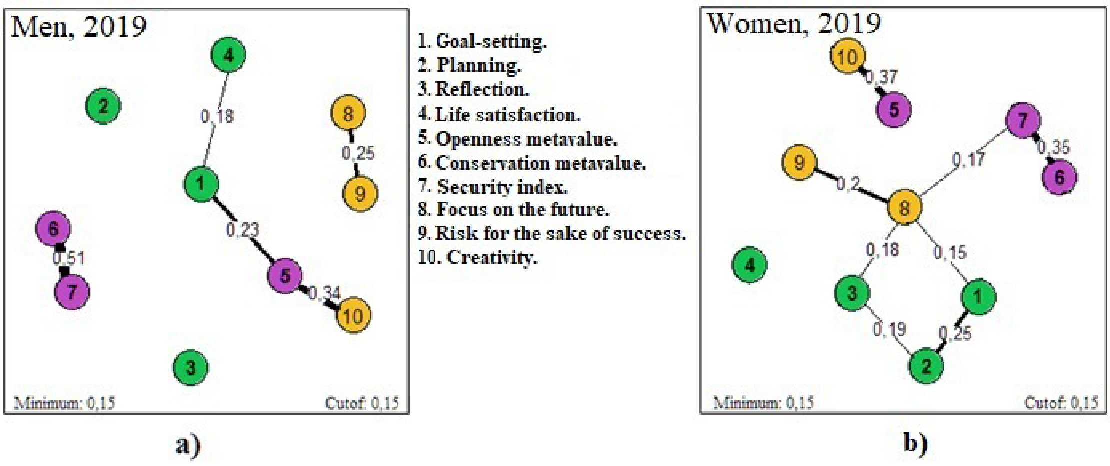
Of greatest interest are the opposite trends in connection with the transformation of the following indicators in men and women: ‘planning’ (Fig. 1a), ‘life satisfaction’ (Fig. 1a), ‘security index’ (Fig. 1b), as well as a significant increase in the indicator ‘creativity’ in women, which before the pandemic had values lower than in men, and during the pandemic exceeded values found in men (Fig. 1c).

To detail the patterns of changes in psychological characteristics, considering the sex factor, in the third stage of the study, a partial correlation network analysis was carried out using the EBICglasso regularization method (Artemenkov, 2021; Epskamp et al., 2018). The results of which are presented for groups of men (Fig. 2a, Fig. 3a), and women (Fig. 2b, Fig. 3b), before the pandemic (2019), and during the pandemic (2020). The network structures shown in the figures are limited by the minimum value of the correlation coefficient r = 0.15 to highlight the most significant connections for analysis. For these network structures, their statistical stability was also assessed based on the calculation of 95 % confidence intervals for each edge using the bootstrap procedure (number of extractions N = 1000) according to modern recommendations (Epskamp et al., 2018). The bootstrap results showed that the edges of the networks shown in Fig. 2a, 3a, 3b, with correlation coefficients r ≥ 0.2 are characterized by sufficient reliability, that being said, they are likely to be reproducible in similar studies in other groups. All edges shown in Fig. 1a, as well as edges in other figures with correlation coefficients r < 0.2, are less reliable, so their analysis should be approached with caution.

In addition, the network sparseness coefficients were calculated, which for the group of men changed from 0.667 to 0.556, and for the group of women from 0.556 to 0.442. In both groups, the sparseness of the network decreased, that is, the networks became solid, more saturated with numerous correlations. However, these changes in men are more characteristic of moderate and strong connections with r > 0.15, and in women – of weak connections with r < 0.15.

Figure 2

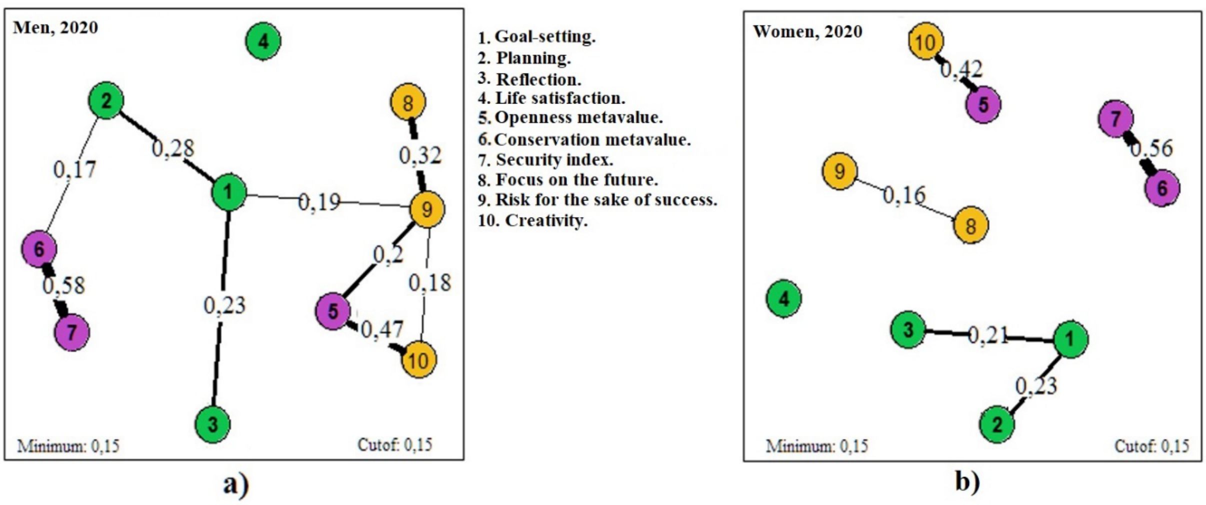
Partial correlation networks for groups of young men (a) and women (b) in the pre-pandemic period, 2019.



The value indicators nodes are highlighted in purple; in green – the indicators of the personal readiness for activity (PRA) scale; brown – for the methodology "Self-Assessment of Personality's Innovative Qualities" (SAPIQ); the numbers indicate the coefficients of partial correlations.

Figure 3

Partial correlation networks for groups of young men (a) and women (b) during the pandemic period, 2020.



The figure legend is the same as in Figure 2.

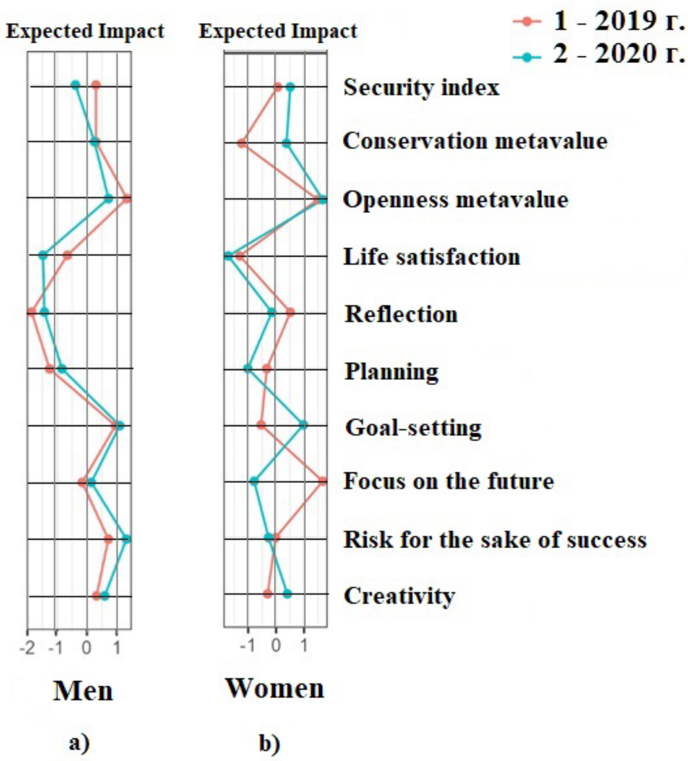
The results presented in Figures 2 and 3 allow us to draw the following conclusions:

– Indicators that measure innovative, regulatory, and value characteristics are more connected to their related scales, forming certain microclusters (for example, 'conservation metavalue – security index' and 'focus on the future – risk for the sake of success' in Fig. 2a).
– There are nodes that connect different microclusters; for example, the 'focus on the future' indicator in Fig. 2b links together the characteristics related to various psychological aspects – value, regulatory, and innovative. In Fig. 3a, a similar function is performed by the indicator 'risk for the sake of success'.
– The change in the network structure for men and women during the pandemic heads in opposite directions, which is manifested in the weakening of moderate and strong relationships for the female sample during the transition from 2019 to 2020, that is the network structure becomes more amorphous. For the male sample, the opposite trend is observed: in 2020, the initially amorphous network structure becomes multiply connected, structured, and clearly expressed.

In the fourth stage, central measures (centrality indices) were calculated for networks of partial correlations – betwenness, proximity, and strength (Artemenkov, 2021; Epskamp et al., 2018), on the basis of which, for each node (indicator), the characteristic of the expected impact for subgroups of men and women in 2019 and 2020 was determined (Fig. 4).

Figure 4

Values of expected impact indicators in partial correlation networks for young men and women in 2019 and 2020.



From the data in Figure 4, it follows that in 2019, for young men, the most significant nodes in terms of the degree of network impact were the nodes 'openness metavalue', 'goal-setting', and 'risk for the sake of success'; and the least significant is the 'reflection' node. In 2020, the 'risk for the sake of success' node becomes the leading center, the second and third most important nodes are the 'goal-setting' and 'openness metavalue'.

For young women in 2019, 'focus on the future' and 'openness metavalue' had the most impact on the network structure. In 2020, the leading nodes were: 'openness metavalue', 'goal-setting', 'security index'.

Discussion

The differences in the changes in the indicators of personality innovation in young men and women during the pandemic (Table 3) could be mediated by specific changes in the values of the representatives of these groups. For women, the priority of the conservation and security values increases significantly, while for men, in contrast, these values become less significant in the pandemic (Table 3). This is consistent with the findings (Purc & Lagun, 2019; Schmidt & Lebedeva, 2014; Fedotova, 2017), showing that increased commitment to conservation and security values negatively impacts innovation behavior.

Another factor contributing to differences in the presence of innovativeness among men and women during the pandemic are the peculiarities of the regulation of their activities. In particular, the personal system of ensuring the vital activity, including cognitive resources for regulating behavior (goal-setting, planning, reflection), under new difficult conditions, in young men turn out to be more stable (their 'PRA index' and the 'planning' indicator remain practically unchanged in 2020, compared to 2019). In young women there are significant decreases in its basic characteristics (first of all, the indicators 'PRA index' and 'planning', Table 3). In other words, men are able to use their regulatory resources during the pandemic to the utmost, as they were before it began, while for women these resources are largely blocked during the pandemic. One can assume that this blockage is most likely due to the specifics of the perception of possible risks to personal health, which is reflected in negative emotional states (increased levels of stress, mental tension, state anxiety, depression), which, as recent studies show, are more expressed in groups of women compared to men (Gonzalez-Sanguino et al., 2020; Li & Wang, 2020; Prowse et al., 2021).

An analysis of the network of partial correlations confirms these conclusions, since in the network structures of 2020 for women (Fig. 3b) we see a decrease in systemic relationships for moderate and strong correlations compared to 2019 (Fig. 2b). That is, the personal system of ensuring vital activity in its most significant respects becomes more amorphous, simple, and semi-structured. In 2020, the 'security-conservation' dyad (microcluster 1) becomes the leading one for women, and the 'openness-creativity' dyad (microcluster 2) becomes the second most important connection, which ensures active behavior under difficult conditions. However, the activity of microcluster 2 is determined mainly by the features of its weak connections with microcluster 1 and its dominant (in life perspective) functioning. Due to this, the active behavior of women in many aspects is limited by attitudes toward increased safety and the preservation of their health, as well as

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the rejection of any behavioral risk (including those associated with innovative practices) in the pandemic. These attitudes will lead them to prefer avoidance coping strategies. At the same time, risk taking is one of the components of innovative behavior. Therefore, the structural features of network relationships in the women's group also create prerequisites for understanding weak changes in innovative behavior among women in 2020 compared to 2019.

The men group is characterized by other regularities in the functioning of network structure. In particular, in the period of 2020, two mesoclusters can be distinguished in it (Fig. 3a). The first of them includes 4 elements associated with such indicators as 'openness metavalue', 'risk for the sake of success', 'creativity', 'focus on the future'. Meanwhile, the central node of this structure is the 'risk for the sake of success' indicator. In other words, men take a proactive form of behavior in the pandemic, focused on being open to challenges, taking risks and overcoming them in possible innovative ways. That being said, men have an increased growth in the innovation indicator. These results are consistent with other researchers (Arieli & Tenne-Gazit, 2017; Schmidt & Lebedeva, 2014), who found positive impacts of the value of openness to change on innovation processes. The second mesocluster includes three nodes (Fig. 3a): 'planning', 'conservation metavalue', 'security index'. Although in this mesocluster the correlation between the values of conservation and security is almost the same in strength as in the female group, it remains open for interaction with other elements and clusters, which as a whole form one megacluster that combines 9 out of 10 studied indicators into a system of integral relationships. This megacluster is connected to two central nodes for its functioning ('goal-setting' and 'risk for the sake of success'), which can be considered as a systemic polycentric formation. It is the basis for the vital functioning of young men in the pandemic.

That is, young men are building their proactive actions in difficult life circumstances in the context of the pandemic based on the actualization of goal-setting as a means of overcoming risk using innovative approaches. This is also evidenced by the data presented in Fig. 4a, from which it follows that in 2020, in young men the node 'risk for the sake of success' becomes the most significant in terms of the degree of network impact; and the second most important is 'goal-setting'.

For young women, the disappearance of the 'focus on the future' indicator from the group of system-forming factors (factors of maximum expected impact (Fig. 4b)), and the inclusion of the 'security index' indicator in this group imply that women's high activity aimed at the future is suppressed. Concurrently, the current vital activity, largely determined by the need to maintain personal security, turns out to be low, because it is framed by instrumental factors (there are no appropriate methods or approaches to overcome new life risks) and the avoidance of any forms of activity for the sake of maintaining personal safety and health. Ultimately, it will lead to a decrease in the innovative capacity of women during the pandemic.

Based on the processing, analysis and interpretation of data, the following *conclusions* can be obtained:

1. The results obtained indicate significant changes in the innovative characteristics, processes of regulation of vital activity, and the system of value orientations of student youth, which are associated with the pandemic situation. The nonspecific effects of the pandemic have shown themselves in some general aspects characteristic of young men and women: in particular, in a significant increase in creativity and a moderate increase in openness to change indicators.
2. Specific features are reflected in a greater shift in value priorities from the tasks of the future to solving the problems of the present (for women), and in reverse trends (for men), as well as in a greater orientation of men toward proactive behavior. It is explained by the need to solve life problems through actions related to risks and reducing personal security, as well as through the intensive use of the potential of innovative behavior and regulatory resources (planning, the general level of personal readiness for activity).
3. For women, a shift in life priorities from the future to the present in conditions of increased risk levels leads to a significant decrease in life satisfaction, an increase in the value of security, and less active behavior poorly oriented toward innovation, to a decrease in the levels of regulatory processes (planning). It is compensated through an increase in the creativity indicator, allowing one to solve several new problems of ensuring one's vitality.
4. The results presented in the article indicate the need to use new approaches to the methodology of modern research that study dynamic processes in complex social and psychological systems. This way, one can enhance the understanding of the considered phenomena and re-evaluate the patterns found due to the transition from the use of criteria of difference, regression and factor models to network analysis.

The results obtained can serve as the basis for the development of systemic psychological and pedagogical measures to develop readiness for innovative behavior, mobilize personality resources to overcome risks, and increase the vital capacity of young people in conditions of intense global changes, considering the factor of sex and age characteristics.

The limitations of this study are related to the choice of indicators and methods used, as well as the relatively small age range (from 17 to 28 years) of the respondents who participated in the study. However, these limitations did not affect the representativeness of the results obtained and the description of the possible psychological mechanisms that characterize its features.

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Author Contributions

I. A. Filenko conducted statistical analysis of the data, carried theoretical analysis of the literature, interpreted the results, and prepared the text of the article.
I. V. Atamanova collected empirical data, interpreted the results, edited the text of the article, designed the text of the article in accordance with the requirements of the journal.
S. A. Bogomaz developed the research methodology, collected empirical data, interpreted the results, edited the text of the article.

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The Relationship Between Social Media Use and Life Satisfaction and Loneliness in Adolescents

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Abstract: Introduction. Active social media use has both positive and negative effects on psychological well-being. Recently, research in this field has explored the links between psychological well-being and social media use by considering various factors such as personality traits and motives for use. A question of particular relevance is how indicators of social media use, characteristics of psychological well-being and the extent to which social media is incorporated into the daily lives of adolescents are related. The novelty of the current work is the study of the mediating role of loneliness in the relationship between life satisfaction and social network use, which is particularly important for adolescents as active users. The purpose of this study is to examine the relationships between life satisfaction, loneliness and the incorporation of social media into daily activity, as well as the formal parameters of social media use. Methods. The study sample consisted of 391 adolescents between the ages of 13 and 18. Formal indicators of social media use were identified as follows: time spent using social media, the number of social networks used and the number of friends in social networks. The Social Media Integration Scale (M. A. Jenkins-Guarnieri et al.), the Life Satisfaction Scale (E. Diener; adapted by D. A. Leontiev, E. N. Osin) and the Three-Point Loneliness Scale (A. Sirola et al.) were also used. Results. Life satisfaction was found to decrease and the experience of loneliness increase with increased incorporation of social media into the daily activities of adolescents. Formal indicators contributed little to overall life satisfaction and loneliness. Loneliness and life satisfaction were found to mediate reciprocal relationships regarding the incorporation of social networks into daily activities. Discussion. Overall, the avoidance of loneliness through active social media use reinforced life dissatisfaction, especially for girls.

Keywords: social networks, adolescents, psychological well-being, loneliness, life satisfaction, social media, internet, number of friends, regression analysis, mediation

Highlights:

- The use of social media and preference for interaction with others through social networking is more characteristic of adolescent girls.
- The integration of social media into daily activities decreases adolescents' life satisfaction and loneliness – this effect is more pronounced for girls.
- Life satisfaction and loneliness are reciprocal mediators, reinforcing the negative effects of integrating social media into daily activities.

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Introduction

The development and use of social media has led to it becoming an integral part of everyday life for adults and children. Active use of social networks has caused the emergence of new research problems, one of which is the nature of the relationship between psychological well-being and the degree of social media engagement (Jenkins-Guarnieri et al., 2013; Sobkin & Fedotova, 2021; Rostovtseva et al., 2022; Gorlova et al., 2021). To date, there are several concepts describing social media activity, such as intensity of use (Ellison et al., 2007), behavior-oriented or compulsive use, which, based on the criteria of addictive behavior, considers social media activity as normative, but having a tendency to form behavior associated with constant online presence (Elphinston & Noller, 2011), and problematic internet use (Gerasimova & Holmogorova, 2018).

One way of describing the psychological component of social media use that combines behavioural and emotional characteristics is by understanding the integration of social media into daily activity (Jenkins-Guarnieri et al., 2013). Social media is investigated as a broad concept due to the existence of various forms of presenting information (content) on social media i.e., text messages, videos, audio files, pictures, or a combination. In general, the integration of social media is seen as a behavioural characteristic associated with various online actions, and as an emotional component of communication via social networks, where the lack of availability of social media leads to the experience of negative emotions. In contrast to formal parameters of social network use, such as time spent online or number of friends, the notion of integration draws attention to the role that social networks play in daily activities and the importance of maintaining communication and experiencing positive emotions when online.

Psychological well-being and the use of social media

The role of various aspects of social media use and activity related to social media engagement to promote psychological well-being has been extensively investigated in recent decades. To date, it can be said that there is evidence to the contrary. Positive effects of social media use on psychological well-being have been demonstrated for students with low self-esteem or life satisfaction (Ellison et al., 2007). Negative effects on psychological well-being depend on time spent on social media, number of friends, and propensity to engage in addictive behaviour (Suntsova & Burdyko, 2018). One of the most studied components of psychological well-being is loneliness; a feeling or emotional experience characterized by a sense of abandonment and loss of connections with other people (Sirola et al., 2019). It has been shown that the formal indicators of social media use are negatively correlated to the experience of loneliness (Gorelova & Inozemtsev, 2020). However, research also demonstrates the inverse, where a decrease in loneliness occurs upon increased social network use, both in the form of status updates and an increase in the frequency of contact with online friends (Ryan & Xenos, 2011; Lou et al., 2012).

The involvement of communication skills and personality traits in psychological well-being remains a separate matter of debate. For example, there is evidence that when communication skills are highly developed, there is no negative impact on psychological well-being when using social media; when offline communication skills and introversion are low, online interactions can lead to improved psychological well-being (Bruggeman et al., 2019; Kim et al., 2009). However, using social media as a means to escape loneliness has a negative effect (Teppers et al., 2014). A 'balanced approach', which considers the positive impact of moderate use of digital devices on psychological well-being, is promising (Przybylski & Weinstein, 2017).

Due to ambiguity in the results of empirical research regarding the links between psychological well-being and social media use, an approach (Bochaver et al., 2019) that would consider different factors and non-linear relationships between psychological characteristics and features of the digital environment seems promising. In particular, a study that considered the effect of motivational and communicative factors on the relationship between loneliness and the number of online friends found that social networking and compensatory motives increase the desire for openness and online communication, leading to more friends (Hood et al., 2018).

The current study investigates the links between life satisfaction, loneliness, and the integration of social media in daily activities, as well as the formal parameters of social media use. The basis for this study was the work of Phu & Gow (2019), which made similar assumptions, but the results were obtained on a sample of 18–29-year-olds. This study involved a sample of adolescents. Based on the existing research, it can be assumed that life satisfaction and loneliness will decrease with increased activity in the use of social media. However, the question arises regarding the relationship between life satisfaction and loneliness in the context of active use of social media. The following research questions have therefore been posed:

1. How does the integration of social media into daily activity and the formal indicators of social media use contribute to life satisfaction and loneliness?

2. What formal quantitative indicators of social media use contribute to life satisfaction and loneliness?

3. (a) Is it possible to talk about a mediating influence of loneliness and life satisfaction in the relationship between the integration of social networks in daily activities and indicators of psychological well-being? (b) Does life satisfaction mediate the relationship between integration of social networks in daily activities and loneliness? (c) Does loneliness mediate the relationship between life satisfaction and number of friends, as shown in Phu & Gow (2019)?

4. What role does gender play in the relationship between the indicators of social network integration in daily activity and formal indicators of social media use with measures of psychological well-being? The gender factor appears to be significant when examining the intensity of social networking activity, as many studies have shown that women tend to use social networks more often (Frison & Eggermont, 2016; Kornienko & Rudnova, 2018).

Methods

Participants

The study involved 439 adolescents, but the final sample consisted of 391 adolescents aged 13 to 18 years (M = 15.6; SD = 1.18; 54 % were girls) living in the Russian Federation. The exclusion of some respondents was due to a subsequent normality test, which revealed a significant asymmetry in the variables "number of hours per week spent on social media" and "number of friends on social media". As a result, the sample was restricted to respondents spending 24 hours or less on social media and having 500 or fewer friends on their social media profile.

Methodology

The formal characteristics of social networking use i.e., time spent on social networks, number of social networks and number of friends on social networks, were established using the following questions: "what social networks do you use?" (multiple choice), "time (in hours) spent in social networks", and "number of friends in the main social network".

The Social Media Use Integration Scale (Jenkins-Guarnieri et al., 2013) was used to assess the degree of behavioural and emotional involvement of an adolescent in a social network: how much social network-related activity is represented in daily practice. The original version of the scale was designed for the social network Facebook (hereinafter: Facebook is the social network of the company Meta, recognized as extremist in 2022; banned in Russia). The name of the social network was replaced with the phrase sozial'naya set' (or social network) to make the scale more universal. Prior to the start of the survey, participants were instructed to focus on the social network they use most often or consider to be their primary social network. The scale contains 10 questions, with response options ranging from 1 (strongly disagree) to 5 (strongly agree).

E. Diener's Satisfaction with Life Scale (SWLS) was used to diagnose subjective psychological well-being (Osin & Leontiev, 2020). The scale contains five questions, with response options ranging from 1 (strongly disagree) to 5 (strongly agree).

The Three-Item Loneliness Scale was used to determine the overall experience of loneliness (Sirola et al., 2019). The scale includes three questions with response options 1 (almost never), 2 (sometimes), and 3 (often).

Statistical analysis

Testing for normality of the distribution showed a significant deviation from normality, as a result the data were transformed (based on a logarithmic function). Initially, a comparative analysis was done to establish the differences by gender, followed by a correlation analysis of all the studied indicators. Next, in accordance with the research questions put forward, regression analysis was carried out, followed by mediation analysis. Mediation was based on the bootstrapping technique of Preacher & Hayes (2004). 10.000 bootstrapped samples were used to obtain a 95 % confidence interval to establish the significance of the indirect effect. Mediation analysis was done using the PROCESS script (Hayes, 2012).

Results

Differences in the use of social media, life satisfaction and loneliness in relation to gender

The following can be seen from descriptive statistics and the comparative criterion. Despite the closeness of values, the boys appear to be significantly older than the girls, but in subsequent analyses the age factor was found to be insignificant. Girls show significantly higher rates of loneliness, integration of social networks in daily activities, as well as having a higher number of friends on social networks at the average effect size.

Table 1

Arithmetic mean, standard deviations (SD) and results of comparative analysis (t-test) of the indicators under study

Indicators	Male N = 179		Female N = 212		t-test	p	Cohen's d
	Mean	SD	Mean	SD			
Age	15.749	1.203	15.434	1.140	2.651	0.008	0.269
Life satisfaction	3.480	0.845	3.395	0.706	0.492	0.623	0.05
Loneliness	1.994	0.886	2.489	1.096	–4.883	0.001	–0.496
Integration of social networks	2.857	0.711	3.071	0.659	–3.156	0.002	–0.32
Number of social networks	4.184	1.688	4.307	1.423	–1.304	0.193	–0.132
Number of online friends	77.525	100.879	97.500	106.246	–2.251	0.025	–0.229
Time spent on social media	4.291	3.830	4.816	3.853	–1.862	0.063	–0.189

The number of friends that participants had was consistent with previous data obtained for adolescents (Soldatova & Teslavskaya, 2018). The average time spent by adolescents on social media did not differ significantly between boys and girls, ranging from 3 hours 50 minutes to 4 hours 20 minutes, with 50 % of respondents being on social media for up to 3 hours and only 6 % for more than 10 hours. The results of the time spent on social networks was consistent with the data obtained on a wider age range (from 14 to 25 years old) (Vorobyeva & Kruzhkova, 2017).

There were no differences in the number of social networks used: 50 % of adolescents were found to use four to five social networks. 41.2 % of respondents used VKontakte as their main social network, 29.7 % used Instagram (Instagram is a social network of the company Meta, recognized as extremist in 2022; banned in Russia), 10 % used YouTube (site that violates Russian legislation).

It can be stated that girls experience loneliness to a greater degree, integrate social networks into daily activity to a greater extent and establish more connections with other people. Overall, adolescents, regardless of gender, experience similar levels of life satisfaction, tending to use two social networks on average, on which they spend about four hours per day.

Correlations of social network use, life satisfaction and loneliness indicators

A correlation analysis (Pearson's correlation coefficient) was then performed to determine the relationships between the indicators.

Table 2

Correlation coefficients of the studied indicators

Indicators	1	2	3	4	5
Life satisfaction					
Loneliness	–0.36**				
Integration of social networks	–0.26**	0.27**			
Number of social networks	–0.11*	0.15**	0.38**		
Number of online friends	0.10*	–0.02	0.19**	0.20**	
Time spent on social media	–0.07	0.08	0.28**	0.15**	0.09

* – $p < 0.05$; ** – $p < 0.01$.

Life satisfaction was found to be negatively correlated to 'loneliness', 'integration of social networks', and 'number of social networks' and positively correlated to 'number of online friends'. The loneliness indicator reveals positive associations with 'integration of social networks' and 'number of social networks' that a person uses. 'Integration of social networks' is positively related to all formal indicators of social networking activity, while the 'number of social networks' is positively related to 'number of friends' and 'time spent on social media'.

The results of the correlation analysis indicate that greater use and integration of social networks is associated with lower life satisfaction, but less experience of loneliness. The 'number of friends in social networks' contributes positively towards 'life satisfaction'. High social media integration is associated with higher quantitative formal indicators of social media activity.

Contribution of social networking indicators to life satisfaction and loneliness

Testing the model for multicollinearity (Farrar–Glauber Test) revealed high correlations between the indicator 'integration of social networks' and 'number of social networks', and a subsequent comparison (t-test) of partial correlations confirmed this effect. As a result, it was decided not to include the indicator 'number of social networks' in the models.

The regression model for 'life satisfaction' ($R2 = 0.178$; $F = 13.83$, (6.384), $p < 0.001$) showed 'social network integration' and 'loneliness' with a negative sign and 'number of social network friends' with a positive sign as significant predictors.

Table 3

Regression analysis results for the life satisfaction indicator

Predictors	b	beta
(Constant)	1,49**	
Age	–0,01	–0,02
Gender	0,03	0,07
Integration of social networks	–0,20**	–0,20
Loneliness	–0,18**	–0,32

Predictors	b	beta
Time spent on social media	–0,00	–0,01
Number of online friends	0,02**	0,13

* – p < 0,05; ** – p < 0,01.

Based on the results, it can be stated that indicators such as greater use of social networks and constant social networking activity, as well as the experience of loneliness contribute negatively to life satisfaction, while the number of friends on social networks increases life satisfaction. It can be assumed that those more satisfied with life spend less of their day on social networks, have more online friends and are less likely to be lonely.

The regression model for 'loneliness' ($R2 = 0.212$; $F = 17.25$, (6.384), $p < 0.001$) finds gender and integration of social networks used by adolescents as significant positive predictors and life satisfaction as negative predictors.

Table 4

Results of regression analysis for the indicator 'loneliness'

Predictors	b	beta
(Constant)	1.20**	
Age	–0.02	–0.06
Gender	0.18**	0.20
Integration of social networks	0.30**	0.17
Life satisfaction	–0.53**	–0.31
Time spent on social media	–0.01	–0.01
Number of online friends	–0.01	–0.04

* – p < 0.05; ** – p < 0.01.

Higher levels of loneliness were found among young people who use social media extensively and experience dissatisfaction with their lives, with girls who use social media extensively being more likely to experience loneliness than boys.

Life satisfaction and loneliness as mediators of the relationship between social networking indicators (mediation analysis)

Further analyses were done to test the research questions that: (3a) 'loneliness' could mediate the relationship between the 'integration of social networks' and 'life satisfaction'; (3b) 'life satisfaction' could mediate the relationship between the 'integration of social networks' and 'loneliness'; and (3c) 'loneliness' could mediate the relationship between 'life satisfaction' and 'number of online friends'. Respondents' gender and age were included in the analysis as covariates.

A. The results of the mediation analysis for the 'life satisfaction' indicator showed the following. In the first step, results on the significance of the contribution of the 'integration of social networks' (β = –0.258, SE = 0.049, p < 0.001) to the 'life satisfaction' indicator were obtained. In the second step, the contribution of the 'integration of social networks' (β = 0.212, SE = 0.084, p < 0.001) and the role of gender (β = 0.193, SE = 0.044, p < 0.001) for the 'loneliness' indicator was determined. The third step determined the contribution of 'loneliness' (β = –0.331, SE = 0.028, p < 0.001) to the 'life satisfaction' indicator, while accounting for the contribution of the 'integration of social networks' indicator (β = –0.178, SE = 0.049, p < 0.001). The explanability of the model accounting for the contribution of the 'integration of social networks' and 'loneliness' was 16.2 % (F = 18.66 (4,386), p < 0.001). The indirect effect of 'loneliness' on 'life satisfaction' was small but significant (b = –0.08, SE = 0.02, CI = –0.123, –0.042.).

Figure 1

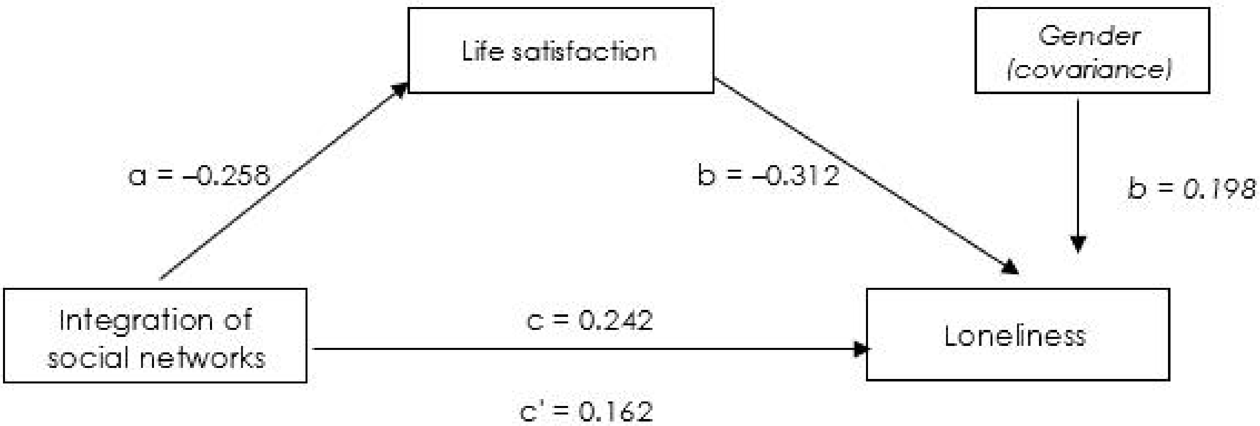
Loneliness mediation model of the relationship between social network integration and life satisfaction (standardised regression coefficients)

Thus, it is possible to say that loneliness contributes further to the relationship between social network integration and life satisfaction, reducing the latter.

B. Mediation analysis for the indicator 'loneliness' revealed the following. The contribution of the 'integration of social networks' ($\beta = 0.242$, $SE = 0.084$, $p < 0.001$) to the 'loneliness' indicator is significant when considering gender ($\beta = 0.193$, $SE = 0.044$, $p < 0.001$). As already indicated, the contribution of the 'integration of social networks' ($\beta = -0.258$, $SE = 0.049$, $p < 0.001$) to 'life satisfaction' is significant. In the third step, the contribution of 'life satisfaction' ($\beta = -0.312$, $SE = 0.081$, $p < 0.001$) to 'loneliness' is considered alongside the contribution of the 'integration of social networks' indicator ($\beta = 0.162$, $SE = 0.082$, $p < 0.001$) and gender ($\beta = 0.198$, $SE = 0.042$, $p < 0.001$). Model explanability was 21 % ($F = 25.71$ (4,386), $p < 0.001$). The indirect effect of 'life satisfaction' on 'loneliness' was small but significant ($b = 0.08$, $SE = 0.02$, $CI = 0.123, 0.042$.).

Figure 2

Life satisfaction mediation model of the links between social network integration and loneliness (standardised regression coefficients)



As in the previous analysis (item A), it is possible to discuss the role of life satisfaction in the relationship between social network integration and loneliness.

Considering the results of the two analyses, it seems reasonable to say that integration of social networks plays an opposing role for life satisfaction and loneliness, with increasing use of social networks reducing life satisfaction but increasing loneliness, which in turn further reduces life satisfaction.

C. Results of the analysis of the mediating role of 'loneliness' in the relationship of 'life satisfaction' and 'number of friends' showed the following. The contribution of 'number of friends' to 'life satisfaction' is significant ($\beta = 0.107$, $SE = 0.009$, $p < 0.05$), but not significant for 'loneliness'. In turn, the contribution of 'loneliness' to 'life satisfaction' when controlling for 'number of friends' is significant ($\beta = -0.371$, $SE = 0.028$, $p < 0.001$), but in this case the regression coefficient for 'number of friends' was not significant. The direct effect of the 'number of friends' and the indirect effect of 'loneliness' on 'life satisfaction' were not significant, suggesting that the number of friends in social networks does not contribute to life satisfaction.

Discussion

Considering the results in the context of gender differences, no differences were found in the time spent by girls and boys on social media. The difference found between genders in terms of the 'integration of social networks' in daily activities was consistent with the evidence of more intensive and compulsive use of social media by women (Kornienko & Rudnova, 2018), including as a way of procrastination (Przepiorka et al., 2016). Distinguishing the results of the current study from those of Phu & Gow (2019) is the presence of a difference in the higher expression of loneliness among girls. Regarding the higher numbers of online friends for girls, this fact is consistent with existing research (Dunbar, 2016).

'Life satisfaction' and 'number of online friends' show a positive relationship; similar findings were found by Lönnqvist & Deters (2016), but the 'loneliness' indicator found no relationship with the 'number of online friends'. This was also shown when investigating different aspects of loneliness and the number of online friends (Hood et al., 2018). The found positive association of loneliness with social network integration is consistent with the correlation found by Phu & Gow (2019) between loneliness and persistence in using Facebook, which characterises the desire to gain access to social media. The correlations of the 'integration of social networks' with formal indicators of social network activity (time, number of friends, and total number of social networks) are also consistent with findings regarding the relationship of similar measures with intensity of Facebook use (Phu & Gow, 2019).

Upon comparison of our results with those of Phu & Gow (2019), a larger set of predictors was found for life satisfaction, including both substantive and formal indicators of social networking activity, rather than just the experience of loneliness. Spending time on social networks was not a significant predictor of life satisfaction, which may be due to the fact that social networking activity involves playing games or surfing other users' pages rather than interacting with them (Tosun, 2012).

For loneliness, the predictor model was also similar to Phu & Gow (2019) in that social networking activity and life satisfaction are significant predictors, but with gender taken into account. Supporting evidence that social media use increases with increased loneliness was also found in another study by Lai et al. in 2012. Given that the integration of social media into daily activities summarises behavioural, emotional and social characteristics, the existence of a link between loneliness and increased integration is further evidence that emotional connection or behavioural activity in relation to social media may occur when the experience of loneliness is high.

The results show that the 'integration of social networks' has a negative effect on 'life satisfaction' and 'loneliness', with 'life satisfaction' and 'loneliness' mediating the relationship between 'integration of social networks' and each other. Greater social network integration reduces life satisfaction but increases the experience of loneliness, while mediating properties reduce this effect. The negative contribution of 'life satisfaction' to 'loneliness' appears to be greater than the reverse effect. Furthermore, gender emerges as a significant factor for loneliness, regardless of whether loneliness is treated as a predictor or as a dependent variable.

Overall, it can be assumed that greater use of social media has a positive effect on the experience of loneliness, but also reduces feelings of life satisfaction. However, life satisfaction appears to be the factor that significantly reduces loneliness, but not vice versa. The negative effect of experiencing loneliness is amplified in girls.

Thus, an adolescent exposed to social networks becomes both more lonely and less satisfied with life, with greater dissatisfaction leading to loneliness. It is also possible to speculate that an adolescent experiencing loneliness begins to use social media to a greater extent, but this leads to both greater dissatisfaction with life and an increased experience of loneliness.

This study did not find evidence that the contribution of the number of social media friends to life satisfaction is mediated by the experience of loneliness. However, there was evidence that more friends, along with low social networking activity and low experience of loneliness, increased adolescents' life satisfaction. This finding is consistent with the findings of Kim & Lee (2011) and with Chou & Edge (2012) that more social networking friends, when contact frequency outside the social network is high, gives the impression that one's life is happier and easier. At the same time, researchers emphasize the importance of considering personality traits as factors that simultaneously influence the number of social networking friends and subjective well-being: extroversion is seen as such a trait, which reduces or negates the effect of the number of friends on well-being (Lönnqvist & große Deters, 2016).

Conclusions

Summarizing the findings of the study, the following can be stated.

Adolescents, regardless of gender, spend approximately the same amount of time on social networks, but activity on social media (viewing news feeds, commenting on posts) and a preference for social interactions through social networks (as manifested by a greater number of friends) is more characteristic of girls. Gender, meanwhile, is a factor that increases the experience of loneliness and thus indirectly decreases life satisfaction.

Factors that decrease life satisfaction were found to be increased integration of social networks into daily activity, increased experience of loneliness and the number of friends in the social network. The experience of loneliness was found to increase with increased integration of social networks in adolescents' daily activities, as did low life satisfaction. Formal characteristics, with the exception of the role of the number of social network friends for life satisfaction, do not contribute to life satisfaction and the experience of loneliness.

Experiencing loneliness was found to mediate the link between integrating social networks into daily activities and life satisfaction, leading to a decrease in the latter. Life satisfaction played a similar role in the relationship between the integration of social networks in daily activity and loneliness. However, formal indicators of social networking activity (number of friends, time spent online) appeared to be the least significant for both life satisfaction and the experience of loneliness. This suggests that increased use of social media, both for content browsing and social interaction, increases the feeling of loneliness and, in general, leads to lower life satisfaction. In seeking more social contact, the adolescent turns to social networking, but because social networking is not only a means of communication but also contains a mass of information that can provoke different reactions and, for instance, lead to the perception of missing out, overall life satisfaction will decrease.

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Value Orientations as Predictors of the Importance of Physical Attractiveness in Friendships and Romantic Relationships

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Abstract: **Introduction**. The analysis of factors increasing/decreasing the importance of physical attractiveness (PA) has reinforced the need to study value-oriented predictors. This study aims to determine the hierarchy of intensities of the impact of value orientations (VOs) on the levels of importance of PA in interpersonal relationships – friendships and romantic relationships. This paper represents a first attempt to examine the value-orientation regulation of different levels of importance of PA. The following hypotheses were tested: Hypothesis 1: There are gender and age-related differences in the levels of importance of PA (Mann–Whitney criterion). Hypothesis 2: There is the hierarchy of intensities of the impact of VOs on the level of importance of PA in different types of interpersonal relationships (multiple regression analysis). **Methods**. The study used the following assessment tools: (a) the questionnaire for Diagnosing the Importance of PA in Various Spheres of Life (V. A. Labunskaya, G. V. Serikov); (b) a modified version of the questionnaire by S. S. Bubnova for Diagnosing the Real Structure of Personal VOs. Russian sample comprised 172 individual participants (aged 18–25 years, M = 20.1) falling into the following subgroups: a) 18–20 year olds (n = 113, 57 % males) and b) 21–25 year olds (n = 59, 36 males). **Results**. As men move into the age group of 21–25 year olds, the importance of PA for romantic relationships increases significantly. Women demonstrate a level of importance of PA regardless of the type of interpersonal relationships. The study revealed the following hierarchy of intensities of the impact of VOs on the importance of PA: 1) VOs toward recognition, respect, and exerting influence over others; VO toward PA; 2) VOs toward social activity, high social status, and managing others; 3) VO toward material well-being; and VO toward seeking beauty and enjoying it. **Discussion**. The comparative and hierarchical analysis of the impact of VOs on the importance of PA in interpersonal relationships is without parallel in the psychology of physical appearance. The study provides new insights into the impact of VOs, levels of importance of PA, and types of interpersonal relationships.

Keywords: predictors, impact intensity, hierarchy, physical attractiveness, value orientations, importance level, interpersonal relationships, romantic relationships, friendships, attractive appearance, gender, age

Highlights:

- VOs of communication subjects represent fundamental predictors of the importance of PA in interpersonal relationships.
- The levels of importance of PA do not differ among young Russians depending on their gender.
- For young men, the dynamics of the importance of PA in romantic relationships is age-dependent.
- The hierarchy of the intensities of the impact of VOs is not constant and depends on the type of interpersonal relationships (friendships, romantic relationships) and the level of importance of PA.

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Introduction

There is no need to prove the impact of physical attractiveness (PA) on interpersonal relationships. Numerous studies present multiple functions of PA in communication (Dementii & Varlashkina, 2010; Dosina & Koshkina, 2010; Hergovich, 2014; Swami & Fernham, 2009; Napp & Hall, 2014, etc.), emphasizing a special importance of PA in the regulation of interpersonal relationships. Among youths and in other age groups, it is widely believed that PA improves various types of interpersonal relationships. For example, higher physical attractiveness contributes to a greater number of friends, may help in finding romantic partners, and choose among them (Hergovich, 2014; Swami & Fernham, 2009). Researchers (Avilés et al., 2021) believe that PA is a precondition for romantic relationships and may affect commitment to such relationships. Their study of couples living in Western Europe showed that partners are interested in relationship commitment when they find each other attractive, but decrease their interest if one partner finds himself/herself more attractive. A study (Deng et al., 2019) found that romantic relationship status effects appearance-based rejection of a partner. This feature is most pronounced in singles who have low PA ratings. To determine the extent to which contributions to PA are related to an individual's self-perception as a romantic partner, a study (Mafra et al., 2016) was conducted demonstrating that women's investments are related to their economic status but not to their assessment of themselves as a romantic partner, while men's investments are driven by PA self-assessments. In other words, the importance of PA for emergence of romantic relationships, their continuation, and retention of a romantic partner, in turn, depends on various factors, in particular on partners' gender and their economic status. We should also emphasize the role of socio-cultural contexts, because these studies were carried out by scientists working with respondents living in China, Brazil, and European countries.

Such a diversity of works does not facilitate the formulation of unequivocal conclusions regarding the importance of PA in interpersonal relationships. With various contexts of studying this phenomenon, new evidence emerges, such as the importance of PA in the formation of a circle of friends in social networks (Walther et al., 2008). The ambiguity of findings on the importance of PA in individuals' social lives raises the question of whether PA really matters for successful communication, friendships, and romantic relationships. Modes and types of interaction (Albada et al., 2002) and a measure of partner concern about each other's appearance (Chevallereau et al., 2021) may increase/decrease the importance of PA. Several studies have demonstrated gender and age-related factors in the importance of PA and body image (Ragozinskaya, 2017; Laus et al., 2018). A summary paper (Quittkat et al., 2019) highlights contradictions in the study of the effects of gender and age on satisfaction with PA and its importance. These authors prove that women emphasize the importance of their appearance more than men. Age is also an important predictor of the importance of PA, but only for men. Thus, with increasing age, the importance of PA decreases among men. The importance of PA remains almost unchanged in women with increasing age.

Heider et al. (2018) consider individuals' negative attitudes toward their PA as the result of a mismatch between actual PA and ideal PA, body image. In this regard, they introduce a predictor – implicit beliefs that thinness corresponds to the standard of beauty. A hierarchical regression analysis showed that implicit beliefs predict self-reported body dissatisfaction. Another study (Lee et al., 2017) examined the importance of PA for high school students. This study showed that girls tended to ascribe higher importance to PA and showed an increased interest in self-care. Compared to male students, girls had lower satisfaction with PA. In general, students who ascribe higher importance to PA are more likely than others to turn to practices to control their bodies. Chae (2022) examined the influence of sexual factors in combination with a number of socio-demographic factors, including school type, the presence or absence of proper nutrition education and sex education, students' academic performance, physical activity in school physical education classes, weight control efforts, and economic status. The influence of these factors was examined in relation to attitudes toward PA, in particular with the example of body image distortion and its correspondence to BMI indicators. Despite the large number of participants in this study, no significant sex differences in body image distortion were found. School performance and weight control were predictors of body image distortion in both males and females. For males, body image might be impacted by participation in physical education classes; for females, economic status effected attitudes toward PA. The results of this study indicate that gender as a predictor of the importance of PA should be examined in combination with other predictors. This approach becomes relevant due to the ideas of objectification and self-objectification theory. Referring to a number of studies, D. V. Kashirskii and O. V. Myasnikova (Kashirsky & Myasnikova, 2020) emphasize the relationship between self-objectification and social anxiety, which is determined by PA. They also note that problems correlating with the phenomenon of objectification and self-objectification are more characteristic of women. The researchers (Gervais et al., 2020) propose a model of goal-based objectifying exchanges between men and women.

In the psychology of PA, women-oriented narratives are represented not only in recent works, but also in earlier studies. Davis et al. (2001) examined personality traits of women demonstrating an orientation toward PA. Women with neurotic and narcissistic traits are more focused on their PA. These personality traits predict the measure of importance of PA. Conducting a systematic analysis of relationships between self-objectification and personality traits, Carrotte & Randerson (2018) concluded that self-objectification is positively related to neuroticism, perfectionism, and narcissism. Along with this statement, E. Carrotte & J. Randerson have noted that to date it is difficult to make fundamental conclusions about other personality traits of women seeking self-objectification through PA.

The impact of the social environment (Izydorczyk et al., 2021; Jansen et al., 2022; Stojcic et al., 2020) on changes in the importance of PA, body image satisfaction, etc. are considered as predictors. Social predictors include exposure to peers, parents, and the media; the intensity of the impact of these factors is mediated by the mechanisms of internalization and social comparison (Izydorczyk et al., 2021; Morgan et al., 2022). The phenomenon of selfies has been studied as a social predictor (Chae, 2019), which reinforces the value of beauty, increases the importance of PA, and may lead to lookism. In accordance with the idea that a number of predictors affect attitudes toward PA, the impact of selfies was studied along with the impact of self-esteem and PA care behaviors. Acceptance of discrimination was found to be related to emphasizing the privileges of more physically attractive individuals. Women with high self-esteem, who do not resort to various cosmetic practices, do not accept such a type of discrimination.

A brief review of current research in the psychology of PA enabled us to draw a number of conclusions:

1. In the works under consideration, the emphasis is not so much on the study of different types of interpersonal relations, but rather on the study of relationships between men and women or on the determination of gender differences in attitudes toward PA. Certainly, among the types of interpersonal relationships, the study of romantic relationships prevails. Meanwhile, there is a lack of studies on friendships, which can be both between men and women. Therefore, it is necessary to study the influence of gender and age on the importance of PA in different types of interpersonal relationships – friendships and romantic relationships. Taking into account the obvious similarity of some parameters, these types of interpersonal relationships differ in their characteristics. High self-value, emotional attachment, mutual sympathy of partners, boundless loyalty, mutual understanding, and unselfishness are inherent in friendships (Levchenko & Ostanin, 2017, p. 97). Romantic relationships are characterized primarily by the presence of intimacy based on love for a partner and on sexual affection for him/her (Bochaver, 2011).

2. Researchers (Vossbeck-Elsebusch et al., 2014) traditionally define the phenomenon of the Importance of PA by introducing the concept of *Appearance Orientation*, which is interpreted as a cognitive-emotional, behavioral construct that includes individuals' investments in their appearance, measured by time spent and material contributions in order to create an attractive, ideal PA. Behavioral and emotional-cognitive aspects of the importance of PA may not coincide, as in any socio-psychological formations. However, emotional-cognitive phenomena may perform attributive functions – attributing to PA the function of changing various aspects of life, including interpersonal relationships. In this study, we understand the importance of PA as a subjective evaluation of the function of changing interpersonal relationships attributed to PA. The subjective evaluation has metrics that allow us to determine the level of importance of PA.

3. The study of the predictors of the importance of PA should take into account the fact that the study participants are Russians of different gender and age groups. In one of our works (Labunskaya, 2021) we considered trends in the study of attitudes toward appearance and outlined a trend – sociocultural, 'country-specific' approaches to the study of attitudes toward various components of PA.

4. Various predictors and dependent variables should be considered as level formations. The 'value of PA' and 'value orientation toward PA' should be considered as a core of the 'multifactor

model of attitude toward individual PA' (Labunskaya et al., 2019b). As a part of individuals' VO, value orientations toward PA extend the value structure of the subject of communication (Labunskaya et al., 2019a).

5. VOs are considered the main predictor of the importance of PA because VOs regulate an individual's social activity (Shamionov et al., 2022), intergenerational interaction (Pishchik, 2019), attitude toward PA (Serikov, 2018) and, entering into meaning-in-life orientations, manage his/her behavior in a situation of uncertainty (Abakumova et al., 2022).

6. Based on the interpretation of values and VOs as indicators of "valuable and meaningful objects and relations..." (Pishchik, 2019, p. 69), in this study we will consider PA as a 'valuable object', and the orientation toward PA will be included as VO in the structure of VOs. VOs will represent predictors of the importance of PA.

Thus, this study implements the methodology of a comparative-hierarchical study of the intensities of the impact of value orientations on different levels of importance of PA in different types of interpersonal relationships. In this regard, *this study aims* to determine the intensity of the impact of VOs on different levels of importance of PA in friendships and romantic relationships, using a comparative-hierarchical approach.

Methods

Experimental design

At the first stage we examined gender and age-related differences in the levels of importance of PA. At the second stage of the study we determined a hierarchy of the intensities of the impact of VOs on the levels of importance of PA in friendships and romantic relationships.

Assessment tools

1. The questionnaire for Diagnosing the Importance of PA in Various Spheres of Life developed together with G. V. Serikov (Labunskaya & Serikov, 2018; Serikov, 2018). Research participants were asked to answer the question, "How much would your friendships and romantic relationships change if you were more physically attractive?" The respondents were asked to use a five-point scale. Each point was a metric for the subjective evaluation of the 'investment contribution' of PA in developing and improving interpersonal relationships (5 = definitely true, 4 = mostly true, 3 = somewhat true, 2 = somewhat false, 1 = definitely false). Based upon the subjective ratings, we determined the importance of PA for two types of interpersonal relationships – a) friendships and b) romantic relationships.

2. A modified version of the questionnaire by S. S. Bubnova (Bubnova, 1994) for Diagnosing the Real Structure of Personal VOs which included judgments revealing VOs toward PA (full version of the questionnaire is presented in (Labunskaya et al., 2019b)).

Study sample

The study sample comprised 172 Russian young adults, aged 18–25 years (M = 20.1). The respondents fell into two age subgroups: 1) those aged 18–20 years (n = 113, 57 % males) and 2) those aged 21–25 years (n = 59, 36 % males). Distribution of study participants according to a level of importance of PA, revealed on the basis of descriptive statistics and the frequency analysis of subjective evaluations of the 'investment contribution' of PA to the types of interpersonal relationships was as follows: (a) 15.1 % of respondents indicated a low level of importance of

PA for friendships; 24.4 % of respondents indicated a low level of importance of PA for romantic relationships; (b) 23.3 % of respondents indicated a below average level of importance of PA for friendships; 19.8 % of respondents indicated a below average level of importance of PA for romantic relationships; (c) 29 % of respondents indicated an above average level of importance of PA for friendships; 17.4 % of respondents indicated an above average level of importance of PA for romantic relationships. More than a third of the study participants highly appreciate the importance of PA for friendships (32.6 %) and for romantic relationships (38.4 %). Combining low and 'below average' levels, high and 'above average' levels of importance of PA provides the following percentage distribution of the study participants: 38.4 % assign low and 'below average' importance to PA for friendships, 54.2 % – for romantic relationships; 61.7 % assign high and 'above average' importance to PA for friendships, 55.8 % – for romantic relationships.

Mathematical procedures

Taking into account the recommendations of specialists (Nasledov, 2005), in case of non-normal or close to normal distribution of the levels of importance of PA it is necessary to use the nonparametric Mann–Whitney test. We used it to test the *hypothesis* of gender and age-related differences in the levels of importance of PA. We used multiple regression to test the *hypothesis* of the hierarchy of intensities of the impact of VOs on the levels of importance of PA in interpersonal relationships. We used the multiple regression analysis for subgroups of study participants with low and high levels of importance of PA for friendships and romantic relationships. This sequence of multiple regression analysis enabled us to conduct a comparative-hierarchical analysis of the effects of VOs, taking into account the level of importance of PA and the type of interpersonal relationships.

Results

1. The U criterion at $p > 0.05$ (Table 1) indicates that there are no significant differences in the levels of importance of PA between women and men of different age groups. Based upon the mean ranks, we should note that regardless of age subgroup women assign more importance to PA than men.

Table 1

Gender differences in the importance of physical attractiveness for friendships and romantic relationships across age subgroups

Statistics	Importance of physical attractiveness for friendships	Importance of physical attractiveness for romantic relationships
	Age subgroup 1 (18–20 years)	
Mann–Whitney U test	1306.000	1384.000
Two-tailed P	0.137	0.299

Statistics	Importance of physical attractiveness for friendships	Importance of physical attractiveness for romantic relationships
	Age subgroup 2 (21–25 years)	
Mann–Whitney U test	336.000	285.000
Two-tailed P	0.316	0.067

a. Grouping variable: gender.

2. The levels of importance of PA do not differ among women of different age groups ($U = 746.000$ at $p = 0.147$, friendships; $U = 762.000$ at $p = 0.182$, romantic relationships).

3. In the group of men the level of importance of PA for friendships does not change significantly with age ($U = 589.500$ at $p = 0.347$). However, the importance of PA for romantic relationships changes ($U = 456.500$ at $p = 0.021$). The importance of PA for romantic relationships increases significantly in the group of men aged 21–25.

4. The multiple regression analysis using data from the entire sample of the study participants indicated that independent VO variables determined 30.5 % (R2 = 0.305) of the variance of the variable of 'importance of PA for friendships' and 38.3 % (R2 = 0.383) of the variance of the variable of 'importance of PA for romantic relationships'. The index indicates the degree of impact of each of the predictors at their significance level of $p < 0.05$. The predictors affecting the 'importance of PA for friendships' are VOs toward recognition, respect, and exerting influence over others ($\beta = 0.310$, $t = 3.955$ at $p = 0.000$) and VO toward PA ($\beta = 0.315$, $t = 4.061$ at $p = 0.000$). The significant predictors affecting the 'importance of PA for romantic relationships' were VOs toward recognition, respect, and exerting influence over others ($\beta = 0.324$, $t = 4.377$ at $p = 0.000$) and VO toward PA ($\beta = 0.319$, $t = 4.371$ at $p = 0.000$). We observed an inversely proportional effect between the 'importance of PA for romantic relationships' and VO toward communication ($\beta = -0.207$, $t = -3.099$ at $p = 0.002$).

5. The multiple regression analysis for subgroups with low and high levels of importance of PA for friendships and romantic relationships indicated that VOs had no significant effect on a low level of importance of PA for friendships, but had a significant effect on a high level of importance of PA for friendships (Table 2). VOs explain 63.4 % ($R^2 = 0.634$) of the variance of the variable of 'high level of importance of PA for friendships'.

6. Among VOs that have a significant impact on the 'high level of importance of PA for friendships', we may distinguish VOs toward recognition, respect, and exerting influence over others ($\beta = 0.324$, $t = 2.717$ at $p = 0.009$) and VO toward health ($\beta = 0.418$, $t = 3.112$ at $p = 0.003$). We observed an inverse relationship between the high level of importance of PA for friendships and VO toward love ($\beta = -0.605$, $t = -3.971$ at $p = 0.000$).

Table 2

Intensity of the impact of value orientations on different levels of importance of PA in friendships and romantic relationships

	R	R^2	Adjusted R^2	Standard error
Dependent variable – high level of importance of PA for friendships				
Model	0.796[a]	**0.634**	0.532	0.3416
Dependent variable – low level of importance of PA for romantic relationships				
Model	0.829[a]	**0.687**	0.557	0.0717
Dependent variable – high level of importance of PA for romantic relationships				
Model	0.521[a]	**0.272**	0.107	0.4540

a. Predictors: VOs – PA; communication; help and mercy to others; health; high social status and managing others; seeking beauty and enjoying it; learning new things about the world, nature, and human; high level of material well-being; love; pleasant pastime, leisure; recognition, respect, and exerting influence over others; social activity to achieve positive changes in society.

7. VO toward help and mercy to others (β = 0.386, t = 2.495 at p = 0,016) and VO toward health (β = 0.270, t = 1.922 at p = 0.060) can markedly affect the high level of importance of PA for romantic relationships.

8. The hierarchy of intensities of the impact of VOs on the importance of PA include: 1) VOs toward recognition, respect, and exerting influence over others; VO toward PA; 2) VOs toward social activity, high social status, and managing others; 3) VOs toward material well-being, seeking beauty and enjoying it.

9. VOs toward recognition, respect, exerting influence over others, and health exert significant impacts on the 'high level of importance of PA for friendships'. The core of VOs affecting the high level of importance of PA for romantic relationships includes VOs toward help and mercy to others and VO toward health.

10. The other value orientations (see Table 2, list of VOs) examined in this study do not significantly affect the low and high levels of importance of PA for friendships and romantic relationships.

Discussion

The evidence regarding gender and age-related differences in the importance of PA is partially consistent with the findings on the conflicting effects of these factors (Quittkat et al., 2019). The present study confirms the evidence that women are more oriented toward PA than men (Lee et al., 2017). However, our results do not support the view that the importance of PA decreases with increasing age in men. In our study, we found that as men move into the age group of 21–25-year-olds, the importance of PA for romantic relationships increases significantly. Our findings are consistent with those of other authors (Quittkat et al., 2019; Jarry et al., 2019; Laus et al., 2018) regarding the relative constancy of women's scores of orientation toward PA, which are not significantly altered with age and the type of interpersonal relationship.

The results of the comparative-hierarchical analysis of the impact of VOs on the importance of PA in interpersonal relationships do not have any correlation to previous research in the psychology of external appearance. However, they are comparable to those works (Chae, 2022; Gervais et al., 2020; Heider et al., 2018; Izydorczyk et al., 2021) that examine the impact of various factors on the severity of orientation toward PA. In contrast to existing works, in our study predictors included VOs, levels of importance of PA, and types of interpersonal relationships – friendships and romantic relationships. The contribution of this study to the issue of predictors of the importance of PA in interpersonal relationships is that the hierarchy of intensities of the impact of VOs on importance of PA is not constant. This hierarchy is determined by the type of interpersonal relationships. The intensity of the impact of certain VOs changes in accordance with the level of importance of PA.

In the field of applied social psychology, *the practical point of view* is that this study contributes to a better understanding of the role of dominant VOs entailing problems associated with high importance of PA, which, in turn, may negatively affect various areas of human existence. Consequently, the reduction of traumatic changes in everyday life can be provided by means of the 'VOs – importance of PA' connection. *A promising direction for further research* is the correlation of VOs with various gender and age-related predictors and determination of their impact on various levels of importance of PA and expansion of the spheres of being. Further research is needed to determine the impact of VOs and other socio-psychological factors on the importance of PA and their subsequent impact on subjective well-being.

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V. A. Labunskaya contributed to research methodology and edited the text of the manuscript (70 %).

O. R. Gura collected experimental data and performed statistical data analysis (30 %).

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1 Editorial note: Facebook is an online social media owned by Meta Platforms, recognized as an extremist organization and banned in Russia since 2022.

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Congruence of the Real and Favored Organizational Culture of a Modern Regional Company: Value Predictors

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Abstract: **Introduction**. The novelty of the research lies in the study of organizational culture in connection with the core values and the organization of personnel activities that is appropriate in the current context of economic development and growth. The model of "competing values" is used, which makes it possible to determine the orientation of organizational culture in two main dimensions, each of which is located between two contrary positions: 1) freedom of activity, dynamism/control, stability; 2) external focus, differentiation/internal focus, integration. **Methods**. The study involved employees of a regional company engaged in consulting and processing applications, 90 people aged 19 to 51 years. The authors used the following methods: Organizational Culture Analyze Instrument by K. Cameron and R. Quinn; the Value Survey Module by G. Hofstede; personal values acmeological test by A. V. Kaptsov. Multiple regression analysis was used to establish predictors of the types of organizational culture appropriate for the current context of economic development. **Results**. Based on the analysis results of the actual organizational culture profile in a regional company, a shift in emphasis towards stability, order and control with a predominance of market culture with a slight excess of the hierarchical one has been established. The clan organizational culture was preferred by the company's employees, which is explained by the resistance of social individuals to the declared values of consumer culture and the need for group solidarity and social support. Predictors of market–type organizational culture are cultural values: a long distance of power, individualism, masculinity, enjoyment of life and personal values of the family; adhocratic type – cultural values that actualize subjective control in innovative achievements. **Discussion**. The conclusion is formulated that despite entering market relations, management in modern regional organizations continues to rely on the principles of control and stability – the basis of the old Soviet period management system with an overwhelming preference for support and care from the leadership.

Keywords: modern regional companies, management, organizational culture, hierarchy, market relations, clannishness, adhocracy, cultural values, collectivism, individualism

Highlights:

➢ The profile of the actual organizational culture of a modern regional company is shifted towards stability, order and control in the segment of the market and hierarchical forms of organization.

➢ The profile of the preferred organizational culture of a modern regional company focuses on the quadrant of a clan organization focused on integration and assistance, social support and assistance.
➢ In the current context of economic development and growth, the value predictors of the market-type organization of a regional company are the values of individualistic orientation and the adhocratic type – the values of subject control.

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Introduction

Changes in the general paradigm in the Russian economy require a transition from an administrative and command management format to a market one, which, in turn, stimulates the orientation of enterprises to the introduction of innovative development models. Despite the more than a thirty-year history of reforms aimed at supporting the innovative economy, the pace, and results of transformations in the economic sphere are unsatisfactory (Saralieva & Zaharova, 2017). Along with the difficulties of legal and technological nature, a psychological component associated with the organization of professional activity of personnel is highlighted, which at least ensures the development of innovative processes (Mihajlova, 2021; Savchenko & Shkurenko, 2020; Salvato, 2009).

One of the functions of organizational culture is coordination, which focuses on the internal integration of personnel and the formation of professional behaviour models in accordance with core values (Büschgens et al., 2013; Schwartz & Cieciuch, 2021; Herbst & Houmanfar, 2009). A sufficiently strong and developed organizational culture is the support of cohesion in understanding significant problems, ensuring continuity, coordination, and prevention of conflicts within the organization, which have a great impact on the attitude of employees to work, their professional motivation with a sense of stability and loyalty on the part of management (Ližbetinová et al., 2016).

In the concept of Cameron & Quinn (2011), the whole variety of indicators of the effectiveness of the organization's activities is reduced to two main dimensions (vectors): 1) flexibility and discreteness as opposed to stability and control, 2) external orientation, differentiation and rivalry as opposed to internal orientation, integration and unity. The quadrants formed by the indicated vectors correspond to the following types of organizational culture: clan culture, built on maintaining relationships within the organization, a high level of cohesion, orientation to the individual development of employees; adhocracy culture, characteristic of dynamically developing organizations, ready for risk, change and new challenges; market culture, typical for organizations focused on achieving results and competition, following the rules of a market economy; hierarchical culture, characterized by a formalized and structured work environment in which formal rules are the consolidating element.

According to Zhang et al. (2008), it is pointless to study the effectiveness of these four types separately since each of them has its advantages that may be "beneficial" for the enterprise at a concrete stage of its development (Számely, 2020). Organizational culture should be considered as an integral structure where cultural types exert their influence synergistically. According to

Hakh et al. (2014), many organizations currently recognize that the only way to find a radical approach to solving the company's current problems is to change the existing organizational culture. Indeed, it is quite difficult to reorient a person to the desired organizational culture, but if there is a strategy for the transition to a more adaptive form of culture, the effectiveness of the organization will increase (Groshev & He, 2020; Sulejmankadieva & Lisina, 2021; Trushkina & Rinkevich, 2020; Jovanoska et al., 2020).

Understanding the importance of organizational culture encourages the organization to search for the most suitable type of it for survival in the modern business environment. Following the idea of balancing organizational culture, the ideal cultural profile would be a combination of all four types proposed by Cameron & Quinn (2011). However, having an ideal cultural profile does not guarantee that the organization will become more effective. By wanting to make changes in organizational culture, companies hope to find a new paradigm based on values that can support their current activities (Anderson et al., 2010).

In practice, the most effective way to optimize the organized activities of any company is to coordinate cultural (national) (Lebedeva et al., 2020; Dartey-Baah, 2011; Hofstede et al., 2010), individual (Herbst & Houmanfar, 2009) and organizational values (Khotinets, 2016; Khotinets & Kozhevnikova, 2017b), the means of achieving effective personnel organization is the establishment of predictive criteria of organizational culture (Leonova & Sultanova, 2018). Thus, the most promising direction in the study of the organizational culture of modern companies is the study of the connections of core values as ways to solve the problems of regulating human activity with the organization of personnel activities that is appropriate in current conditions of economic development and growth.

The purpose of the study is to establish value predictors of the types of organizational culture of a regional company that are appropriate in the current context of a market economy.

Methods

Sample group

The study involved employees of a regional company of the Udmurt Republic engaged in consulting and processing requests through voice communication channels, online chat mode and mail requests in the interests of the organization (call center), a total of 90 people, of whom: 23 men and 67 women (26 % and 74 % of the sample, respectively) aged from 19 to 51 years (M = 28 years).

Techniques

The Organizational Culture Assessment Instrument (OCAI) proposed by Cameron and Quinn (2001) was used *to assess organizational culture*. The questionnaire consists of six parts, each represented by four statements describing any characteristics of the organization's activities. The respondent needs to distribute 100 points twice between these alternatives to describe the current state of the organization ("now") and the preferred development option of this organization, for example, in the next five years, to succeed ("preferably"): A – clan culture; B – adhocracy culture; C – market culture; D – hierarchical culture.

The fourth version of The Values Survey Module (VSM-13 version), developed by Hofstede & Minkov (2013), was used *to measure cultural values*. It includes six "cultural meters" that determine the quantitative characteristics of cultures (Hofstede, 2014): 'power distance index' (PDI), 'individualism/collectivism' (IDV), 'uncertainty avoidance index' (UAI), 'masculinity/femininity' (MAS),

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'long-term/short-term orientation' (LTO) and 'self-indulgence/restraint index' (IVR). These meters are rated on a scale from 1 to 5. For the purposes of our study, individual indicators were needed for each of the six scales, which were calculated according to the algorithm proposed by Tatarko & Lebedeva (2011).

The personal values acmeological test by A. V. Kaptsov (2015) (the author's version of ANL 4.6) was used *to measure personal values*. The methodology contains 49 statements, which the respondent evaluates on an 8-point scale. The results of processing are presented in the form of two groups of basic scales: life values (professional life, education and training, family life, social life, hobbies), personal values (others (sociality), spiritual satisfaction, creativity, vital activity, achievements, traditions, material wellness, self (individuality)).

Methodology

To divide the selection into subgroups based on satisfaction and dissatisfaction with the type of culture existing in the organization, a cluster analysis was carried out through the k-means method using the coefficient of divergence between the estimates of existing and preferred cultures calculated by us as a criterion variable.

Using the Mann–Whitney U-test, data analysis was carried out to identify significant differences between the selected subgroups according to the analyzed indicators. Hypothesis *H1* about the difference in samples by the indicators severity level was tested first. Otherwise, hypothesis *H0* was accepted – about the absence of differences between the desired indicators.

Multiple regression analysis *(Linear regression, Backward (reverse step-by-step method))* was used to establish value predictors of favored types of organizational culture. Dependent variables were the types of market and adhocratic organizational culture favored in modern management, and cultural and personal values were independent. Hypothesis H1 was tested about the presence of a connection between a "dependent" variable and a set of "independent" variables. In the opposite version, hypothesis H0 was accepted – about the absence of the desired connections. In the course of explaining the data, the following values were taken into account: R (multiple regression coefficient), R^2 (multiple determination coefficient), Fisher's F-test and its p-significance level ($p \le 0.05$). Data processing was carried out using the SPSS 22.0 for Windows program.

Results

At the first stage of the study, in order to analyze the measure of divergence between real and preferred types of organizational culture, an additional coefficient was introduced. It was calculated by the following formula:

C divergence = (|CCC – CCP| + |ACC – ACP| + |MCC – MCP| + |HCC – HCP|) / 4,

where: CCC – clan culture current; CCP – clan culture preferred; ACC – adhocracy culture current; ACP – adhocracy culture preferred; MCC – market culture current; MCP – market culture preferred; HCC – hierarchy culture current; HCP – hierarchy culture preferred.

This coefficient shows the degree of divergence between an employee's assessments of the existing and preferred type of cultures. It allows one to make assumptions about the degree of employees' satisfaction with the current type of leadership, performance criteria, communication rules, standard of behavior.

For example, employee X evaluates current and preferred cultures' types in the following way:

C *divergence* = (|56.50 – 56.67| + |11.67 – 10.00| + |13.33 – 13.33| + |18.50 – 20.00|) / 4 = 0.83.

Another employee Y made the assessment differently, in particular:

C *divergence* = (|11.67 – 39.17| + |0.83 – 12.50| + |2.50 – 32.50| + |85.00 – 15.83|) / 4 = 34.58.

That is, employee X demonstrates a greater degree of satisfaction with the existing management culture in their organization, relationships in the team and with leader personnel, a work evaluation system and behavior rules. On the contrary, employee Y is extremely dissatisfied with the current type of culture: it seems to them that the group cohesion and the possibility of creative expression are insufficient; the tension is caused by strictly regulated procedures for operational activities and formalism of relations; the management team's focus on internal control.

The conducted analysis led to the need to divide the sample into two subgroups: those who are satisfied and those who are not satisfied with a current type of culture in the organization. For this purpose, the procedure for cluster analysis of indicators was carried out according to the criterion of the calculated divergence coefficient. As a result, two clusters of company employees were identified: "satisfied" ($n = 67$, final center of the cluster = 5.44) and "unsatisfied" ($n = 23$, final center of the cluster = 19.15) with the current type of organizational culture.

For significant differences identification in other analyzed indicators in the selected subgroups, data analysis was conducted using the Mann–Whitney U-test. The results of the analysis revealed significant differences in the following indicators: 'clan culture current' ($p \leq 0.001$), 'adhocracy culture current' ($p \leq 0.001$), 'market culture current' ($p \leq 0.05$), 'hierarchy culture current' ($p \leq 0.001$), 'clan culture preferred' ($p \leq 0.001$), 'adhocracy culture preferred' ($p \leq 0.001$), 'market culture preferred' ($p \leq 0.05$), 'hierarchy culture preferred' ($p \leq 0.001$), 'area of society' ($p \leq 0.05$). Overall, the main differences are primarily related to the indicators of current and preferred types of organizational culture. Consequently, the samples formed based on the results of cluster analysis can be considered homogeneous in terms of personal and cultural values.

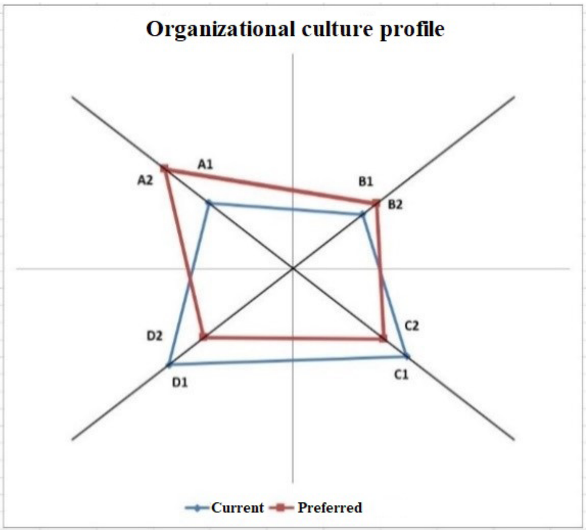
To solve *the first empirical problem*, the "competing values framework" model developed by K. Cameron and R. Quinn was used. The constructed diagram (Fig. 1) shows the profiles of the current and preferred types of organizational culture based on the entire selection.

The analysis of organizational culture profiles by employees of selected groups according to the criterion of 'satisfaction' and 'dissatisfaction' with the current type of culture in the organization is of no less interest (Fig. 2, 3).

The ideal model for optimal management of an organization in the modern socio-economic and cultural-historical context of the development of Russian society is the hypothetic model (Fig. 4). There, the profiles of current and preferred types of organizational culture almost coincide.

Figure 1

Organizational culture profile (n = 90)



Note (here and elsewhere): A1/A2 – clan culture ('current'/'preferred'), B1/B2 – adhocracy culture ('current'/'preferred'), C1/C2 – market culture ('current'/'preferred'), D1/D2 – hierarchy culture ('current'/'preferred').

Figure 2

Organizational culture profile of a group of employees (n = 67) satisfied with current organizational culture type

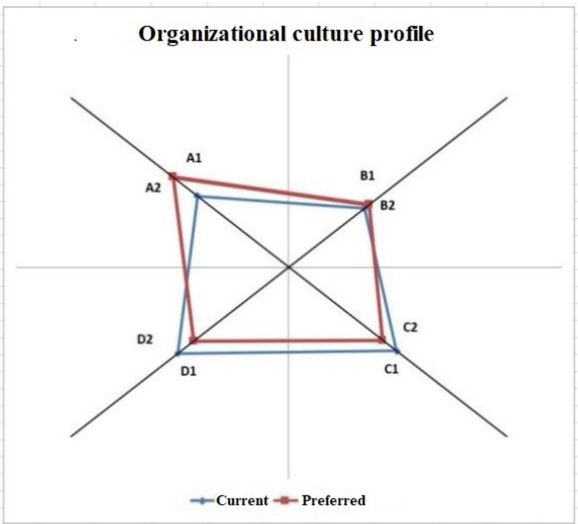


Figure 3

Organizational culture profile of a group of employees (n = 23) dissatisfied with current organizational culture type

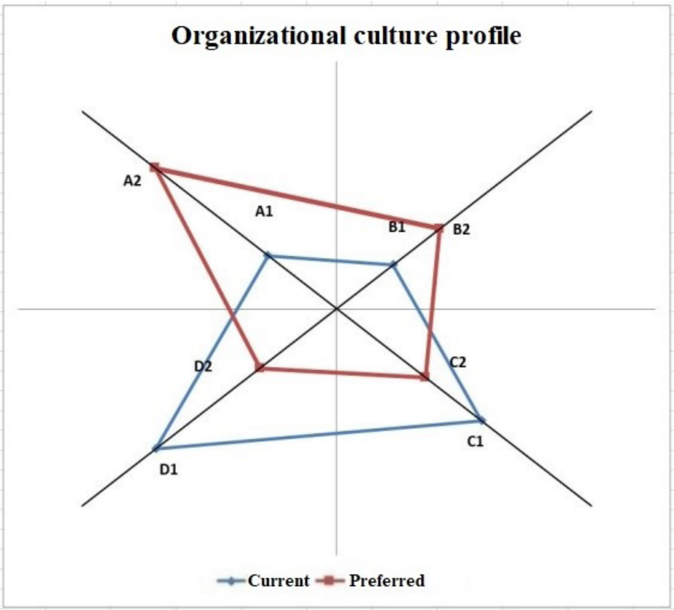
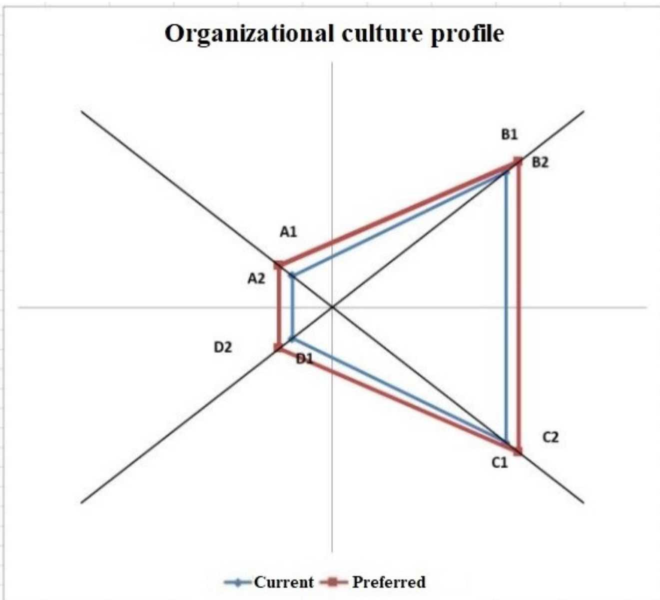


Figure 4

Hypothetic organizational culture model



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At the next stage of the study, to solve the second problem, multiple regression analysis was used. There, the dependent variables were market (Table 1) and adhocracy (Table 2) organizational culture types that are viable from the standpoint of the modern economy, and the independent variables were cultural and personal values.

Table 1

Results of multiple regression analysis: coefficients of independent variables of the final model (dependent variable - preference for market type of organizational culture)

Independent variables in the model	B	St. error	β	t	p
Power distance (PDI)	3.652	1.500	0.248	2.434	0.017
Individualism / collectivism (IDV)	3.809	1.502	0.268	2.535	0.013
Masculinity / femininity (MAS)	3.804	1.518	0.265	2.506	0.014
Self-indulgence / restraint index (IVR)	4.076	1.505	0.270	2.707	0.008
Sphere of family life (SFL)	–0.694	0.254	–0.281	–2.737	0.008
Constant	–21.426	11.198		–1.913	0.059

$R^2 = 0.198$, $F = 4.135$, $p = 0.002$.

Therefore, the resulting model describes 19.8 % of the sample (R^2 is 0.198). The model is significant with an *F* coefficient of 4.13 at a significance level of 0.002. According to the results of the analysis, it became possible to construct a regression equation that reflects the predictors of preference for the market type of organizational culture:

Preference for market type of organizational culture prediction) = 3.652 * PDI + 3.809 * IDV + 3.804 * MAS + 4.076 * IVR – 0.694 * SFL – 21.426

Notes: PDI – distance of power; IDV – individualism; MAS – masculinity; IVR – Self-indulgence / restraint; SFL – sphere of family life.

Table 2

Results of multiple regression analysis: coefficients of independent variables of the final model (dependent variable – preference for adhocratic type of organizational culture)

Independent variables in the model	B	St. error	β	t	p
Self-indulgence / restraint index (IVR)	–3.320	1.523	–0.226	–2.181	0.032
Constant	30.242	5.026		6.415	0

R^2 = 0.051, F = 4.755, p = 0.032.

The resulting model describes 5.1 % of the sample (R^2 is 0.051). The model is significant with an *F* coefficient of 4.75 at a significance level of 0.032. As a result, a regression equation was constructed marking the predictors of preference for the adhocracy type of organizational culture:

Preference for the adhocratic type of organizational culture (prediction) = –3.320 * IVR + 30.242
Note: IVR – Self-indulgence / restraint.

Discussion

According to the analysis of the profile of the current and preferred types of organizational culture in the entire sample (Fig. 1), it was revealed that in the studied organization there is no absolute predominant type of culture. A large profile area describing the 'current' situation is located at the bottom of the diagram in the stability and control segment with a predominance of a quadrant with a current market culture with a slight excess in a hierarchy culture. We dare to state that the insufficient readiness of the Russian society, economy and production for the transition to market relations three decades ago is still reflected in the formation of a modern market economy. It is characterized by the intentions to maintain stability and control of the economy with the classic attributes of bureaucracy.

In the 'preferred' situation, the shift of the diagram towards the clan type of culture is fixed on the background of a decrease in the area of the hierarchy culture, but with the preservation of internal control and integration. Notice that clan-type forms are clearly imbued with values, goals, cohesion, and social support, shared by all (Cameron & Quinn, 2001, pp. 73–76). It is well-known that the foundation of Russian culture is the values of collectivism with the provision of group solidarity, socially responsible behavior with group support (Vyatkin et al., 2022). The values of individualism with predominance over the needs of other people, cultivated at the present stage of development of Russian society. It causes a resistance characterized by nostalgia for the past Soviet era.

Comparing the obtained profiles of current and preferred types of organizational culture in the 'satisfied' (Fig. 2) and 'dissatisfied' (Fig. 3) groups with current organizational culture, one can draw several conclusions. In the 'satisfied' group, the organizational culture profile predictably does not reflect the difference between existing and desired types of culture. It is predominantly located in the integration and internal control segment. The profile of 'unsatisfied' with an organizational culture (Fig. 3) is located in polar opposite parts of the diagram. If the current organizational culture for them is hierarchy, then they select 'clan' culture as a preferred one. It is considered that the shift in emphasis to the 'clan' quadrant is ensured by increased support for employees and their involvement in business, psychological climate improvement in an organizational group with concern for its members (Cameron & Quinn, 2001, pp. 127–128).

Without a real opportunity to radically rebuild system of established patterns of interaction between employees and an employer, leader personnel can focus on changing system of employees' ideas about the types of organizational culture. The ideas ensure an increase in the efficiency of organization's functioning in the context of economic development and growth. Let us consider what cultural and personal values were the predictors of two economically viable types of market and adhocracy organizational culture in the modern conditions.

According to the results of multiple regression analysis, it was found that the predictors of the market type of organizational culture preferred in the modern conditions of economic development of society are values at the individual cultural level: a large distance of power, individualism, masculinity, indulgence in desires and values of family life. We agree that the market organizational culture is based on an unequal distribution of power between an owner of a company and its employees, who are competitive with autonomy and independence from others, responsible only for themselves with the right to privacy in the free satisfaction of basic human needs.

The predictors of the reality of the adhocracy type of organizational culture preferred in modern socio-cultural conditions include the cultural values of restraint. Innovative activity, which ensures a qualitative increase in the efficiency of processes and results demanded by market, requires high competence and cognitive abilities from a subject of professional activity. Thereby the activity limit them in satisfying hedonistic needs, obtaining life's enjoyments and pleasures.

Conclusion

Based on the analysis of the profile of the current organizational culture of the regional company, the shift in emphasis was established towards stability, order, and control, with a predominance of the market culture, and with a slight excess of the hierarchy culture. The obtained data are explained by the specific conditions for the development of a market economy with classical attributes of bureaucracy. It is made in accordance with the data obtained earlier in the study of the contingence of organizational logic as a legitimizing principle of institutionalized relations of power with the values of national culture with the participation of various organizations of the Udmurt Republic (Khotinets & Kozhevnikova, 2017b). The clan organizational culture was preferred. It is explained by the resistance of social individuals to the entrusted values of the culture of consumption and the need for group solidarity and social support. It is confirmed by the study of organizational logic in the regional context (Khotinets & Kozhevnikova, 2017a).

The obtained results showed that employees' ideas about current and preferred types of organizational culture in the company diverge significantly. This is especially clearly observed when analyzing the profile of the organizational culture of employees dissatisfied with management style and communication system approved in the company. If the current organizational culture for them is hierarchy, then they select 'clan' culture as a preferred one.

According to multiple regression analysis, it was found that the predictors of the market type of organizational culture, which is viable in the current conditions of economic development and growth, are values at the individual cultural level: a large distance of power, individualism, masculinity, indulgence in desires and values of family life. The predictors of the adhocracy type of organizational culture include cultural values that actualize innovative achievements with high subjective control, opposing hedonistic needs and enjoyment of life.

The obtained results are of practical importance for achieving the organizational effectiveness of personnel of regional companies in the modern economic conditions. Harmonized core and organizational values have a predictive ability in relation to the organizational culture that is most appropriate in the specific conditions of economic development. The limitations of the study extend to the choice of: 1) methodological tools, in particular, the use of a framework of values of organizational culture, represented by only two dimensions of effectiveness; 2) building groups strategies (sampling) that involve a real group of employees of the regional call center.

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V. Yu. Khotinets developed the scientific apparatus, substantiated the problem methodologically, explained and interpreted the data (40 %).

O. V. Kozhevnikova made a theoretical analysis of the research problem, developed the empirical study design, constructed the mathematical models (40 %).

N. A. Baranova collected the empirical data, conducted the primary processing of the research data (20 %).

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Conflict of Interest Information

The authors have no conflicts of interest to declare.