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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 adheres to international standards of publishing ethics in accordance with the recommendations of the Committee on Publication Ethics (COPE).

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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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Russian Psychological Journal, 2025, Vol. 22, № 2
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CONTENTS

Russian Psychological Journal, 2025, Vol. 22, № 2
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Associations of Core Beliefs with Representations of the World and Relationships with Significant Others in Adolescents Living Under Different Conditions

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Abstract

Introduction. Various living conditions, including uncontrolled global changes in the world, can affect the personality of adolescents and their representations of the world around them. In this case, the search for support resources in the social development environment becomes very important. This study aims to examine the associations between implicit representations of the world and the self and the characteristics of peer relationships and perceived support from significant others in adolescents living under different conditions. **Methods.** In total, 238 adolescents aged 13 to 15 years took part in this study, 52 % of whom lived in Moscow, and 48 % lived in Mariupol. The study used the following diagnostic tools: (a) the World Assumption Scale by Janoff-Bulman, (b) the Multidimensional Scale of Perceived Social Support by G. Zimet, (c) the World Today and the World in 5 Years psychosemantic differential developed by the authors, and (d) the Inventory of Parent and Peer Attachment by G. Armsden and M. Greenberg. **Results.** Compared to adolescents in Mariupol, those living in Moscow represent the world as more friendly but less fair; they have more positive self-image and greater belief in luck and control. The representations of the "world today" among Moscow adolescents is characterized by greater reliability, friendliness, unity, calmness, and complexity; the

"world in 5 years" is characterized by greater value and manageability, compared to adolescents in Mariupol. Perceived support from family and significant others (directly) and peer alienation (inversely) are predictors of individual core beliefs. **Discussion.** The study proposes the picture of the transformation of implicit representations of the world and the self in relation to the new conditions of living of adolescents (who live near combat zones) and discusses the role of social support as a resource to adapt to new conditions.

Keywords

core beliefs, representation of the world, perceived social and psychological support, peer relationships, social development situation, adolescence

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Introduction

Core beliefs are personality traits that largely determine an individual's behavior and thinking. The model of world assumptions was proposed by R. Yanoff-Bulman as a system of hierarchically organized cognitive-emotional implicit representations of the world and the self, which influences individual thinking and behavior. The stability of the subjective view of the world is reflected in the specific nature of the interpretation of events involving individuals and serves as a stable foundation in a changing social world (Janoff-Bulman, 1992). Based on the analysis of the study of the core beliefs in the Russian sample, five core beliefs that provide a holistic picture of the world were identified, including the benevolence of the world, justice, self-worth, luck, and control (Padun & Kotelnikova, 2008). A study involving Russian adolescents revealed the following hierarchy of core beliefs (from the most to the least expressed): self-worth, luck, benevolence of the world, control, and justice. At the same time, adolescents facing military operations in the immediate vicinity of their residence have a significantly higher

score of "justice", and all other core beliefs are reduced compared to adolescents without such experience (Almazova et al., 2025). A study (Almazova et al., 2025) showed that the benevolence of the world and beliefs about control over life are inverse predictors of the severity of adolescents' use of mechanisms of alienation from moral responsibility, which again confirms that fundamental beliefs underpin human behavior, including deviations (ibid.). Although individual core beliefs begin to form very early and are very close to the structures of other widely accepted psychological theories, such as internal working models (Bowlby, 2006) and basic trust (Erickson, 1996), these implicit representations in young people are dynamic and can change depending on the reality around them (Mikulinger & Shaver, 2023; Yang et al., 2020; Kalinina, 2021).

An important correlation of a person's core beliefs is the image of the world, defined in V. V. Petukhov's model of "a holistic view of the world that reflects the specific historical, ecological, social and cultural contexts in which the whole human mental activity develops" (Molchanov et al., 2023, p. 73). For example, in a study of young people involved in volunteering, it was shown that participation in volunteering is associated with a more active, manageable and benevolent representation of the present and future world (Molchanov et al., 2023). We can say that the image of the world is associated with human activity, and the positive image of the world is associated with participation in pro-social activities. Complex and ambiguous events can affect the image of the world, complicating life activities under conditions of high uncertainty.

Adolescence as a self-determination period is extremely sensitive to the quality and content of social interaction with others, which determines the patterns of behavior, values, beliefs, the space of life goals, attitudes towards others and the vision of the world (Avdulova, 2025; Parishioners & Tolstykh, 2025). Social environments, including communication and interaction, are a source of mental development for children and adolescents and determine the specificity of the social development space (Elkonin, 1989). The key to development is the active position of adolescents in relation to the social environment around them. It is not only the content of social interaction that is important, but also the attitude of the subject of development towards this interaction. (Karabanova, 2024). This is particularly reflected in the fact that the process of assimilation of social images transmitted by surrounding society is nonlinear in adolescence, which is the transition period from childhood to adulthood. Different social groups can be identified as important to provide conditions for the development and support of adolescents. The age-related psychological approach in understanding adolescence identifies peers as the most important social group that impacts the essence and content of the process of self-determination (Elkonin, 1989). At the same time, the role of parents as representatives of the social environment, which determines most of the characteristics of psychological well-being and development, does not diminish. A study of child-parent relationships in adolesce shows the possibility of positive and negative effects on personality development of adolescents (Branje, 2018). It is noted that in the modern world, significant others may include not only classmates

and parents, but also other adults with high social status for adolescents (Krasilo, 2006; Tolstykh, 2020). Global political, social, and economic transformations affect social interaction of people (Bronfenbrenner, 2005).

Resistance to the risks of new social development is necessary to maintain the psychological well-being of adolescents (Olsson et al, 2003; Zimmerman et al, 2015). It is important to organize intensive communication and social support for adolescents from parents and adults (nearby adults, family members and other significant adults). The main resource for the life of adolescents is the recognition of social support from significant others.

Important geopolitical changes have a major impact on the social situation of the development of modern adolescents. On the one hand, the life of adolescents who have experienced combat operations can be considered to have undergone considerable rapid changes (changes in social conditions of functioning, personal and social identity, moral and value-related attitudes). On the other hand, it is linked to the potential trauma experiences of recent years (being in a combat zone, possible participation and death of relatives, friends, acquaintances in combat operations). Change in one's own worldview and a decrease in control of life under the influence of external factors in connection with ongoing combat operations can lead to difficulties in the development of age-related skills and new formations that contribute to the development of a harmonious personality of an adolescent. This can be reflected in the age-related and psychological specificity of adolescence and specific developmental tasks during this period. There is a large number of research that shows the negative impact of exposure to and contact with combat experiences on the psychological well-being and development of adolescents and young adults, as well as stimulating the development of affective and behavioral disorders (Abakumova et al., 2024; Betancourt et al., 2018; Masten & Narayan, 2012; Slone & Shoshani, 2014; Slone & Shoshani, 2021). Therefore, the issue of adolescents' resources to adapt to a new reality and make life choices in the face of dramatic changes is extremely important (Asmolov, 2015; Kahneman & Tversky, 2000; Leverett et al., 2020; Marcell & Halpern-Felsher, 2007; Martsinkovskaya, 2019; Silbereisen & Chen, 2010).

Based on L.S. Vygotsky's thesis that the social situation of children determines the nature of their experience of life events is the basis for the formation of fundamental beliefs about the world and themselves (Vygotsky, 1984), their ideas about the present and the future, we assume that there are significant differences in the nature of fundamental beliefs and representations of the present and future world among adolescents in Moscow and Mariupol.

Based on L.S. Vigotsky believes that cooperation as a social relationship system is the basis of personality development, in which, during a child's joint activity and social environment in an "event community" (Slobodchikov & Zuckerman, 1996) and, firstly, communication with peers is the main activity of adolescence (Elkonin, 1989), individual consciousness is formed, and that perceived support and characteristics of the relationship with adolescents, as resources for adaptation, are associated with how adolescents evaluate the world around them.

The **aim of the study** was to examine the relationship between the implicit representations of the world and the self, the characteristics of peer relationships, and the support from significant others in adolescents living under different conditions (Moscow and Mariupol).

The objectives of the study included:

1. Comparative analysis of core beliefs of adolescents living in Moscow and Mariupol.

2. Comparative analysis of representations of the present and future world among adolescents living in Moscow and Mariupol.

3. Identification of the vector of the dynamics of representations of the present and future world.

4. Analysis of the relationship between the core beliefs of adolescents and the perception of socio-psychological support and the characteristics of peer relationships as adaptation resources.

5. Identification of predictors of implicit representations of the world and the self among the resources under consideration (perceived support and peer relationships).

Methods

Participants

In total, 238 adolescents aged 13 to 15 years took part in this study (M = 14.2; SD = 1.78), 102 (42.9 %) of whom were boys. All participants in the study were students in grades 8–9 of a comprehensive school; 124 (52.1 %) adolescents lived in Moscow, and 114 (47.9 %) adolescents lived in Mariupol.

Research methods

We should note that among adolescents living in Mariupol there was a high proportion of those who lost a family member due to hostilities in the city in 2022. This determines the need to analyze the broader social context of communication as a resource for social support: family as an integrated system, friends, socially significant adults, etc.

Diagnostic tools

The following diagnostic tools were used in our study:

- The World Assumption Scale (WAS) is aimed at studying the profiles of individual core beliefs (Janoff-Bulman, 1989; Padun & Kotelnikova, 2008). The instrument assesses the following core beliefs: Benevolence of the World, Justice, Self-Worth, Luck, and Control. The scale includes 37 items assessed using a 6-point Likert scale.

- The semantic differential technique as a method of studying the characteristics of the consciousness of respondents (Petrenko, 1988) focused on studying the present (the present world) and the future (the world in 5 years). The modified version contained 10 dichotomously arranged pairs of adjectives, including unpredictable – stable, unfair – fair, unreliable – reliable, chaotic – manageable, hostile – friendly, disunited – holistic, anxious – calm, useless – valuable, passive – active, and complex – simple (Almazova et al., 2024).
- G. Zimet Multidimensional Scale of Perceived Social Support (MSPSS) (Zimet et al., 1990; Chistopolskaya et al., 2020) which includes three scales assessing the perception of the social support received from family, friends and significant others. The instrument includes 12 items assessed using a 7-point Likert scale.
- G. Armsden and M. Greenberg Inventory of Parent and Peer Attachment (IPPA) adapted by N.V. Sabelnikova, D.V. Kashirsky, T.Yu. Sadovnikova (Sabelnikova et al., 2023; Armsden & Greenberg, 1987) to examine specific peer attachment styles in adolescence. The Inventory includes the following subscales: Peer Attachment, Trust, Communication, and Alienation and consists of 25 questions assessed using a 5-point Likert scale.

Data were collected using an address link to complete the study on the Russian online test platform Testograph with the informed consent of the study participants.

Statistical analysis

To determine the possibility of using parametric criteria, the Kolmogorov-Smirnov criterion was used. As for all analyzed assessments, both for the sample as a whole and for sub-samples, the distribution is normal, parametric criteria were then applied. We used the Student's t-test for independent samples to test the differences in assessments obtained for adolescents from different groups, the Pearson correlation coefficient to analyze the relationship between assessments of the scales of different instruments, and regression analysis to identify predictors.

Results

Representations of the world and the self in this world

Using the WAS diagnostic tool, we obtained assessments of core beliefs for all study participants (Benevolence of the World, Justice, Self-Worth, Luck, and Control). With the help of semantic differentiation, we have obtained semantic profiles of the representations of the world today and in the next five years.

Table 1 shows the means and standard deviations of the assessments of core beliefs (WAS scales) in adolescents from Moscow and Mariupol and the result of comparing these assessments (independent samples t-test).

Table 1

Means and standard deviations for the WAS scales among adolescents living in Moscow and Mariupol, comparison of assessments

WAS scales / Adolescent groups	Moscow		Mariupol		Differences		
	M	SD	M	SD	t(236)	p	Cohen's d
Benevolence of the World	4.2	1.10	3.6	.79	4.217**	<.001	.563
Justice	3.8	.93	4.0	1.00	-2.050*	.042	-.262
Self-Worth	4.7	.95	4.2	.81	4.475**	<.001	.546
Luck	4.4	.92	3.9	.70	4.987**	<.001	.590
Control	4.6	.64	4.1	.59	4.424**	<.001	.813

Note. * p <.05, ** p <.01.

In the group of adolescents from Moscow the assessments of the Benevolence of the World, Self-Worth, Luck, and Control are significantly higher, and assessments of Justice are significantly lower, compared to the group of adolescents from Mariupol.

Table 2 shows the means and standard deviations of the assessment of the representations of the world today among adolescents in Moscow and Mariupol (based on 10 pairs of semantic differential adjectives) and the results of the comparison of these assessments (independent samples t-test). Figure 1 shows a graph representation of the means.

Table 2

Means and standard deviations of the assessments of the representations of the world today among adolescents in Moscow and Mariupol, comparison of assessments

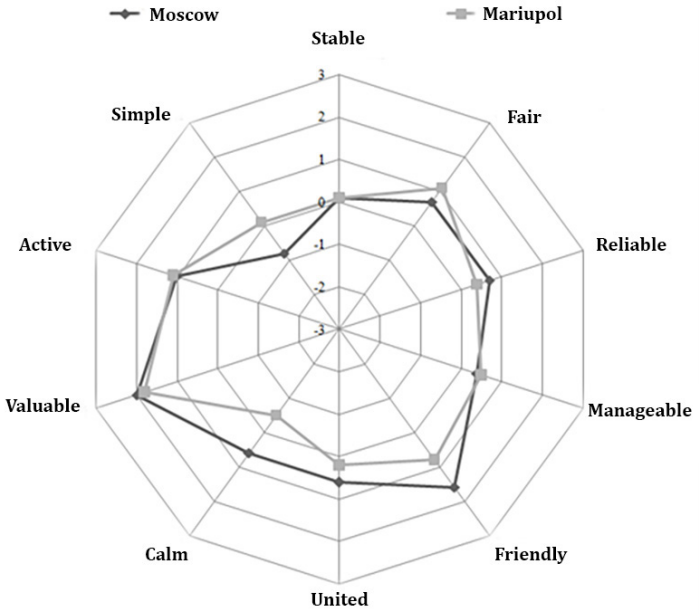
SD scales / Adolescent groups	Moscow		Mariupol		Differences		
	M	SD	M	SD	t(236)	p	Cohen's d
unpredictable – stable	.1	1.45	.1	1.23	.233	.816	.030
unfair – fair	.7	1.52	1.1	1.33	-.694	.488	-.090

SD scales / Adolescent groups	Moscow		Mariupol		Differences		
	M	SD	M	SD	t(236)	p	Cohen's d
unreliable – reliable	.7	1.51	.4	1.49	2.799**	.004	.493
chaotic – manageable	.4	1.38	.5	1.39	.956	.340	.124
hostile – friendly	1.6	1.45	.8	1.18	3.107**	.002	.403
disunited – united	.6	1.46	.2	1.35	2.443*	.015	.317
anxious – calm	.6	1.61	-.5	1.33	5.484**	<.001	.712
useless – valuable	2.0	1.71	1.8	1.25	.884	.377	.115
passive – active	1.0	1.51	1.1	1.43	-.191	.849	-.025
complex – simple	-.8	1.42	.1	1.35	-4.503	<.001	-.584

*Note. * p <.05, ** p <.01.*

Figure 1

Means of the assessments of the representations of the world today among adolescents in Moscow and Mariupol



Moscow adolescents represent the world at the present time as significantly more reliable, friendly, united, calm, and complex, compared to those in Mariupol.

Table 3 shows the means and standard deviations of the assessment of the representations of the world in 5 years among adolescents in Moscow and Mariupol and the result of comparing these assessments (independent samples t-test).

Table 3

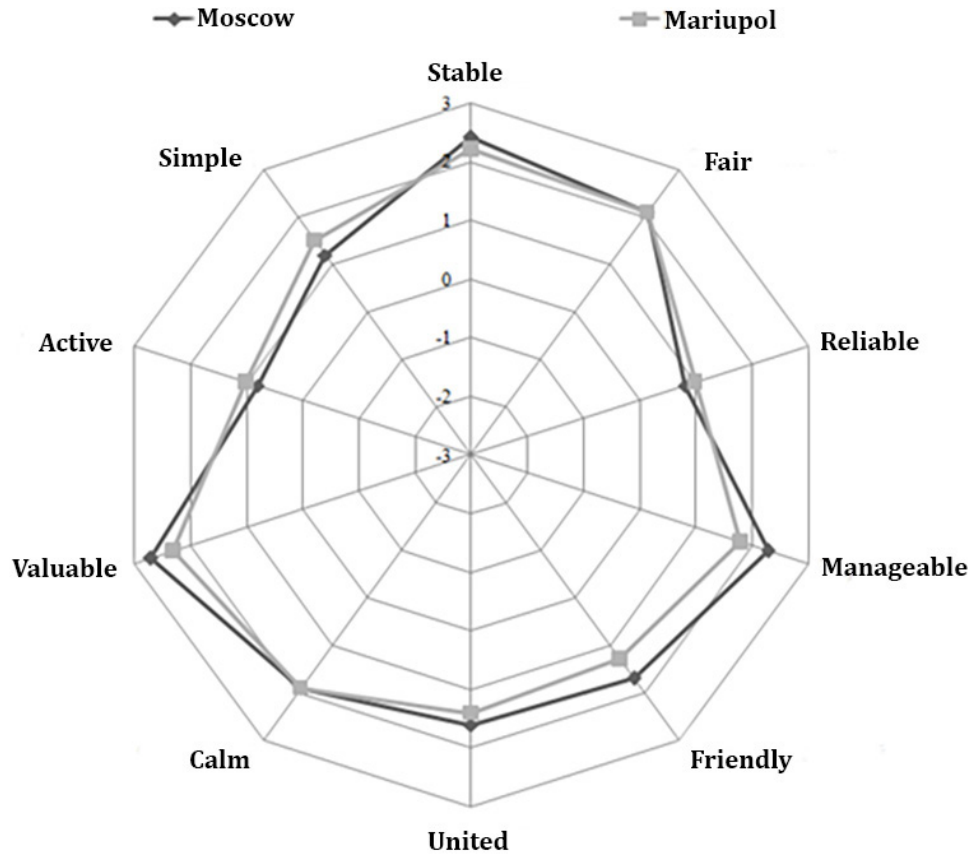
Means and standard deviations of the assessments of the representations of the world in 5 years among adolescents in Moscow and Mariupol, comparison of assessments

SD scales / Adolescent groups	Moscow		Mariupol		Differences		
	M	SD	M	SD	M	SD	M
unpredictable – stable	2.4	.80	2.2	.98	.424	.672	.013
unfair – fair	2.1	.86	2.1	1.02	-.102	.919	.055
unreliable – reliable	.8	.90	1.0	1.07	-.851	.396	.110
chaotic – manageable	2.3	.83	1.8	1.16	3.884**	<.001	.504
hostile – friendly	1.7	.81	1.3	.75	1.474	.142	.191
disunited – united	1.6	1.23	1.4	1.23	.400	.690	.094
anxious – calm	1.9	1.01	1.9	1.16	1.593	.113	.052
useless – valuable	2.7	.71	2.3	1.16	3.621**	<.001	.470
passive – active	.8	1.00	1.0	1.05	-.333	.740	.043
complex – simple	1.2	1.29	1.5	1.34	-1.424	.156	.207

*Note. * p <.05, ** p <.01.*

Figure 2

Assessments of the representations of the world in 5 years among adolescents in Moscow and Mariupol



Moscow adolescents represent the world in 5 years as significantly more manageable and valuable, compared to those from Mariupol.

To identify the vector of the dynamics of the representations of the present and future world, we introduced another characteristic – the squared distances between the assessments of the representations of the world today and the world in 5 years, with M = 38.9, SD = 21.41 for adolescents in Moscow and M = 53.5, SD = 32.33 for adolescents in Mariupol. Using independent samples t-test we found that the squared distances between semantic representations of the world today and the world in 5 years among Mariupol adolescents is significantly higher, compared to those from Moscow ($t = 3.720$; $p < .001$; Cohen's $d = .461$).

Using the Pearson correlation coefficient, we found that the squared distances between semantic representations of the world today and the world in 5 years are inversely related to the assessments of all core beliefs of the individual by significant relationships (r - from -.39 to -.24, $p < .001$).

Peer relationships and perceived support

All participants in the study were evaluated for trust, attachment, satisfaction with communication and feelings of alienation in peer relationships and perceived support from family, friends and significant others.

Table 4 shows the means and standard deviations of peer relationship assessments (IPPA scales) and perceived support from different groups of people (MSPSS) for adolescents in Moscow and Mariupol and the results of comparing these assessments (independent samples t-test).

Table 4

Means and standard deviations of IPPA and MSPSS scales for adolescents from Moscow and Mariupol, comparison of assessments

IPPA and MSPSS scales / Adolescent groups	Moscow		Mariupol		Differences		
	M	SD	M	SD	t(236)	p	Cohen's d
Peer Attachment	4.1	.70	3.6	.61	5.751*	<.001	.763
Trust	4.4	.76	3.9	.77	4.605*	<.001	.588
Communication	4.2	.81	3.5	.86	5.839*	<.001	.775
Alienation	2.3	.71	2.7	.73	-2.951*	.004	-.586
Support from Friends	5.8	1.44	5.3	1.31	2.798*	.014	.322
Family support	5.2	1.56	4.8	1.43	2.079*	.039	.263
Support from Significant Others	5.7	1.29	5.5	1.34	1.424	.156	.189

Note. * p <.05, ** p <.01.

Assessments of peer attachment, trust, and communication are significantly higher among adolescents from Moscow; assessments of alienation are significantly higher among adolescents from Mariupol.

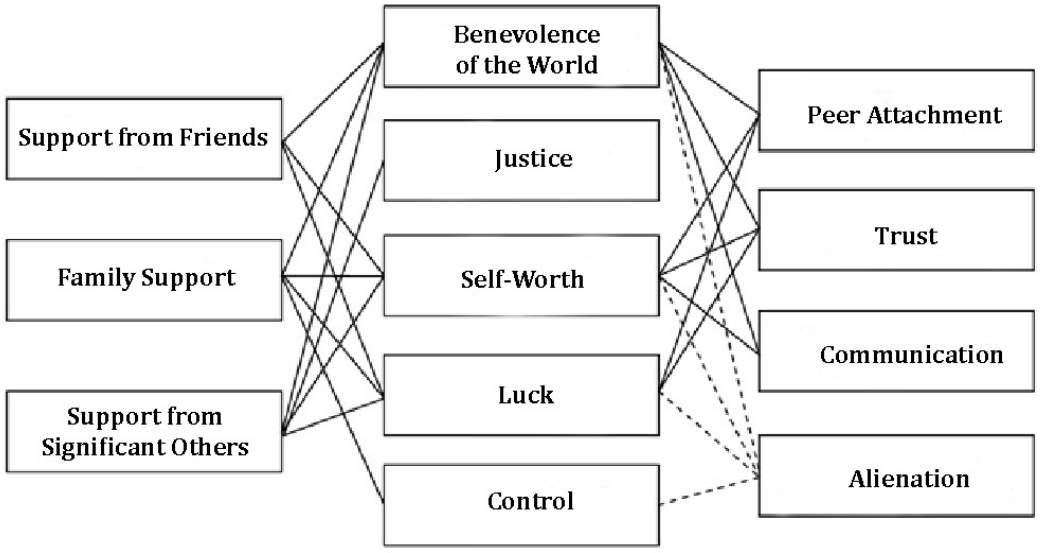
Assessments of perceived support from family and friends among adolescents from Moscow are significantly higher than those of adolescents from Mariupol.

The relationship of peer relationships and perceived support with adolescents' core beliefs

We examined the relationships between the assessments of core beliefs and the assessments of peer relationships and perceived support from different groups of people (Pearson correlation coefficient). Figure 3 presents the results.

Figure 3

Relationships between core beliefs and the assessments of peer relationships and perceived support (| r |>.2; p <.05)



Relationships between the scores of the WAS and IPPA scales:

1. Assessments of Peer Attachment are directly associated with assessments of Benevolence of the World (r = .41; p <.001), Self-Worth (r = .31; p <.001) and Luck (r = .28; p <.001).

2. Assessments of Trust are directly associated with assessments of Benevolence of the World (r = .34; p <.001), Self-Worth (r = .23; p <.001), and Luck (r = .20; p = .002).

3. Assessments of Communication are directly associated with of Benevolence of the World (r = .29; p <.001) and Self-Worth (r = .22; p = .001).

4. Assessments of Alienation are inversely associated with assessments of Benevolence of the World (r = -.34; p = .001), Self-Worth (r = -.29; p = .001), Luck (r = -.33; p <.001) and Control (r = -.21; p = .002).

Relationships between the scores of the WAS and MSPSS scales:

1. Assessments of Support from Friends are directly associated with Benevolence of the World (r=.41; p<.001), Self-Worth (r=.31; p<.001), and Luck (r=.28; p<.001).

2. Assessments of Family Support are directly associated with Benevolence of the World (r=.34; p<.001), Self-Worth (r=.23; p<.001), Luck (r=.20; p=.002), and Control (r=.23; p<.001).

3. Assessments of Support from Significant Others are directly associated with Benevolence of the World (r = .29; p < .001), Justice, Self-Worth (r = .22; p = .001), and Luck (r = .29; p < .001).

Separately, in each group of adolescents from Moscow and Mariupol (with the Bonferroni correction), the same relationships between the inventories were obtained, except that in adolescents from Mariupol, assessments of Benevolence of the World were also associated with assessments of friend support (r = .22; p = .040).

We assessed the relationships between the squared distances between the semantic representations of the world today and the world in 5 years with assessments of peer relationships and perceived support from different categories of people (Pearson correlation coefficient). We found that the considered squared distance is directly associated with Alienation (r = .34; p <.001) and inversely associated with family support (r = -.28; p <.001). Separately, in each group of adolescents from Moscow and Mariupol (with the Bonferroni correction), we obtained the same relationships between the constructed constructs considered.

As all core beliefs are interconnected by medium to strong correlations (Pearson correlation coefficient, r - from .41 to .76, p <.001), we took into consideration the average score for all core beliefs and, using regression analysis, identified predictors of this characteristic. As predictor candidates, we took into account the assessments of perceived support from different groups of people and the different aspects of relationships with peers. The scale of peer attachment was removed from the model, as it is an integrative characteristic of other scales of the IPPA diagnostic instrument.

Table 5
Linear regression model for the average score of individual core beliefs

Predictor	Unstandardized		Standardized	T	p	95% Confidence Interval	
	B	SE	β			Lower Bound	Upper Bound
(Constant)	3.235	.238		13.611	<.001	2.766	3.703
Family Support	.079	.020	.240	3.927	<.001	.039	.118
Friends' Support	.027	.032	.078	.852	.395	-.036	.090
Others' Support	.068	.028	.181	2.414	.017	.013	.124
Trust	.027	.072	.043	.382	.703	-.114	.169
Communication	.022	.072	.037	.304	.761	-.119	.163
Alienation	-.175	.047	-.234	-3.712	<.001	-.267	-.082

For the model R^2 = .311, F (6. 231) = 17.341, p <.001. Significant predictors of scores on the general indicator of individual core personality beliefs for 31.1% of the variance are (directly) perceived support from family and significant others and (inversely) a sense of alienation in relationships with peers.

Discussion

Our study aimed to investigate the psychological characteristics of adolescents living under different living conditions. The results confirmed the assumption about significant differences in the core beliefs of adolescents from Moscow and Mariupol. The world around them is perceived by adolescents from Moscow as more benevolent, and self-image is more positive. Luck and Control scores are also significantly higher, which is explained by the sustainability, stability, predictability of development conditions and the respondents' ability to plan and implement their life plans. At the same time, adolescents living in Mariupol perceive the world as fair, which is consistent with the results of our previous study, in which adolescents from the Belgorod region, who were near the war zone, also considered the world to be fair compared to their peers from stable regions of Russia (Almazova et al., 2025).

A comparative analysis of the representations of the world today and in the future among adolescents living under different living conditions also revealed significant differences. The image of the world in the present among adolescents living in Mariupol, who experienced potentially traumatic events related to military actions, including in places where civilians live, differs from the image of the world among adolescents in Moscow, who live under conditions of greater stability, in terms of reliability, friendliness, integrity, calmness, and complexity, and the representations of the world in the future – in terms of value and manageability. The image of the world among adolescents in Mariupol (less reliable, friendly, integral, and calm), with the exception of the representations of the world today as simpler, is more negative than among their peers from Moscow. The unexpected difference in the representations of the world as simple or complex can be explained by the fact that the polarity of the events experienced and the clarity of the adopted course for recovery and integration into peaceful life, in the present, structures and simplifies the life tasks of adolescents from Mariupol, and in the case of adolescents from Moscow, the tasks of life self-determination appear as more complex in the context of a plurality of choices of possible pathways of self-development.

An important result of the study was the identification of the vector of positive dynamics of the semantics of the image of the world in the present time and in the future among adolescents from Mariupol, confirmed by the similarity of their assessments of their future lives with those of young people from Moscow. This indicates positive expectations of adolescents and optimism in the representations of their future, which constitutes a favorable basis for life self-determination and the construction of life scenarios for the future (Selezneva et al., 2024). It is interesting to note that if there were no significant differences in control and value indicators in the representations of the world in the present, then these differences were observed in the representations of the world in the future. A possible explanation for this fact may be as follows. One of the most important tasks for adolescents in the future (within a period of five years) is professional self-determination. The world in solving this problem is perceived as more valuable and

manageable under stable sociocultural conditions (adolescents in Moscow) compared to adolescents in Mariupol, where the solution of self-determination problems will be carried out under more uncertain conditions. Significant differences in the assessment of the world from two perspectives – the present and the future – can indicate a decline in the level of actual well-being of adolescents. In our study, we found that among Mariupol adolescents the discrepancy between images of the world in the present and in the future is significantly greater

Semantic images of the present and future world function as indicators of the key component of the social situation of development - experiences, in the integrity of their affective and semantic components. And experiences, as noted in the works of L.S. Vygotsky, act as a basis for the formation of an active position of the subject in the creation of his being (Karabanova, 2024) and for the formation of core beliefs as the basis of the worldview. In this regard, the results obtained appear logical and justified. Differences in the difficult living conditions of adolescents, different experiences of events of recent years are reflected in the image of the world of the present and the future, as well as in the nature of individual core beliefs.

In this case, social support resources are particularly important, which can contribute to the normalization of the adolescents' adaptation process and their successful normative development. The assumption of the connection between core beliefs and areas of social support has been empirically confirmed. Support in the sphere of interpersonal relationships with friends is significantly associated with beliefs in benevolence of the world, self-worth, and luck. Support in the family sphere is positively associated with beliefs in benevolence of the world, self-worth, luck, and control. Support from significant others is associated with beliefs in benevolence of the world, justice, self-worth, and luck. We found that family support is of the greatest importance for the belief in control, which is due to reliable protection, a sense of security and guidance provided by the family to adolescents The belief of adolescents in the fairness of the world is significantly associated with the support of important others, which confirms the important role of social support in shaping the representations of the world as fair. In the absence of opportunities for Mariupol adolescents to receive support from their family (due to the death of one or both parents or other relatives), it is possible to speak of a reduction in satisfaction with the need for security and protection as an important component of psychological well-being.

Given the special role of communication with peers in adolescence, we paid special attention to the analysis of the relationship between the parameters of the core beliefs of the individual and the relationships with peers. Peer attachment and trust reveal a positive significant relationship, and alienation reveals an inverse significant relationship with beliefs in benevolence of the world, self-worth, and luck. Communication with peers has a positive significant relationship with beliefs in benevolence of the world and self-worth. The belief in control is negatively associated with alienation. There were no significant relationships for the belief in justice, which once again indicates the importance of a broad system of social conditions for its formation. Consequently, we have confirmed

the importance of interpersonal relationships with peers for the formation of individual core beliefs.

The analysis carried out has enabled us to identify predictors of core beliefs of adolescents. Factors that make the world and one's self more positive are the support of family and friends, and a more negative factor is the alienation of peers. The results obtained enable us to say that these aspects of social support are the targets for psychological support for adolescents facing difficult situations in life and traumatic events.

Thus, the results obtained show that the content of the social situation of adolescents' development is particularly important in the process of adaptation and reintegration into civilian life. Self-feeling, the feeling of individual role and experiences in the development of society as a whole, and the relationship with the surrounding social world are important factors for the success of normative mental development. In the low expression of such resources as support from family and peers, the process of forming a positive image of oneself and the surrounding world can become more complicated and lead to the development of negative psychological changes affecting such important components of adolescence as identity, adequate methods and forms of self-determination, stability of value-related attitudes and resilience.

With regard to the results obtained from the study, we can talk about the important role of psychological education and support for adolescents who have experienced traumatic events as a result of military operations, in order to form a positive image of themselves and the world by expanding support sources in the absence of such from family members, as well as by including them in socially significant forms of interaction with others as a tool for developing friendly relationships with others and increasing trust in these relationships.

The limitations of this study are related to the general assessment of the characteristics of the social situation of adolescents in the region. Prospects for further research are the study of important stress events in the lives of the respondents and the mode of their affective assessment.

Conclusion

We have drawn the following conclusions:

1. There are differences in the core beliefs of adolescents living under different conditions. Moscow adolescents are characterized by the representations of the world as more friendly, but less fair, more positive self-image, greater beliefs in luck and control, compared to their Mariupol peers.

2. The representations of the present world among adolescents living in Moscow is characterized by greater reliability, friendliness, unity, calmness, and complexity and the image of the future world is more valuable and manageable compared to adolescents living in Mariupol.

3. The positive dynamics of the world representations in the perspective of time from the present to the future were revealed in both groups of adolescents living under different conditions.

4. A correlation has been established between the core beliefs of adolescents and the areas of social support – friends, family, and significant others. The following characteristics of the relationship have been revealed: Family support is important for forming control beliefs, support from significant others is important for beliefs in justice.

5. Significant positive correlations were revealed between core beliefs in benevolence of the world, self-worth, luck and peer attachment, trust, and communication. Negative correlations were found with peer alienation. There was a negative correlation between the belief in control and peer alienation.

6. The specificity of the social situation of development of adolescents affects core beliefs. It is shown that predictors of individual core beliefs are directly perceived support from family and significant others and, inversely, a feeling of peer alienation.

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Ol'ga Viktorovna Almazova contributed to the discussion of the research concept, selection of diagnostic instruments, statistical analysis of the results, and discussion of the results.

Sergei Vladimirovich Molchanov contributed to the discussion of the research concept, selection of diagnostic instruments, discussion of the results, and generalization of the results. **Sergey Nikolaevich Ryagin** – critical revision of the article's content.

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The Scale of Self-Perceived Ability – Spatial and Engineering: development, validation, reliability

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Abstract

Introduction. Current qualification requirements in scientific and technological practices emphasize the demand to take into account both engineering and spatial abilities when selecting students for advanced training in STEM disciplines. A comprehensive assessment of these abilities can improve the efficacy of education and increase the number of highly qualified specialists in the STEM sector. The aim of this study was to develop a valid and reliable scale for the measurement of self-perceived spatial and engineering abilities.
Methods. The sample consisted of 5062 students of higher educational institutions of Russia aged 18 to 25 years (average age 18.35 years). In order to evaluate psychometric properties of the scale, exploratory, confirmatory, and multigroup factor analysis were used. **Results.** Factor analysis revealed a four-factor structure of 10 items endorsed by excellent model fit indices. The identified factors of Orientation, Engineering, Rotation, and Visualization together explained 52% of the total variance. Factor loadings ranged from 0.72 to 0.98, confirming the high reliability of each scale item. Cronbach's alpha for the entire scale was 0.85, indicating high internal consistency. Comparative analysis of mean values for the top and bottom 27% of the sample demonstrated significant differences for all scale items. Analysis of mean values by gender groups revealed significant differences for four identified factors. Measurement invariance analysis showed that the scale corresponds to configural, metric, and scalar types of invariance. **Discussion.** The factor structure of the scale corresponds to the model of spatial abilities of "large" and "small" scale. The novelty of this study consists in the validation of the first Russian-language scale, providing a brief and comprehensive assessment of both spatial and engineering abilities important for educational and professional practice.

Keywords

spatial abilities, engineering abilities, students, gender, psychometric analysis

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Introduction

The ability to identify, manipulate and transform spatial information is crucial for human adaptation to the environment (Newcombe & Huttenlocher, 2000). Spatial skills are associated with key aspects of human cognitive and academic functioning, such as education achievement (Liu et al., 2021; Dvoinyin & Trotskaya, 2022), intelligence (Lohman, 1996, Karpov, 2012), creativity (Kell et al., 2013; Suh & Cho, 2020), scientific reasoning (Clements & Battista, 1992; Mayer et al., 2014). Notably, spatial skills are essential for successful education and career in STEM – science, technology, engineering and mathematics (Zavyalova et al., 2020; Wai et al., 2009; Miller & Halpern, 2013; Veurink & Sorby, 2017; Uttal & Cohen, 2012). In this particular case, the ability to effectively manipulate and interpret spatial information allows better understanding and solution of applied problems (Uttal et al., 2013).

Although spatial, mathematical, and verbal abilities are considered to be the foundation of students' cognitive abilities, assessment of spatial abilities has not received sufficient attention in STEM education (Uttal & Cohen, 2012; Sorby et al., 2013). It is particularly remarkable that spatial ability is considered an important and relatively accurate predictor of potential talent and success in STEM fields. (Lowrie et al., 2019; Stieff & Uttal, 2015; Uttal & Cohen, 2012; Wai et al., 2009). Furthermore, engineering abilities such as understanding the functioning principles of technical systems and devices require future STEM professionals to have a high level of spatial thinking in order to effectively develop the skills and competencies necessary to solve real-life problems in engineering practice (Uttal et al., 2013; Brotman & Moore, 2008). As a result the interaction between spatial and engineering abilities forms a firm basis for successful academic and professional activity in STEM.

Modern demands for professional activity in scientific and technical fields also emphasize the importance of considering not only engineering but also spatial abilities

when selecting students for advanced studies in STEM fields (Lubinski, 2010; Sorby et al., 2018; Yoon & Mann, 2017). The combined assessment will help maximize the effectiveness of training in these critical areas and lead to a significant increase in the number of highly skilled professionals in the STEM sector (Wai et al., 2009; Adya & Kaiser, 2005). In turn, isolated assessment of spatial and engineering abilities has a number of disadvantages. First of all, isolated assessment does not take into account the synergistic influence of spatial skills on solving engineering problems and vice versa (Uttal et al., 2013), which can manifest itself as underestimation of candidates with high spatial abilities but low scores on engineering criteria for engineering positions. Moreover, the lack of an interdisciplinary approach limits the interpretation: traditional tests of spatial abilities are insufficient to identify skills important for engineering design (Hegarty & Waller, 2004). This can lead to a skewed impression of actual competencies and hinder professional development in interdisciplinary fields such as architecture and mechanics which require synergy between different types of reasoning (Sorby, 2009). Therefore, comprehensive assessment of spatial and engineering abilities is essential for an accurate evaluation of professional skills.

Thus, the development of a measurement tool for spatial and engineering abilities becomes a milestone step toward enhancing the quality of education and personnel recruitment within the STEM field. An integrated assessment will contribute to increase in the effectiveness of industry-specific education and candidates' competence development for engineering professions which is particularly vital in the context of rapidly advancing technologies. The cooperation between spatial and engineering abilities lays emphasis on the necessity of their joint assessment highlighting the importance of creating interdisciplinary instruments for practical assessment.

Spatial and Engineering abilities

The definition of spatial abilities remains a debatable question in psychometric research, as these abilities are not considered a single construct but rather a constellation of multiple components of spatial cognition (Aristova et al., 2018; Casey, 2013; Hegarty & Waller 2004, 2005; Lohman, 1996; Uttal & Cohen, 2012). One of the bases for the classification of spatial abilities is the scale of the subject in relation to the objects of space (Aristova et al., 2018).

The literature distinguishes between local (small-scale) and global (large-scale) spatial abilities (Jansen, 2009; Aristova et al., 2018). The "small scale" group of spatial abilities includes skills related to the manipulation of specific objects: the main abilities of this group include the transformation of objects (Zacks et al., 2000), mental rotation (Blajenkova et al., 2005), and object manipulation (Kozhevnikov & Hegarty, 2001). Within the context of "large-scale" abilities, spatial orientation and the mental representation of object locations relative to the observer are distinguished. This group of abilities encompasses the judgement on direction and distance (Jansen, 2009); specifically, it

includes navigation (Kozhevnikov et al., 2006), the «sense of direction» (De Beni et al., 2006), spatial orientation (Kozhevnikov & Hegarty, 2001), and perspective-taking (Hegarty & Waller, 2004). Furthermore, psychological and neuropsychological research provides evidence of a partial dissociation between abilities related to "small-scale" and "large-scale" spatial cognition (Morris & Parslow, 2004; Wang et al., 2014).

Conversely, engineering abilities can be defined as the aggregate of knowledge, skills, and personal qualities necessary for the successful resolution of engineering problems and effective performance in technical and applied field (Miller, 2017; Anufrieva, 2023). These abilities encompass both technical skills and social competencies (Groeneveld et al., 2020), as well as general cognitive abilities (Frank, 2006; Ackerman et al., 2013). Cognitive abilities that play a crucial role in engineering competencies include analytical thinking (Hidayat et al., 2023), critical thinking (Ahern et al., 2019), creative thinking (Cropley, 2016), and spatial reasoning (Lubinski, 2010).

The interplay between spatial and engineering abilities warrants particular attention due to their significance for achieving success in STEM fields. The ability to visualize objects and their interrelationships within three-dimensional space becomes essential for design and analysis as it facilitates the comprehension of abstract concepts (Hegarty & Waller, 2004; Lee et al., 2010; Ha & Fang, 2016). This confirms the fact that spatial reasoning is a key component of engineering thinking and can be effectively transformed into practical skills (Buckley et al., 2018; Buckley et al., 2022).

Self-Perceived Ability – Spatial and Engineering Scale

Currently, there are several Russian-language assessment tools designed to evaluate various components of spatial abilities (Trotskaya, 2017; Likhanov et al., 2020; Batova, 2021). However, the assessment of both spatial and engineering abilities can be demanding. Given the relevance of screening methods for individual differences measurement, there is a need to develop a brief self-assessment scale for spatial and engineering abilities. For scale development, a series of statements from the Bricks questionnaire aimed at evaluating both "large-scale" and "small-scale" spatial abilities adolescents were utilized (https://datadictionary.teds.ac.uk/studies/webtests/18yr_bricks_qnr.htm) from Twins Early Development Study (TEDS) project. Additionally, three specific statements were developed to measure engineering abilities reflecting the combination of spatial and engineering skills involved in the successful execution of tasks related to understanding and designing objects, devices, and mechanisms.

We hypothesize that the factor structure of the self-assessment scale for spatial abilities will be divided into two theoretically justified interconnected components: spatial and engineering. The main **aim** of this study is to evaluate the theoretical and psychometric validity of the developed scale.

Methods

Sample

The study involved 5,062 students from four Russian higher education institutions. Of these, 14.3% completed the assessment instrument in a careless manner, as identified through analysis of individual response variability and response sequence length. For the following analysis, a sample of 4,336 participants was selected, including 1,236 males (28.51%). The mean age of the participants was 18.35 years (range: 18–25 years; SD = 0.9).

Self-Perceived Ability - Spatial and Engineering Scale

The Self-Perceived Ability - Spatial and Engineering Scale comprised 11 statements. Of these, 8 items pertain to the assessment of spatial abilities, while items 9-11 eleven are aimed at the evaluation of engineering abilities (Table 1). Participants are asked to indicate their level of agreement with each statement on a Likert scale ranging from 1 (Strongly agree) to 5 (Strongly disagree). Statements 4, 6, and 8 are reverse-coded (negative). For subsequent analysis, responses to all items, except the reverse-coded ones, were re-coded in the opposite direction: "strongly agree" as 5 points, "agree" as 4 points, and so on. The total score for the scale was calculated by summing the individual item scores.

Table 1
Content of the Self-Perceived Ability - Spatial and Engineering scale's items.

№	Item Content
1	Я хорошо ориентируюсь на местности.
2	Я хорошо представляю, как 2D объекты выглядят в 3D.
3	Я хорошо запоминаю ориентиры, когда гуляю где-то в первый раз.
4	Мне трудно представить, как будут выглядеть объекты с другого ракурса.***
5	Я редко теряюсь, когда гуляю где-то в первый раз.
6	Мне сложно мысленно вращать объекты.***
7	У меня хорошие пространственные способности.
8	Обычно я не знаю, где нахожусь относительно ближайших ориентиров.***
9	Я легко понимаю принцип работы приборов, механизмов или устройств.
10	Если понадобится, то я смогу разобрать и собрать обратно бытовой прибор или механизм.
11	Для меня не составляет труда собирать модели из бумаги или конструировать из кубиков Лего.

Note. **** – reverse-coded statements*

Statistical Analysis

To evaluate the validity of the theoretical construct and to identify the underlying factor structure of the Self-Perceived Ability - Spatial and Engineering scale (SPA-SAE), participants' responses were analyzed using structural equation modeling. The sample was evenly divided into two parts to conduct Exploratory Factor Analysis (EFA) prior to performing Confirmatory Factor Analysis (CFA). The first 2,168 participants were used for EFA, while the remaining 2,168 participants were selected for CFA. The initial EFA was conducted using the psych package (Revelle, 2025) in R version 4.3.1 to determine the factor clustering of the data. Based on the results of the EFA, CFA was performed using promax rotation to assess the fit of the observed data to the proposed factor structure. The confirmatory factor analysis was carried out using JASP software version 0.18.1.

Subsequently, an assessment of the internal consistency and stability of the SPA-SAE scale was conducted. This analysis included the calculation of Spearman's rank correlation coefficients (ρ) between individual items and the total scale score. For each subscale, Cronbach's alpha (α) was computed to determine the internal reliability of the items. This analysis was performed using R version 4.3.1.

Finally, a test of measurement invariance across different gender groups was conducted using Multigroup Confirmatory Factor Analysis (MCFA). Within this framework, three models were analyzed to assess configural invariance, metric invariance (factor loadings), and scalar invariance (thresholds). The multigroup confirmatory factor analysis was performed using JASP software version 0.18.1.

Results

Descriptive statistics

Table 2 presents the distribution characteristics of raw scores for the scale items. The normality analysis of the total score distribution for the entire sample was conducted using the Shapiro-Wilk test and indicated a significant deviation from a normal distribution ($W = 0.99$, $p < 0.001$). Following this, non-parametric criteria were employed for subsequent analyses.

Table 2
Descriptive statistics of data distribution of scale's statements and total score.

№ Item	Mean	Median	SD	Min	Max	Skewness	Kurtosis
1	3,59	4	1,12	1	5	-0,43	2,35
2	3,54	4	1,08	1	5	-0,37	2,39
3	3,71	4	1,08	1	5	-0,54	2,54
4	3,56	4	0,96	1	5	-0,65	3,02

№ Item	Mean	Median	SD	Min	Max	Skewness	Kurtosis
5	3,29	3	1,18	1	5	-0,19	2,09
6	3,92	4	1,09	1	5	-0,47	2,51
7	3,43	3	1,02	1	5	-0,18	2,34
8	3,44	4	1,11	1	5	-0,61	2,49
9	2,85	3	1,07	1	5	0,24	2,41
10	2,61	2	1,22	1	5	0,37	2,15
11	3,33	3	1,53	1	5	-0,27	2,08
Total Score	36,76	37	7,45	11	55	-0,13	3,05

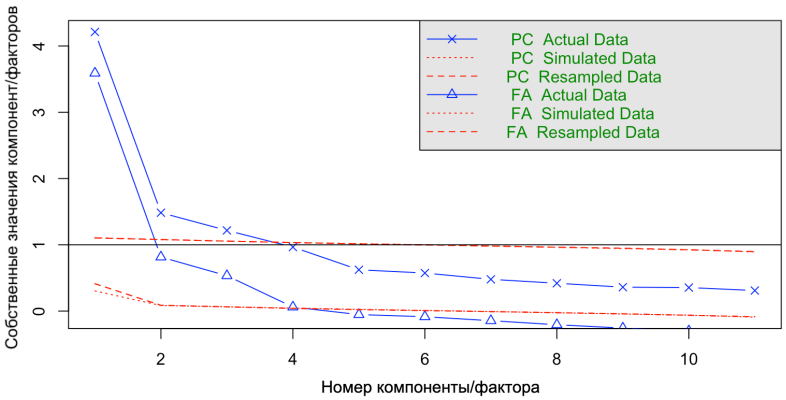
Exploratory Factor Analysis

To determine the factor structure of the scale exploratory factor analysis was conducted on the first half of the sample (N = 2,168). Prior to this the feasibility of the sample for further analysis was assessed. The Kaiser-Meyer-Olkin (KMO) measure was calculated and found to be 0.85. The results of Bartlett's test of sphericity were significant (χ^2 = 17,676.79, p < 0.001) indicating that the data are multivariate normally distributed and meet the criteria for factor analysis.

To determine the number of latent factors a parallel analysis was conducted. The scree plot (Figure 1) indicated the presence of three components with eigenvalues exceeding 1. However, the acceleration coefficient analysis suggested the presence of four factors. Based on these results, a four-factor structure was selected for subsequent exploratory factor analysis.

Figure 1

Graphical estimation of the number of components and factors in the exploratory factor analysis model



An EFA was conducted to determine the factor loadings of the items within the proposed factor model. The number of factors was set to four corresponding to the previously identified structure, and oblique promax rotation was applied to facilitate a more reliable interpretation of the factor loadings. The results indicated that the four identified factors explained 18%, 15%, 13%, and 6% of the total variance, respectively, cumulatively accounting for 52%. In the next stage, the degree of correspondence between each statement and its respective factor was assessed. When interpreting the pattern of factor loadings an item was considered significantly loaded onto a factor if its loading value was 0.3 or higher based on widely accepted guidelines regarding the minimum threshold for item loadings. Item 8 did not meet this criterion and was therefore removed from the scale. The factor loadings for each statement are presented in Table 3.

Table 3

Factor loadings of scale's items based on Confirmatory Factor Analysis

Item		Factor loadings after rotation			
№	Item content	1	2	3	3
1	Я хорошо ориентируюсь на местности	0,839			
3	Я хорошо запоминаю ориентиры, когда гуляю где-то в первый раз.	0,772			
5	Я редко теряюсь, когда гуляю где-то в первый раз.	0,645			
9	Я легко понимаю принцип работы приборов, механизмов или устройств		0,731		
10	Если понадобится, то я смогу разобрать и собрать обратно бытовой прибор или механизм		0,923		
11	Для меня не составляет труда собирать модели из бумаги или конструировать из кубиков лего		0,521		
4	Мне трудно представить, как будут выглядеть объекты с другого ракурса.			0,791	
6	Мне сложно мысленно вращать объекты.			0,828	
2	Я хорошо представляю, как 2D объекты выглядят в 3D				0,602
7	У меня хорошие пространственные способности.				0,379

Note. *Amount of explained variance: 51,895%, Factor 1: 18,128%, Factor 2: 15,221%, Factor 3: 12,747%, Factor 4: 5,799%*

Based on the analysis of the patterns of factor loadings and the theoretical content of the statements, it was determined that statements 1, 3, and 5 form a factor related to spatial orientation and navigation abilities. Consequently, this factor was named "Orientation." Statements 9, 10, and 11, which assess engineering abilities, form the "Engineering" factor. The theoretical content of statements 4 and 6 is categorized as mental rotation skills; this factor was referred to as "Rotation". The fourth factor comprising statements 2 and 7 focused on evaluating spatial visualization abilities, and was named "Visualization".

Confirmatory Factor Analysis

Following the EFA, confirmatory factor analysis (CFA) was conducted on the second half of the sample (N = 2,168) to verify whether the derived factors accurately represent the theoretical framework of spatial and engineering abilities. Scale's factor structure was derived in the previous stage of analysis based on the results of the EFA. Consequently, all identified factors were explicitly defined and comprised 2 to 3 items. The model's fit was evaluated using standard fit indices: chi-square (χ^2), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR). An acceptable model fit was confirmed by RMSEA values below 0.08 and CFI and TLI values ranging from 0.90 to 0.95 (Hu & Bentler, 1999).

The four-factor CFA model demonstrated an excellent data fit ($\chi^2(283) = <0.001$; CFI = 0.971; TLI = 0.956; RMSEA = 0.064; SRMR = 0.038). Moreover, the factor loadings ranged from 0.72 to 0.98 (see Figure 2). The factor correlation matrix indicated moderate to high correlations among all four factors, ranging from 0.36 to 0.80 (see Figure 2). These findings provide reasonable evidence supporting the construct validity of the SPA-SAE scale.

Reliability

To estimate the reliability of the identified factors a correlation analysis was conducted on the full sample (N = 4,336) using Spearman's rho coefficient. Spearman's rho correlations were calculated to examine the relationships between four factors and the total score (see Table 4). The four factors and the total scale score were positively correlated. The Cronbach's alpha coefficients for internal consistency of the four scale factors ranged from 0.70 to 0.79 (see Table 4). These results further support the multidimensionality of the scale and confirm the presence of four distinct factors.

Picture 2

Factor structure diagram of the Self-Perceived Ability - Spatial and Engineering scale.

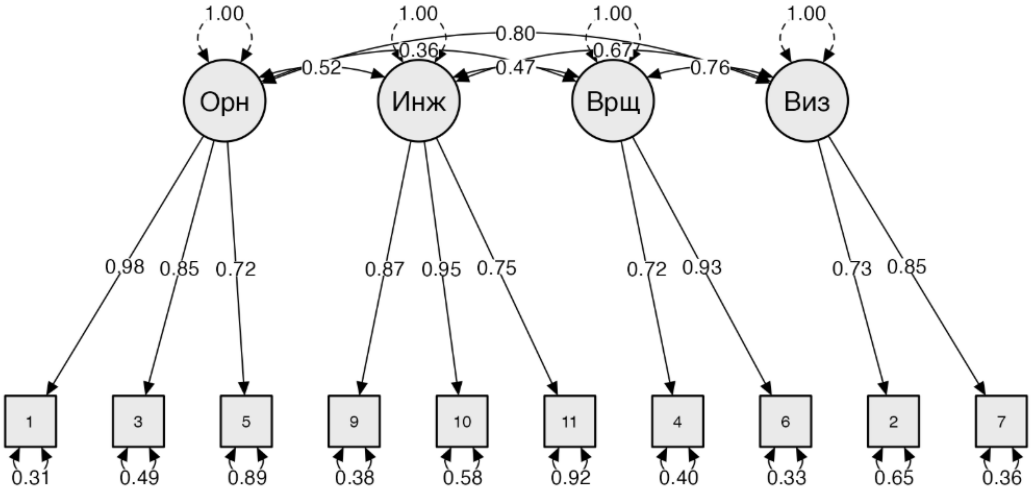


Table 4

Coefficients of internal consistency for the factors and correlation coefficients between the factors and the total score

	Orientation	Engineering	Rotation	Visualisation	Total score
Orientation					0,768***
Engineering	0,396***				0,783***
Rotation	0,272***	0,362***			0,657***
Visualisation	0,569***	0,505***	0,572***		0,830***
α Cronbach	0,79	0,78	0,78	0,70	0,85

Note. **** – p-value <0,001*

To evaluate the discriminative capacity of the items, corrected correlations between each item and the total score were calculated for sample groups comprising the lowest 27% (N = 1,217) and highest 27% (N = 1,236) of scores. The differences between the mean scores of the lower and upper groups were analyzed using the Mann-Whitney U test, a non-parametric independent test. The corrected correlations between each item and the total score for scale items ranged from 0.573 to 0.768 (see Table 5). All values were positive and high, confirming the internal consistency of each item with the total score. For all items, the differences in mean scores between the lower and upper 27% groups were statistically significant ($p < 0.001$) (see Table 5). These findings provide compelling evidence of the items' discriminative ability and scale's internal consistency.

Table 5

Correlation between scale's statements and total score, and mean values comparison between groups of lower and upper 27 % scores

Factor	№	Total score correlation	Gr.	Mean	SD	Mann-Whitney, p-value	Rank-Biserial, Correlation
Orientation	1	0,709***	L	2,607	0,952	<0,001	-0,864
			U	4,515	0,657		
	3	0,657***	L	2,843	1,038	<0,001	-0,791
			U	4,520	0,668		
	5	0,573***	L	2,491	0,998	<0,001	-0,712
			U	4,092	1,005		
Engineering	9	0,683***	L	2,035	0,783	<0,001	-0,822
			U	3,788	0,901		
	10	0,639***	L	1,778	0,863	<0,001	-0,786
			U	3,666	1,088		
	11	0,636***	L	2,402	1,060	<0,001	-0,796
			U	4,290	0,853		
Rotation	4	0,580***	L	2,895	0,975	<0,001	-0,668
			U	4,151	0,716		
	6	0,610***	L	2,562	1,051	<0,001	-0,727
			U	4,109	0,791		
Visualisation	2	0,690***	L	2,608	0,947	<0,001	-0,813
			U	4,358	0,758		
	7	0,768***	L	2,467	0,755	<0,001	-0,898
			U	4.315	0.675		

Note. **** – p-value <0,001; L – lower 27% group; U – upper 27% group.*

Measurement invariance

As a result of the comparative analysis of mean scores between male (N = 1,236) and female (N = 3,100) groups, significant differences were observed in favor of the male gender (see Table 6).

Table 6

Comparative analysis of mean values in female and male gender groups.

Factor	Gr.	Mean	SD	Mann-Whitney, p-value	Rank-Biserial, Correlation
Orientation	M	11,587	2,653		
	F	10,201	2,846	<0,001	0,283
Engineering	M	10,204	2,827		
	F	8,231	2,771	<0,001	0,384
Rotation	M	7,330	1,778		
	F	6,803	1,872	<0,001	0,170
Visualisation	M	7,576	1,681		
	F	6,725	1,846	<0,001	0,270
Total score	M	36,697	6,647		
	F	31,961	6,997	<0,001	0,392

Note. *M – male gender group; F – female gender group.*

Measurement invariance implies that the scale provides equivalent measurement of the same constructs across different groups. To assess the satisfaction of invariance conditions multigroup confirmatory factor analysis (MCFA) is frequently employed in practice (Vandenberg & Lance, 2000; van de Schoot et al., 2012). In order to evaluate the reproducibility of the factor loadings pattern across two gender groups, a configural model based on four factors (Orientation, Engineering, Rotation, and Visualization) was utilised. The configural model was compared with a model that assumes invariance of factor loadings (metric invariance) and with a model that assumes invariance of both factor loadings and thresholds (scalar invariance). The results of the MCFA are presented in Table 7.

Table 7
Results of the Multigroup Confirmatory Factor Analysis and invariance models comparison.

Model	χ2	df	p-value	CFI	RMSEA	SRMR
Model 1 configural	582,61	58	<0,001	0,968	0,065 95% CI (0,060; 0,069)	0,041
Model 2 metric	600,32	64	<0,001	0,967 Δ=-0,001	0,062 Δ= -0,003 95% CI (0,058; 0,067)	0,042 Δ=0,001
Model 3 scalar	631,16	70	<0,001	0,965 Δ=-0,002	0,061 Δ= -0,001 95% CI (0,057; 0,065)	0,041 Δ=-0,001

Based on widely accepted guidelines regarding acceptable model fit decline in invariance testing (ΔCFI ≥ −0.01, ΔRMSEA ≥ 0.015, and ΔSRMR ≥ 0.03), we can conclude that configural invariance and metric invariance are confirmed for this sample (Chen, 2007). Similarly, using corresponding criteria for scalar invariance (ΔCFI ≥ −0.01, ΔRMSEA ≥ 0.015, and ΔSRMR ≥ 0.01), the conditions for verification of this type of invariance are also met. Therefore, the primary types of measurement invariance for the self-assessment scale of spatial and engineering abilities are confirmed.

Discussion

In the present study a series of statements constituting a brief scale was developed for the rapid self-assessment of spatial and engineering abilities in students (Self-Perceived Ability - Spatial and Engineering, SPA-SAE). This scale was evaluated using a representative sample of students enrolled in Russian higher education institutions, enabling a comprehensive analysis of its psychometric quality. Various diagnostic methods were employed to evaluate the scale, including analyses of internal consistency and construct validity, and measurement invariance across gender groups. The results demonstrated the high quality of the proposed scale, confirming its theoretical foundation and appropriateness for use in assessing students' core spatial and engineering abilities.

Factor structure of the scale

Aactor analysis was conducted to ensure the validity of the theoretical construct and to identify the psychometric structure underlying the self-assessment scale of spatial and engineering abilities. The results of the exploratory factor analysis indicated that scale's statements related to spatial navigation, engineering skills, mental rotation, and spatial visualization, loaded onto distinct but correlated factors (Orientation, Engineering, Rotation, and Visualization, respectively). Confirmatory factor analysis further validated the four-factor structure.

These findings are in congruence with the conceptualization of spatial ability components as classified into "large-scale" and "small-scale" groups (Jansen, 2009). Thus, the "Orientation" factor can be considered as representing "large-scale" spatial abilities as the items associated with this factor pertain to tasks that require spatial orientation and the mental representation of object locations relative to the observer. Conversely, the "Rotation" and "Visualization" factors are associated with "small-scale" spatial abilities, with the statements referring to mental representation of objects in space, object's transformation tracking, and performing mental manipulations.

Thus, the identified factor structure of the proposed scale is in line with existing conceptualizations of spatial abilities and their relationship with engineering skills, thereby supporting the theoretical validity of the scale's structure.

Reliability and Validity

According to the results, the "Engineering" factor demonstrated moderate correlations with both the "Orientation" factor, and the "Rotation" factor, and "Visualization" factor. These findings are in congruence with the notion that the development of advanced engineering skills requires well-developed spatial abilities (Berkowitz & Stern, 2018; Sorby et al., 2018). Furthermore, spatial visualization emerges as a primary and the most strongly intercorrelated factor within the structure of spatial and engineering abilities, exhibiting the greatest connections with the other spatial factors, as well as the "Engineering" factor. The relationships between the scale's factors confirm the association between engineering and spatial abilities, which are crucial for specialized tasks such as solving spatial problems or working with technical documentation. Additionally, these results denote the justified need for combined assessment approaches for profiling in educational and career guidance contexts.

Measurement invariance in gender groups

Comparisons of mean scores across the identified factors as well as the total score revealed significant differences between male and female gender groups. Gender differences in spatial abilities are well-documented in numerous studies. Specifically, males tend to outperform females on several spatial tests (Maeda & Yoon, 2013; Uttal et al., 2013), as

well as in engineering skills (Halpern et al., 2007; Ceci & Williams, 2010; Charlesworth & Banaji, 2019; Antoshchuk, 2021). Research attributes these differences to various factors, including evolutionary (Silverman et al., 2007), strategic (Heil & Jansen-Osmann, 2008; Weiss et al., 2003), and hormonal influences (Heil & Jansen-Osmann, 2008; Vuoksimaa et al., 2010). The detection of gender-based differences within this sample confirms the scale's sensitivity to individual variations in spatial and engineering abilities.

The invariance analysis across gender groups demonstrated that the scale with its four-factor structure satisfied the conditions for configural, metric, and scalar types of invariance. This result indicates the scale's reliability in comparison of latent factor means and structural model components, as well as the invariance of threshold parameters across the examined gender groups. Based on these findings, it can be concluded that scale's estimates are highly comparable and that the interpretations of the scale statements are consistent across gender groups.

Conclusions

The developed self-assessment scale of spatial and engineering abilities constitutes a theoretically valid and reliable instrument ready for application in Russian-language research and practice. We offer a practical tool that can be effectively employed in educational institutions to identify and evaluate key spatial and engineering skills among students, and it can serve as a basis for further investigations in STEM fields.

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Assessing Metacognition in 5- to 6-Year-Old Children: Methodological Considerations

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Abstract

Introduction. Metacognition is a process of awareness and regulation of one's own cognitive processes, in which two components are distinguished: metaknowledge (of the strategies and factors of cognition) and metaregulation (planning, monitoring and evaluation). Metacognition was thought to emerge only at the age of 7-8 years, but recent research suggests that some components of metacognition can be detected from an earlier age. **Methods.** The aim of the study was to identify those components of metacognition that can be assessed in 5–6-year-old children and to develop a methodology for their assessment. The study involved 62 children from 4 years 11 months to 6 years 10 months (mean age 66.8 months, 50% boys) - pupils of senior and preparatory groups of kindergartens in Moscow and Kazan. Two types of tasks were used: mnemic and thinking, the assessment of metacognition components was based on a conversation with children in the process of problem solving. Correlation analysis and analysis of differences by the Mann-Whitney criterion were used for data processing. Qualitative analysis was used to analyse children's answers. **Results.** Components that can be assessed at this age were identified: two components of metaknowledge (of the strategy and success factors), and two components of metaregulation (evaluation of one's success and evaluation of difficulties). Metacognitive evaluation of one's success and difficulties are positively related to success on thinking tasks, but not on memorisation tasks. Also, greater success on thinking tasks is found in children who can identify their strategy and the factors that influenced their outcome. No such relationship was found for mnemic tasks. **Discussion.** The analysis of solving thinking tasks provides greater opportunities for assessing the components of metacognition in children than the analysis of solving memory tasks, this technique is considered as the most promising for future research.

Keywords

metacognition, metaknowledge, metaregulation, problem solving, memorisation, senior preschool age

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Introduction

Metacognition is broadly defined as children's awareness and regulation of their cognitive processes (thinking, memory, imagination, etc.) (Veraksa & Veraksa, 2023). The term 'metacognition' was proposed by J. Flavell (Flavell, 1976) in his model of cognitive monitoring of memory. According to this model, four types of metacognitive phenomena can be distinguished: 1) the subject's awareness of the task, 2) awareness of the strategy, 3) awareness of factors affecting the outcome of the task (task features, strategy, and one's own personality), and 4) metacognitive experience or reflection (affective or cognitive) on the progress of the task (Flavell, 1976; 1979). More recent studies of metacognition have summarised these phenomena into two main components of metacognition, metaknowledge and metaregulation (Paris, Cross & Lipson, 1984; Flavell, 2000; Veenman, Van Hout-Wolters, Afflerbach, 2006; Whitebread et al., 1999). The knowledge component included awareness of the factors influencing the problem-solving process, one's personal characteristics, the features of the task itself, and the features of the chosen strategy. The regulatory component was described as the subject's ability to manage his/her own cognition (Schraw, Moshman, 1995, p. 354), including three types of strategies, planning strategies (selecting the right methods and allocating resources), monitoring (tracking one's own understanding or success in solving the task), and evaluation (comparing what was planned with what was actually achieved).

Is it possible to speak about metacognition in relation to senior preschool children?

The author of the idea of metacognition J. Flavell correlated the emergence of metacognition with Piaget's stage of formal operations, because at this stage children are able to think in a hypothetico-deductive way, which, according to J. Flavell, requires

metacognitive control (Flavell, 1992, p. 118). From Flavell's point of view, the development of metacognition at earlier stages is impossible due to the fact that cognitive egocentrism does not allow the child to refer to his or her own thinking processes and reflect on them. J. Flavell further suggested the idea of the presence of the so-called proto-metacognition level at earlier stages, when children in general know that there are different points of view, but are not yet able to deal with them freely. For example, metacognitive knowledge can appear at the age of 4-6 years as an understanding that in the process of solving a problem 'something goes wrong'. But this, from J. Flavell's point of view, does not apply to metacognitive regulation, which emerges closer to adolescence (Veenman & Spaans, 2005). Accordingly, it was long believed that metacognitive abilities do not appear before the age of 7-8 years (Flavell, 1979; Kreutzer et al., 1975; Veenman et al. 2006). More recently, however, researchers have increasingly begun to suggest that the issue may not be one of age, but of research methods, and techniques have been created that demonstrate the presence of elements of metacognitive abilities as early as 3-4 years of age (Bartsch & Estes, 1996; Lockl & Schneider, 2006; Gascoine, Higgins, & Wall, 2017).

Methods for assessing metacognition in younger and senior preschool children

The problem of assessing metacognition in preschool children is connected, first of all, with the specificity of the construct 'metacognition' itself, which can be characterised as 'action over action'. This means that metacognition in one way or another reflects the child's reflexive level, which manifests itself not only in cognitive activity, but also, for example, in speech - in understanding irony, humour, mixed (contradictory) emotions, and so on. (Shatskaya et al., 2024). The evaluation of the presence or absence of reflexion is difficult due to the underdevelopment of children's speech skills - it is difficult for children to verbalise rather abstract constructions related to the sphere of cognition. That is why metacognition questionnaires practically do not work on 5-7-year-old children, although such attempts are made (see, for example, Chernokova, 2013).

The most common method of diagnosing metacognition in senior preschoolers is observation according to predetermined criteria. For example, Whitebread et al. (2007) analysed and categorised short video recordings of metacognitive activity, which were collected by teachers over the course of two years. They assessed the degree of metacognitive knowledge (of their personal characteristics, task features and strategy) and the degree of metacognitive regulation (planning, monitoring and evaluation). The results of this study showed the presence of all the described components in children as early as 3 years of age, and more often in situations of co-operation with peers, without the involvement of teachers. Similarly, metacognition was assessed by A. Shamir et al. Shamir et al. (2009), but the authors of this study chose only one type of task (memorising pictures) and observed and assessed the extent to which the components of metacognition were manifested over 10 days. In the study by F. Buehle and N. Oeri

(2024), children were given a task in the middle of which they encountered an inability to finish, with the experimenter leaving the room and recording what the child did and said in terms of the representation of the two components of metacognition, monitoring and control. In a study by D. Bryce & D. Whitebread (Bryce & Whitebread, 2012) children were given the task of assembling a railway from a model, the process was videotaped and the videos were then analysed according to certain criteria.

The second option for assessing metacognition is to talk to the child during and immediately after problem solving. Numerous studies have shown that the younger a child is, the more his or her metacognitive features are tied to the context of solving specific tasks, which means that it is necessary to use diagnostics that are as 'embedded' in the task as possible (Brown, 1987; Schneider & Pressley, 1997; Bernard et al., 2015; Bryce et al., 2012; Whitebread & Pino-Pasternak, 2010; Marulis, 2016). Thus, in the work of Marulis et al. (2016), children 3-5 years old were asked to assemble different kinds of pyramids from different shaped parts, the process was recorded on camera and the results were used to conduct a so-called metacognitive interview. The interview included 4 blocks of questions: 1) did you do well/average or poorly? what did you do to do well? what could have been done to make you do even better? 2) was anything difficult for you? if no, why, if yes, why and what could have made the task easier, 3) would these tasks have been more difficult for another child your age? why yes/why not? 4) how did you know that you did all the tasks correctly? Based on the answers to these questions, only metacognitive knowledge, knowledge of yourself, task and strategy knowledge, was assessed, and it was not so much the answer that was important, but the fact that there was a metacognitive rationale for it. It is believed that metacognitive knowledge in 3-5 year old children is better formed than metaregulation. However, from our point of view, questions about how the child evaluates his/her success ('How did you do - good, average or poorly?') and the presence of difficulties ('Was it difficult for you?') are questions more likely to ask about the regulatory component of metacognition, metacognitive evaluation, while what helped or hindered, exactly about awareness (metacognitive knowledge). In another paper, Bernard et al. (Bernard et al., 2015), metaregulation (procedural metacognition) was assessed through the so-called 'opt-out task', where children had to recognise images of different quality presented on the screen (some were clearly visible, others were worse) and if they could recognise, they pressed a button of one colour, and if they could not, another. Thus, here we were talking about metacognitive evaluation (can or cannot solve) as a component of metaregulation.

Based on the analysis of the methods presented in the literature, we have identified those components of metacognition that seem to be detectable in children aged 5-7:

1. metaknowledge: of the strategy (how I acted) and of the factors (what helped and hindered me), among the factors we can distinguish three groups: personal characteristics, features of the task and features of the strategy,
2. metaregulation: subjective evaluation of success and difficulty, involving comparison with real success and difficulty.

Purpose of the study

The main purpose of the study was to develop a methodology for assessing metacognition in senior preschool children. It was necessary to select a type of cognitive tasks that, firstly, presuppose a conversation with a child 'embedded' in the context of problem solving that does not require a high level of reflection, and, secondly, actually allow us to successfully assess the formation of the selected components of metacognition. As an addition, we planned to test the hypotheses about the growth of the selected components of metacognition with age and about the relationship between the quality of metacognition and the success of problem solving.

The following **preliminary hypotheses** of the study were put forward:

1. The elder the child is, the better developed are all the components of metacognition under study (evaluation of success, evaluation of difficulty, metaknowledge of the strategy and conditions);

2. Those children who have better metaknowledge (of the strategy and conditions) have higher success rate in solving cognitive tasks;

3. Those children who have better metaregulation (success and difficulty evaluation) have higher success in solving cognitive tasks.

Methods

Participants

The metacognition assessment method was tested on 62 children from 4 years 11 months to 6 years 10 months (average age 66.8 months, 50% of the sample were boys), the pupils of the senior and preparatory groups of kindergartens in Moscow and Kazan. No differences between boys and girls were found in any of the parameters.

Methodology

When selecting a specific methodology, we relied on the work of M. Marulis et al. (2016) described above. However, based on the available research, we decided to give a task not only for thinking (pattern construction), but also for memory, assuming to compare the results and choose the most appropriate type of task. Accordingly, in the first series of the study children solved a task for visual memory (memorising pictures), and in the second series - a task for construction based on a pattern (the first 3 tasks from Nikitin blocks). In each series, children were offered to solve three tasks in sequence, and the formation of metacognition components was assessed on the basis of answers to questions after solving each task.

Stage 1. Metacognition in the process of memorisation

The instruction to the tested was as follows:

'I am going to show you pictures now, try to remember as much of them as possible'.

Course of the study: 22 cards with pictures of animals or plants are shown for 40-45 seconds. After that, the cards are removed and the child is asked to name what was depicted on them. The number of cards named is recorded. The same cards with the same instructions are shown two more times. In the intervals between presentations and reproductions, the following questions are asked:

After the first presentation and reproduction:

1. Now you have memorised ___ cards (say how many). I will show you these cards again. How many cards do you think you can remember?

After the second presentation and reproduction:

2. Do you think you did better now than you did the first time? (evaluation of success);
3. What helped you do better? (metaknowledge of the conditions).

After the third presentation and reproduction

4. Do you think you did better now than the last time? (evaluation of success);
5. What helped you do better? (metaknowledge of the conditions);
6. What prevented you from memorising all the cards? (metaknowledge of the conditions);
7. Tell me how you memorised them? (metaknowledge of the strategy).

Based on the results of the interview, the following variables were identified:

1. **Adequacy of success evaluation**: maximum 2 points, 1 point for each question 'Do you think you did better now than you did the first time?' in case the child's answer (better/worse/the same) coincides with the real change in the number of memorised words.

2. **Metaknowledge of the strategy** (awareness of the way of solving the problem): maximum 1 point in case the answers reflect any possible way, maximum for two questions 2 points. Examples of 1-point answers: 'kept silent in order to remember in my head'; 'put them one by one and memorise them that way'; 'a way of concentration'.

3. **Metaknowledge of the conditions**: a total score from 0 to 4 was calculated when the child identified conditions and the presence of one of 4 types of conditions, task, strategy, personal characteristics, external causes, was recorded separately:

- Examples of children highlighting **features of the task** as a condition: 'there are too many pictures'; 'too many similar cards'; 'the cards are beautiful'; 'this is the third time I see them';

- Examples of children highlighting the **features of the strategy** as a condition: 'while I was looking at the second one, I forgot the first one'; 'talking to myself helped'; 'memorising things I didn't name before';
- Examples of children highlighting **personal characteristics** as a condition: 'my brain helps me'; 'my mind', 'my memory', 'my mouth helps me'; 'my eyes help me'; 'my head helps me'; 'I don't memorise well what I don't know';
- Examples of children highlighting **external causes** as conditions: 'my favourite car helped'; 'flowers helped'; 'shouting distracted me'

The adequacy of the difficulty evaluation in Episode 1 was not calculated because the task was set the same all three times.

Stage 2. Metacognition in the process of problem solving

The child is shown Nikitin blocks with successively more complicated patterns that need to be assembled. The experimenter demonstrates a sample of solving the simplest problem. The instruction to the tested was as follows:

'Let's play a game. We need to assemble this figure from these blocks (shows the simplest figure). Try it.'

When the child says that he/she has already solved, the experimenter records the fact of solving or its absence and asks questions:

1. Did you do a good job? (evaluation of success);
2. Was it difficult? (evaluation of difficulty).

After the answers are recorded, a more difficult figure is given; after the child says he/she has done everything, again success is recorded and questions are asked:

3. Did you do better or worse than the last time? (evaluation of success);
4. Was it easier or harder for you? Why? (evaluation of difficulty).

After the answers are recorded, an even more difficult figure is given, and questions are asked after the assembly is complete:

5. Did you do better or worse than the last time? (evaluation of success);
6. Was it easier or harder for you? Why? (evaluation of difficulty);
7. What prevented you from assembling the last figure correctly (in case of failure)? What helped you to assemble such a difficult figure (in case of success) (metaknowledge of the conditions);
8. How did you act when you assembled the pieces? (metaknowledge of the strategy);

Based on the results of the interview, the following variables were highlighted:

1. **Adequacy of success evaluation**: maximum 3 points, 1 for each question, 1, 3, 5 if the child's answer (better/worse/the same) coincides with the real success (assembled/not assembled);

2. **Adequacy of difficulty evaluation**: maximum 3 points, 1 for each question, 2, 4, 6 if the child's answer (harder/easier/the same) coincides with the real difficulty of the process, which was recorded by the experimenter;

3. **Metaknowledge of the strategy** (awareness of the way of solving the problem): maximum 2 points in case the answers to questions 7 and 8 reflect any possible way. Examples of answers scored 1 point: 'thought about how to assemble'; 'looked at the pattern'; 'matched by colour';

4. **Metaknowledge of the conditions**: assessed by the answer to question 7, a total score from 0 to 4 was calculated for the fact that the child identified conditions and separately recorded the presence of one of 4 types of conditions, task, strategy, personal characteristics, external causes):

- Examples of children highlighting features of a task as a condition: 'the pattern is too difficult';
- Examples of children highlighting features of the strategy as a condition: 'I was twirling them, spinning them'; 'pick up the right blocks';
- Examples of children highlighting personal characteristics as a condition: 'brain'; 'mind';
- Examples of children highlighting external causes as conditions: 'my favourite doggy helped'; 'you helped'.

Results

Descriptive statistics for each of the parameters in each episode are presented in Table 1.

As for memorising pictures, predictably, the number of words reproduced by children increases with each presentation, with only 8.1% of children inadequately evaluating their actual success compared to the previous one (considering that they did better when they did worse, and vice versa). 53.2% of preschoolers evaluate their memorisation success compared to the previous one as adequately as possible.

Table 1
Descriptive statistics for the parameters of success and metacognition assessment

	N	M	SD	Frequencies by level (if available) (%)
Stage 1 (memorisation)				
Number of words reproduced after 1 presentation (out of 22)	62	5,84	2,34	
Number of words reproduced after 2 presentation (out of 22)	62	7	2,33	

	N	M	SD	Frequencies by level (if available) (%)
Number of words reproduced after 3 presentation (out of 22)	62	8,4	3,08	
Adequacy of success evaluation (0-2)	62	1,45	0,64	2 – 53,2 1 – 38,7 0 – 8,1
Metaknowledge of the strategy (0-2)	62	1,03	0,81	2 – 33,9 1 – 35,5 0 – 30,6
Metaknowledge of the conditions (0-4)	62	1,02	0,64	4 – 0 3 – 0 2 – 20,9 1 – 59,68 0 – 45,16
Task (0–1)	62	0,16	0,37	1 – 16,12 0 – 83,88
Strategy (0–1)	62	0,34	0,48	1 – 33,9 0 – 66,1
Personal characteristics (0–1)	62	0,42	0,5	1 – 41,9 0 – 58,1
External causes (0–1)	62	0,1	0,1	1 – 9,7 0 – 90,3

	N	M	SD	Frequencies by level (if available) (%)
Stage 2 (problem solving)				
Actual success rate of the solution (0-3)	62	1,74	1,02	3 – 11,7 2 – 29,4 1 – 11,8 0 – 41,2
Adequacy of success evaluation (0-3)	62	2,05	0,89	3 – 23,5 2 – 35,3 1 – 41,2 0 – 0
Adequacy of difficulty evaluation (0-3)	62	2,44	0,8	3 – 29,4 2 – 35,3 1 – 29,4 0 – 5,9
Metaknowledge of the strategy (0-2)	55	0,58	0,76	2 – 16,4 1 – 25,5 0 – 58,1
Metaknowledge of the conditions (0-4)	53	0,75	0,59	4 – 0 3 – 0 2 – 7,5 1 – 60,4 0 – 32,1
Task (0–1)	53	0,27	0,42	1 – 22,6 0 – 77,4
Strategy (0–1)	53	0,13	0,34	1 – 13,2 0 – 86,8
Personal characteristics (0–1)	53	0,3	0,46	1 – 30,2 0 – 69,8
External causes (0–1)	53	0,09	0,29	1 – 9,4 0 – 90,6

At the same time, children's actual success in memorising is not related to their evaluation of their success (Spearman's R). However, those who more adequately evaluate the success of their memorisation are much less likely to 'complain' about the features of the task that prevented them from doing better ('there are too many pictures') or about the ease of these tasks ('it's the third time I've looked at it') (Spearman's $R = -0.54$, $p < 0.01$). Children most often identify their personal characteristics (41.9% 'the fact that I am clever helped', 'memory helped') as conditions (what hinders and what helps), followed by strategy features (33.9% 'talking to myself helped', 'remembering things I didn't name before'), task features (16.12% 'too many similar cards'), and external factors (9.7% 'music distracted me'). As for solving thinking tasks, only 11.7 per cent of children coped with all three patterns, and 41.2 per cent did not cope with any of them. At the same time, a correlation between real success and adequacy of evaluation of their success was found in this task. The better children coped, the more accurately they evaluated their success (Spearman's $R = 0.62$, $p < 0.001$). In general, those children who evaluate success more adequately, significantly more accurately evaluate the presence/absence of difficulties in the solution process (Spearman's $R = 0.52$, $p < 0.001$), and identify hindering and helping factors (Spearman's $R = 0.27$, $p < 0.05$). It is also interesting that the children who are more successful in problem solving are those who can identify a solution strategy (Spearman's $R = 0.52$, $p < 0.01$). Children most often identify their personal characteristics as conditions (what hinders and what helps) when assembling figures (30.2% 'I am clever', 'I am diligent', 'I am attentive', etc.), followed by the features of the task (22.6% 'difficult figures', 'we went from simple to complex', etc.), then by the features of the chosen strategy, followed by features of the chosen strategy (13.2% 'I looked at the picture too much, but I should have looked at the blocks', 'I learnt at first, and then it helped'), some children (9.4%) named only external factors ('the noise behind the door disturbed', 'you didn't help me').

Interestingly, no relationships were found between the variables of adequacy of evaluation of success, difficulty and the fact of strategy allocation for two different tasks (memory and thinking). Awareness of the conditions of remembering was not related to awareness of the conditions of assembling the figures. However, those children who more often named external factors (what hindered and what helped) in the memory task, more often named the same external factors in the thinking task (Spearman's $R = 0.34$, $p < 0.05$).

Thus, we obtained the most interesting results when analysing metacognition in solving thinking tasks, which is probably due to the fact that here, unlike in memory tasks, there are clear performance criteria, whether the child assembled the figure as in the sample or not, which allows children to more accurately evaluate the adequacy and difficulty of the tasks.

Hypothesis testing

1. The elder the child is, the better developed are all the components of metacognition under study (success evaluation, difficulty evaluation, metaknowledge of the strategy and conditions).

The hypothesis was not confirmed: age does not make a significant contribution to any of the components of metacognition in either the memory or thinking tasks. This may be due to the lack of a sufficient age spread in our sample, and it is necessary to test the methods on elder children.

2. Those children who have better metaknowledge (of the strategy and the conditions) have higher success in solving cognitive tasks.

The hypothesis was confirmed only for thinking tasks. Children with metaknowledge of the strategy and the conditions performed better on such tasks (Spearman's R for strategy = 0.52, $p < 0.001$, Spearman's R for conditions = 0.28, $p < 0, 05$).

3. Those children who have better metaregulation (evaluation of success and difficulty) have higher success in cognitive tasks.

The hypothesis was confirmed, again, only for thinking tasks. Children with a higher level of metaregulation performed better on such tasks (Spearman's R for success adequacy = 0.62, $p < 0.001$, Spearman's R for difficulty adequacy = 0.3, $p < 0.05$). The results of hypothesis testing allow us to state that the technique involving thinking tasks gives more interesting results on metaknowledge than the technique where children solve memorisation tasks.

Discussion

The problematics of metacognition in senior preschool and primary school children is embedded in the broader context of the problem of formation and development of the child's subjectivity both in kindergarten and in primary school (Tsukerman & Obukhova, 2024; Nisskaya & Tsyganova, 2024). However, before identifying the conditions for the formation of metacognition components, it is important to find adequate methods for their assessment. In recent years, there has been an active discussion of such methods (Buehle & Oeri, 2024; Lyons & Ghetti, 2010; Lockl & Schneider, 2006; Gascoine, Higgins & Wall, 2017; Chernokova, 2013). However, due to the reflexive 'nature' of the phenomenon of metacognition itself, which by definition implies awareness and regulation of one's cognitive processes, the study of metacognition in childhood is very difficult. Nevertheless, even a simple observation of senior preschoolers and young schoolchildren shows that they differ in the level of formation of metacognitive skills, some children, for example, easily evaluate their success or level of difficulty in performing a task, while others cannot adequately describe their actual results and the amount of effort expended. Some children can identify the method by which the task was solved, while others find it difficult to even realise that a method can be used here. In the present study, an attempt was made to find an approach to assess metacognition in preschool children on the basis of their solving different types of cognitive tasks, memorisation tasks and thinking tasks accessible to this age (for example, such as assembling a figure according to a pattern).

In this paper, based on the analysis of the literature, the components of metacognition, in terms of the formation of which children can really differ. Most often, psychological

works present methods for assessing only one of the components of metacognition, metaknowledge (Marulis et al., 2016; Schneider & Pressley, 1997), mainly knowledge about the tasks, strategies and factors of cognition (Flavell, 1979; Schraw & Moshman, 1995). Metaregulation as mastery of strategies for planning, monitoring, and evaluating problem solving is thought to be a later age-related acquisition. However, as our study showed, individual components of metaregulation may be present in the form of adequacy in evaluating the success and difficulty of a task.

A significant result of our work was the fact that we discovered that thinking tasks apparently more reliably assess those components of metacognition that can be seen in senior preschoolers. These are two components of metaknowledge (metaknowledge of the strategy and metaknowledge of the conditions) and two components of metaregulation (adequacy of evaluation of one's success and adequacy of evaluation of difficulty). The question about conditions (metaknowledge of the conditions) in solving thinking tasks, 'What helped you and what hindered you in performing these tasks?' was very interesting from the point of view of the differences obtained. In answering this question, children clearly divided into four groups: most of them named their personal characteristics as such conditions ('my mind', 'my brain', 'I think well', etc.), the second place is occupied by the features of the task ('the pattern was too difficult'), then by strategies ('I matched the colour', 'I twisted') and, finally, by external causes ('it was noisy'). In the memorisation tasks, the distribution of children into groups was similar, but the second place was 'taken' not by the features of the task, but by the features of the strategy (the third place, by the features of the task, the fourth, by external causes). Apparently, this is due to the specificity of memory tasks compared to patterning tasks: in memory tasks, strategy plays a clearly more important role. This leads us to the idea of finding such thinking tasks in which the strategy would appear to children more explicitly, where it would be possible to actually choose different solution strategies.

Unfortunately, we did not obtain age differences for any of the variants of the methodology, which is probably due to the small sample of the study.

Conclusion

The most reliable type of tasks for assessing the components of metacognition are thinking tasks, in particular, the ability to reproduce the pattern of a figure; however, such tasks should include the possibility of using different ways of solving them. The development of a specific methodology based on the results obtained and its testing, including on elder children, is the task of subsequent research.

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Work Design Questionnaire (WDQ): Russian Version Adaptation and Validation

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Abstract

Introduction. The article presents the results of the Russian adaptation of the Work Design Questionnaire (WDQ) originally developed by F. Morgeson and S. Humphrey in 2006. The authors aimed to keep the original instrument's structure as much as possible – the questionnaire includes 77 questions combined into 21 scales in 4 domains: task characteristics, knowledge characteristics, social characteristics, and work context. This adaptation is intended to fill the lack of Russian psychometric tools for the theoretical study of psychosocial work design, as well as for the practical assessment and design of competitive and safe workplaces. **Methods**. The Russian translation of the questionnaire was conducted focusing on its psychological equivalence to the English original source. The psychometric properties of the technique were tested on a sample of 500 respondents (average age 39 years, 65% female) employed in more than 20 industries. Internal consistency was tested by Cronbach's alpha coefficients, factor structure was checked by Confirmatory Factor Analysis and Item Response Theory methods. **Results**. The adapted questionnaire generally showed satisfactory internal consistency ($\alpha = 0.85$). The instrument structure was checked by CFA (RMSEA = 0.058; SRMR = 0.07; CFI = 0.78) and IRT methods (noise levels for each scale not exceeding 40%). The obtained results allow the questionnaire to be used on a Russian sample, but remain the possibility of further improvement of some items and general structure. **Discussion** The psychometric properties of the adapted version of WDQ are similar to the original English version. The study results show that the Russian version of WDQ is a well enough reliable and valid psychometric tool that can be used in future research.

Keywords

work design, work environment, psychosocial environment, psychosocial design, quality of work life, work design questionnaire, psychosocial environment design, work environment design

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Introduction

According to the consulting agency "Yakov and Partners" (formerly "McKinsey Russia"), the Russian labor market is facing a shortage of personnel, which may increase to 4 million people by 2030, and employers' use of traditional approaches (including increasing salary and creating some conditions for productivity growth, as well as attracting migrant workers) is unable to cope with the problem (Kuznetsova, Zuev, Babchenko, Chuichenko, 2023).

In the situation of increasing competition for professionally trained human resources, the ability to change, pro-active flexibility and timely consideration of personal needs and interests of employees become an important goal for the organization's survival and development. The studies conducted since the early 20th century have shown that work design, the design of the employee's workplace has a crucial role in this process (Parker, Morgeson & Johns, 2017).

The COVID-19 pandemic has significantly changed the labor market, accelerating the changes that were already taking place and thus contributing to the emergence of new approaches to organizing and building employer-employee relations (Vyas, 2022). It should be recognized that the time of the domination of unified workplaces is over. Personalized and hybrid models of work organization create both new opportunities and challenges for employees and employers. At the forefront are social aspects, collaboration, the need to reinforce a sense of common goals and the organization's culture (Babapour, Hultberg & Bozic, 2021). To sustain productivity, organizations are now being forced to flexibly reorganize their existing internal processes, adopt hybrid and remote work formats, and focus on motivation and work-life balance (Vyas, 2022).

Employee productivity and engagement are dependent on the harmonization of the work design with their psychological needs (Kahn, 1992). Another important and socially significant issue is the protection of employees' health. Over the past decades, research on this issue has increasingly emphasized work factors other than physical factors that affect health. For their labeling the term "psychosocial factors" or "stressors" is most often used (Kop et al., 2016). The complex of these factors is forming the "psychosocial work environment" of the organization. In Russian science, the concept closest in meaning is "collective socio-psychological climate". The main difference is the emphasis not on the interaction of a person with the working environment, but on the interpersonal relations formed in it (Medvedeva, 2008). The factors of the working environment are considered as external to the emotional, behavioral and cognitive components of the socio-psychological climate (Necheporenko, 2013).

Employees evaluate the attractiveness of a workplace in terms of the possibility of achieving social well-being and taking into account their own criteria of the quality of working life (including job content, workplace characteristics, organizational and managerial culture, etc.). In the competition for the most qualified and valuable employee, as a rule, the employer who is able to create the most attractive and interesting conditions for this employee wins (Maslov, 2014).

Therefore, the question of psychosocial design and regular re-design of work – designing "the content and organization of work tasks, activities, relationships and responsibilities" (Parker, 2014) – arises. The solution to this issue on the part of psychological science requires the availability and application of appropriate psychometric tools, especially questionnaires that allow for comprehensive quantitative measurements of physical and psychological factors of the work context (Mararitza et al., 2024).

The analysis of Russian scientific publications on the keywords "work evaluation" and "workplace design" has shown that most of the methods presented in them are related either to the process of lawfully established "special assessment of working conditions" (including the assessment of physical work factors that can be harmful to the employee's health), or to economic indicators of work efficiency. The methods operationalizing the concept of "socio-psychological climate" of an organization are mostly narrowly aimed at assessing interpersonal relations in the work environment (which makes their application for work design purposes difficult). Foreign psychometric techniques for assessing socio-psychological factors of the working environment of organizations published in Russian sources do not contain references to data on testing their psychometric properties on a Russian sample. Examples of such publications are: "Factor structure of organizational context" (Lvova, 2017) – Workspace Characteristics Profile and The Work Design Questionnaire; 'Socio-psychological factors of organizational commitment of employees (on the example of commercial organizations)' (Lipatov, Sinchuk, 2015) – 'Organizational Commitment Scale' by J. Meyer and N. Allen; "Extended model of affective commitment" (Nikolaeva, 2017) – Work Design Questionnaire; "Proactivity as a predictor of employee engagement" (Sharifzyanova, 2021) – Work Design Questionnaire;

"International requirements for the order of translation and cultural adaptation of the universal questionnaire COPSOQ III on assessment of psychosocial working conditions and health promotion of medical workers" (Kuznetsova, Vasilieva, Tyranovec, 2023) – COPSOQ questionnaire. Even the paper titled "Development of the Russian-language version of the Copenhagen Psychosocial Questionnaire COPSOQ III and its adaptation in different professional groups" (Novikova, Perevezentseva, Shirokov, 2024) describes only the process of translation and adaptation, but does not provide any psychometric details. This situation significantly reduces the possibility of conducting relevant research related to the psychosocial design of work.

International publications describe numerous models and instruments that are based on various directions of psychosocial work environment research and are based on their own categorizations of the constructs being measured. A review of instruments that can be used in assessing and developing organizational environments conducive to workers' mental health published in 2023 in the USA (Nebbs et al., 2023) includes 207 different psychometric tools. A comparison of some of the most widely known and popular international instruments (Kabanova, Shport, Makurina, 2019) is presented in Appendix 1.

Despite the common features, each of the questionnaires (as well as the model it operationalizes) is designed for a certain task and cannot claim to be a comprehensive assessment of the characteristics of the work environment "as a whole". For example, the Organizational Stress Questionnaire, developed in the UK and used since 2008 to assess stress in the workplace, contains 35 questions and operationalizes 7 constructs related only to psychological factors affecting employees (Edwards et al., 2008).

The most up-to-date, 3rd version of the Copenhagen Psychosocial Environment Questionnaire (COPSOQ-III), which includes 152 questions and has been used since 2019 to assess psychosocial factors in the workplace, measures 26 scales that capture both psychological and physical exposures (Burr et al., 2019), but some of the dimensions (e.g., Sense of Community, Commitment, Quality of Work) are more applicable to assessment rather than work environment design. In addition, this questionnaire has a rather large volume that requires a long time to be filled out and processed, which reduces its practical usability.

The Work Design Questionnaire (WDQ), specifically developed for this purpose (Morgeson & Humphrey, 2006), is, in our view, the most relevant to the task of designing a workplace. The questionnaire, developed in 2006 in the USA, allows measuring the impact of both psychological and physical factors on 21 scales and contains 77 questions.

The questionnaire has been translated into German, Dutch, Spanish, Chinese, Polish and has been successfully adapted and validated in at least five countries. It has been evaluated as a powerful measurement technique that corresponds to modern concepts of work design and covers almost the entire range of variables related to work characteristics. Limitations of the technique may include the fact that it does not address

such potential and important aspects of work design as motivation, emotional well-being and worker safety, and the factor of time. The rather small size of the subscales and of the whole questionnaire allows it to be used on large samples, but may cause superficial assessment of some constructs (Ríos et al., 2017).

It was chosen because of its wide applicability and its high reliability and validity in the above-mentioned cross-cultural validation.

The technique was developed by American psychologists Frederick Morgeson and Stephen Humphrey (Morgeson & Humphrey, 2006) based on several theories of motivation and work performance, the key of which is Hackman and Oldham's Job Characteristics Model (this model considers five basic characteristics of work: variety, complexity and importance of tasks, autonomy in how they are performed, and external and internal feedback) (Hackman & Oldham, 1976). The development of the technique was a response to the lack of a widely applicable tool suitable for both fundamental research on the nature of work and for designing and redesigning workplaces in organizations. The selection of the set of constructs measured by the instrument was made by its authors on the basis of a careful review of specialized scientific literature (to identify, sort, and categorize terms describing work and then develop questionnaire items based on them). Half of the items were developed anew, while the rest were taken or adapted from pre-existing techniques. The 77 items of the questionnaire, organized into 21 measurement subscales, reflect the four domains of the psychosocial work environment: task characteristics, required knowledge, and the social and physical context of work. The subscale values are calculated by averaging the items comprising them. Initial validation of the technique was conducted on a sample of 540 U.S. workers from 22 occupational groups (due to the research strategy of collecting primary data from business students among their relatives and friends, this sample includes a disproportionately large number of managers). Construct validity was tested by comparing the results of the study with previously published data from the U.S. Department of Labor (the DOT directory and the O*NET database, which contain comprehensive descriptions and characteristics of various occupations and positions) and conducting confirmatory factor analysis; internal consistency and reliability were tested by calculating Cronbach's alphas and intraclass correlation coefficients (Morgeson & Humphrey, 2006).

The original English version, available on the official website of one of the authors www.morgeson.com/wdq.html and allowed by him for research purposes, was used as the Russian translation and adaptation source. The Russian-language version of the questionnaire posted on the same site (as well as translations into several other languages) by Y. Levashina was not used due to significant structural differences from the original source (e.g., order of questions, number and names of domains) and the lack of any data on its validation in the Russian sample. In addition, due to the detailed published description of the translation and adaptation procedure, the authors of this article considered it useful to perform an expert version of the translation.

Methods

The translation, adaptation, and validation of the questionnaire were conducted in several stages using international recommendations and best practices outlined in the University of Michigan's guidelines for cross-cultural research (Survey Research Center [SRC], 2011).

Translation procedure

The procedure of translating an adapted foreign-language psychometric technique raises the question of psychological equivalence of its items rather than linguistic equivalence (Osin, 2012). Since the procedure of forward and backward translation with subsequent harmonization of their results, which is usually applied and complies with international recommendations, does not take into account the possibility of obtaining a result that may have a slightly different psychological meaning than the original, the authors of the present study chose a different approach.

The translation of the questionnaire into Russian was carried out by a group of experts (4 persons): with Master's and PhD degrees in social psychology, fluent in English and familiar with the subject area – research on work design – psychological characteristics of the work environment in general, and with the content and structure of the WDQ questionnaire, in particular.

The translation process was organized with the aim of precisely reflecting the meaningful stimulus of the original English-language questionnaire while adapting it for perception in Russian, taking into account the specifics of language and culture. From the point of view of process, the translation was performed by each expert separately, without preliminary reading of each other's versions, and then the final wording of the translation was harmonized by eliminating discrepancies and making the necessary adjustments. This approach did not require a back-translation procedure due to the above-described features of the chosen focus of the study.

Sampling and data collection

The finalized English-Russian translation of the questionnaire was expanded with questions to clarify the socio-demographic profile and working status of the respondents and posted as a moderated online survey (using anketolog.ru) on the Internet. Participation in the study was voluntary and anonymous, the survey involved working respondents aged 18 years and older, and the survey was conducted until a sample of 500 people was reached. The sample size on which the adapted version of the questionnaire was tested (N=500) is comparable to the sample from the original study (N=540), but the average age of participants in the Russian study was significantly lower than in the American study (39 and 48 years, accordingly). Unlike the original technique, which used a 5-point Likert scale, the adapted questionnaire used a 7-point scale to obtain a more differentiated picture of the factors.

Assessment of psychometric properties

Reliability and internal consistency of the scales were assessed by calculating Cronbach's alpha coefficient. The fit of the obtained data to the factor structure was checked by confirmatory factor analysis and Item Response Theory (IRT) methods.

Results

The translation of the questionnaire was done without any significant dispute between the translators. The final version of the translation used in the study is provided in Appendix 2 (items are listed in the order of their correspondence to the scales, the item number in the questionnaire is given in the first column below the scale coding).

The study data were collected from October to November 2023. 500 respondents (employed in more than 20 sectors of the Russian economy) from all federal districts of the Russian Federation aged 18 to 66 years, including 174 men and 323 women (3 respondents refused to specify their gender) took part in the study.

More than 64% of respondents are employed in six industries: "trade and commerce", "manufacturing", "science and education", "health care and social security", "construction and architecture" and "information technology". In each of the other 16 industries, less than 5% of the total number of the sample are involved, and 3.4% of respondents refused to indicate the industry. 44% of respondents have the status of ordinary employees, 32% are key specialists, 11% are middle managers, and 9% are top managers.

Major socio-demographic data on the study participants are summarized in Appendix 3. Statistical analysis of the collected data was made using Statistica, Jamovi and JMP software. The questionnaire showed high consistency – the value of Cronbach's alpha coefficient was 0.85. The internal consistency of each scale was checked by calculating Cronbach's alpha coefficients with items removed one by one. For most of the scales, the value of the alpha coefficient is within acceptable limits (0.63...0.85). The consistency of the "Specialization" and "Ergonomics" scales is 0.57 and is below the commonly used in psychological research acceptable lower limit of 0.6. The similar indicator from the original study on the "Ergonomics" scale was also low – 0.64. At the same time, the values of McDonald's omega coefficient were above the cut-off point of 0.6 for all scales of the questionnaire.

Consistency has also been tested by calculating the correlations between responses to each individual question (questionnaire item) and the mean score on the scale in which they are included. All items showed a medium to high level of correlation on the Cheddock scale (0.56...0.93) at a significance level of $p \leq 0.05$, indicating that each item measures the same construct as the entire subscale to which they belong. Measurement results are summarized in Table 1 (parameter values for all individual items within scales are given in the same order as in Appendix 2).

Table 1

Measurement results (N=500, Cronbach's α = 0.85)

Scale		Number of Items	M	SD	α with item removed	α	Scale correlation	ω
	Domen: Task characteristics							
WSA	Work scheduling autonomy	3	4,92	1,12	0,70 0,56 0,53	0,70	0,79 0,78 0,80	0,71
DMA	Decision-making autonomy	3	4,97	1,13	0,77 0,61 0,60	0,75	0,78 0,83 0,84	0,76
WMA	Work methods autonomy	3	5,06	1,12	0,71 0,66 0,62	0,75	0,80 0,83 0,82	0,75
TV	Task variety	4	5,08	1,06	0,71 0,71 0,72 0,73	0,76	0,80 0,79 0,76 0,74	0,78
TS	Significance	4	5,01	1,22	0,82 0,81 0,79 0,81	0,85	0,81 0,82 0,86 0,83	0,85
TI	Task identity	4	5,19	0,95	0,75 0,62 0,64 0,65	0,74	0,69 0,79 0,77 0,74	0,74
FFJ	Feedback from job	3	4,90	1,08	0,69 0,54 0,57	0,69*	0,74 0,83 0,80	0,70
	Domen: Knowledge characteristics							
JC	Job complexity	4	3,84	1,17	0,79 0,60 0,65 0,67	0,75	0,64 0,84 0,77 0,76	0,76
IP	Information processing	4	5,20	1,13	0,71 0,73 0,79 0,68	0,78	0,80 0,78 0,68 0,84	0,79

Scale		Number of Items	M	SD	α with item removed	α	Scale correlation	ω
PS	Problem solving	4	4,46	1,12	0,70 0,59 0,67 0,55	0,70	0,65 0,77 0,67 0,80	0,71
SV	Skill variety	4	5,06	1,11	0,80 0,76 0,80 0,73	0,82	0,77 0,83 0,77 0,86	0,82
Spec	Specialization	4	4,47	1,03	0,62 0,51 0,34 0,50	0,57* (0,62)**	0,56 0,64 0,78 0,68	0,61
	Domen: Social characteristics							
SS	Social support	6	4,94	1,00	0,72 0,71 0,76 0,76 0,72 0,73	0,78	0,71 0,75 0,61 0,64 0,72 0,69	0,78
II	Initiated interdependence	3	4,19	1,25	0,68 0,64 0,57	0,72	0,78 0,80 0,83	0,72
RI	Received interdependence	3	4,50	1,13	0,47 0,50 0,62	0,63*	0,76 0,78 0,74	0,64
IOO	Interaction outside organization	4	4,29	1,41	0,79 0,78 0,77 0,78	0,83	0,80 0,80 0,82 0,81	0,83
FFO	Feedback from others	3	4,24	1,32	0,77 0,72 0,71	0,81	0,83 0,85 0,86	0,81
	Domen: Work context							
Ergo	Ergonomics	3	4,51	1,21	0,26 0,46 0,63	0,57* (0,63)**	0,82 0,74 0,64	0,64
PD	Physical demands	3	3,50	1,60	0,89 0,84 0,81	0,89	0,88 0,91 0,93	0,89

Scale		Number of Items	M	SD	α with item removed	α	Scale correlation	ω
WC	Work conditions	5	4,93	1,20	0,80 0,77 0,76 0,73 0,75	0,81	0,70 0,72 0,76 0,81 0,76	0,81
EU	Equipment use	3	3,77	1,28	0,60 0,47 0,65	0,67*	0,78 0,83 0,72	0,69

Note. (*) *α <0,7. (**) Excluding Spec-1 and Ergo-3 items from the Specialization and Ergonomics scales increases Cronbach's alpha to from "poor" to "questionable" level of values (α>0,6).*

The factor structure of the questionnaire was tested by using Confirmatory Factor Analysis (CFA) and comparing its results with those reported in the original study. CFA analysis was conducted for the 21-factor model that showed the best fit both in the original study (Morgeson & Humphrey, 2006) and in several validations of the WDQ on samples from other European countries (Ríos, Ramírez-Vielma, Sanchez, Bargsted, Polo Vargas, Ruiz, 2017).

Good model fit can be confirmed by either CFI≥0.96 comparative fit index and SRMR≤0.09 standardized root mean square residuals or RMSEA ≤ 0.06 and SRMR ≤ 0.09 (Hooper, Coughlan & Mullen, 2008). The test of fit based on CFI is more applicable for exploratory and RMSEA is more applicable for confirmatory factor analysis (Rigdon,1996). When the number of degrees of freedom is large, it is also recommended to favor the RMSEA test (Kenny, Kaniskan & McCoach, 2015). The CFA results and their comparison with the original study are summarized in Table 2.

Table 2
Comparison of CFA results for 21-factor model

Model	χ^2	d f	χ^2 / d f	C F I	R MSEA	S R M R
Original study (USA) N=540	5 027	2 618	1,92	0,91	0,04	0,06
Russian version N=500	7 122	2 639	2,70	0,78	0,058	0,07

In addition to these types of analysis, the Polytomous Rasch Model (one of the IRT methods), was used to examine the structure of the questionnaire. This method allows testing latent variables (constructs) one by one. The fit of the items to the construct (the subscale they are part of) is assessed using the values of the Infit (weighted) and Outfit (unweighted) statistics. The mathematical expectation of the values of these statistics is equal to one; deviation from one indicates a measure of noise (disagreement of the data with the measurement model). For psychometric instruments, statistic values between 0.6 and 1.4 (inclusive) are considered acceptable. Items with statistic values greater than 1.5 require the most attention (Wright, Masters, 1982). The concordance statistics for each of the subscales of the Russian version of the questionnaire are shown in Table 3.

Table 3
IRT statistics

Scale and item		Infit	Outfit	Scale and item		Infit	Outfit	Scale and item		Infit	Outfit
					1	1,34	1,34				
	1	1,18	1,20						1	0,87	0,88
					2	0,94	0,95				
WSA	2	0,92	0,92	JC				RI	2	1,07	1,07
					3	0,79	0,81				
	3	0,94	0,93						3	1,07	1,09
					4	0,94	0,96				
					1	0,95	0,96		1	1,10	1,10
	1	1,15	1,14								
					2	1,05	1,03		2	0,92	0,93
DMA	2	1,03	0,98	IP				IOO			
					3	1,17	1,19		3	1,01	1,01
	3	0,92	0,92								
					4	0,94	0,93		4	1,04	1,04
					1	1,12	1,13				
	1	1,07	1,05						1	1,02	1,05
					2	1,01	1,01				
WMA	2	1,10	1,11	PS				FFO	2	0,98	0,97
					3	1,00	1,01				
	3	0,89	0,87						3	1,03	1,02
					4	0,89	0,88				

Scale and item		Infit	Outfit	Scale and item		Infit	Outfit	Scale and item		Infit	Outfit
	1	1,11	1,11		1	1,18	1,15				
									1	1,01	1,00
	2	1,03	1,03		2	0,95	0,95				
TV				SV				Ergo	2	0,98	1,00
	3	0,98	0,95		3	1,11	1,12				
									3	1,02	1,05
	4	0,98	0,98		4	0,87	0,86				
	1	1,08	1,09		1	1,06	1,09				
									1	1,12	1,10
	2	1,09	1,06		2	0,94	0,97				
TS				Spec				PD	2	0,98	0,94
	3	0,90	0,85		3	0,87	0,86				
									3	0,93	0,88
	4	1,03	1,01		4	1,09	1,08				
					1	0,93	0,92				
									1	1,24	1,27
	1	1,30	1,31		2	0,90	0,88				
									2	0,92	0,96
	2	0,97	0,96		3	1,40	1,36				
TI				SS				WC	3	1,07	1,08
	3	0,92	0,94		4	1,21	1,27				
									4	1,12	1,04
	4	0,88	0,87		5	0,70	0,75				
									5	0,77	0,77
					6	0,94	0,93				
	1	1,11	1,10		1	1,02	1,03		1	1,06	1,06
FFJ	2	1,06	1,07	II	2	1,01	1,02	EU	2	1,00	0,99
	3	0,91	0,90		3	0,98	0,98		3	0,96	1,00

The concurrent validity of the questionnaire (which is understood as its ability to differentiate respondents on the basis of significant characteristics of their work) was additionally checked by comparing the mean values and standard deviations of the scales for 6 major groups of employees in the category "Industry of organization" (Appendix 4) and 4 groups in the category "Position level" (Appendix 5). This comparison revealed the presence of differences in almost all scales of the questionnaire between all selected groups in both categories.

Discussion

The consistency of the Russian version (Cronbach's alpha = 0.85) is only slightly lower than the result (α = 0.87) reported by the authors of the original study. In the case of the item-by-item analysis of almost all scales of the questionnaire, there is a decrease (or only a slight increase) in the value of the Cronbach's alpha coefficient, which indicates its stable structure, which, in turn, confirms a satisfactory level of translation and cultural adaptation. The McDonald's omega coefficient and the correlation coefficients between each scale and their items also confirmed the satisfactory reliability of the measurements.

At the same time, the low consistency values obtained for two scales – "Specialization" and "Ergonomics" – can probably indicate either an incorrect translation or significant cultural differences between the countries in which the research was conducted (or the social desirability of some respondents' answers). One partial solution to this problem would be to remove the items "My work goals, tasks and activities are highly specialized" and "I receive feedback on my performance from other people in the company (such as my manager and colleagues)" from the Russian version of the questionnaire, which would raise the consistency of the respective scales to an acceptable level. Nevertheless, given the fact that the exclusion of these items would raise the Cronbach's alpha coefficient above the "threshold" value of 0.6 and from "poor" to "questionable", we concluded that the original structure of the questionnaire should be kept.

For several items whose removal of them from their scales leads to, albeit not significant, increases the Cronbach's alpha coefficient:

- DMA-1 "The job gives me a chance to use my personal initiative or judgment in carrying out the work"
- TI-1 "The job involves completing a piece of work that has an obvious beginning and end"
- JC-1 "The job requires that I only do one task or activity at a time (reverse scored)"
- IP-3 "The job requires me to keep track of more than one thing at a time";
- Spec-1 "The job is highly specialized in terms of purpose, tasks, or activities"
- Ergo-3 "The job involves excessive reaching (reverse scored)"

It is important to note that the translation of the questionnaire used in this study may be difficult to understand by respondents. A more detailed and easy-to-understand decoding of these items may be necessary in its application. Measurement testing using Rasch's polytomous model showed that all items have acceptable fit with their scales, with noise levels not exceeding 40% for any of them (Andrich, 2010).

Confirmatory factor analysis proved the quality of the factor structure of the instrument – its results indicate good fit of the fullest 21-factor model. The obtained values of RMSEA = 0.058 and SRMR = 0.07 with a large number of degrees of freedom df = 2639 meet the condition (RMSEA $\leq$0.06 and SRMR $\leq$0.09), indicating good model fit (Rigdon, 1996; Hooper, Coughlan & Mullen, 2008; Kenny, Kaniskan & McCoach, 2015) and are not significantly different from the results obtained in the original study by this criterion (RMSEA = 0.04; SRMR = 0.06; df = 2618). However, the obtained value of CFI = 0.78 is lower than the value obtained for original English-language questionnaire (0.91), which may indicate the possibility of improving the structure of the Russian version.

Considerable differences of mean values and standard deviations of all scales of the questionnaire, revealed by their comparison for 6 main groups in the category "Industry of organization" and all 4 groups in the category "Level of position" allows to suggest the concurrent validity of the adapted instrument.

As a result, the obtained data suggest that the adapted technique can be used to properly assess the constructs measured by it.

Limitations

A limitation of this study is the lack of verification of content validity and an attempt to preserve as much as possible the structure of the questionnaire items and scales developed by the authors of the original American technique, which may not fully correspond to the current sociocultural and organizational context of Russian organizations. The consistency of several scales shows a doubtful level of reliability, which may indicate that the translation of the items is not clear enough for respondents. Like the original technique, the adapted questionnaire was tested on representatives of a significant but limited number of industries and types of workplaces. Therefore, we can say about its broad, but, still, not comprehensive applicability, especially in the context of dynamic development of the modern labor market and the increasing importance of such factors as: emotional well-being and intrinsic motivation of employees. In addition, given that the retest reliability of the adapted technique has not been analyzed in the Russian sample, it is impossible to state unequivocally that the reliability of the construct's measurement will remain stable in the long term.

Conclusion

In the study, the Work Design Questionary was translated, linguistically and culturally adapted, and its main psychometric properties were tested on a Russian sample. The

study showed satisfactory reliability and stable structure of the Russian version of WDQ, which can be used both in further studies of psychosocial work environment and in developing and improving work design in Russian organizations.

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Appendix 1

Comparison of the most popular overseas (non-Russian) questionnaires

Questionnaire, year	Items	Scales	Purpose of development
Health and Safety Executive Indicator Tool (HSE), 2008	*35*	Job demand Job control Management support Colleague support Relationships Role clarity Changes	workplace stress evaluation
COPSOQ-III, 2019	*152*	Quantitative Demands Work Pace Cognitive Demands Emotional Demands Demands for Hiding Emotions Influence at Work Possibilities for Development Variation of Work Control over Working Time Meaning of Work Predictability Recognition Role Clarity Role Conflicts Illegitimate Tasks Quality of Leadership Social Support from Supervisor Social Support from Colleagues Sense of Community at Work Commitment to the Workplace Work Engagement Job Insecurity Insecurity over Working Conditions Quality of Work Job Satisfaction Work Life Conflict	evaluation of psychosocial factors in the workplace

Questionnaire, year	Items	Scales	Purpose of development
Work Design Questionnaire (WDQ) 2006	*77*	Work scheduling autonomy Work methods autonomy Decision-making autonomy Task variety Significance Task identity Feedback from job Job complexity Information processing Problem solving Skill variety Specialization Social support Initiated interdependence Received interdependence Interaction outside organization Feedback from others Ergonomics Physical demands Work conditions Equipment use	measuring workplace characteristics

Appendix 2

WDQ Translation

	In English	In Russian
	Using the scale below, please indicate the extent to which you agree with each statement. Remember to think only about your job itself, rather than your reactions to the job. 1 = Strongly Disagree 2 = Disagree 3 = Neither Agree nor Disagree 4 = Agree 5 = Strongly Agree	Используя приведенную ниже шкалу, укажите, в какой степени вы согласны с каждым утверждением. Пожалуйста, думайте о самой работе, а не о своих реакциях на нее. 1 = Совершенно не согласен 2 = Не согласен 3 = Скорее не согласен 4 = Неопределенно 5 = Скорее согласен 6 = Согласен 7 = Совершенно согласен
	Task Characteristics / Характеристики задач	
	Autonomy / Автономия	
WSA	Work Scheduling Autonomy	Управление расписанием и режимом работы
1	1. The job allows me to make my own decisions about how to schedule my work.	1. Работа позволяет мне управлять своим рабочим расписанием и режимом
9	2. The job allows me to decide on the order in which things are done on the job.	2. Работа позволяет мне определять приоритетность и порядок выполнения рабочих задач
17	3. The job allows me to plan how I do my work.	3. Работа позволяет мне самостоятельно раскладывать рабочие задачи на шаги и подзадачи
DMA	Decision-Making Autonomy	Автономия в принятии решений
25	1. The job gives me a chance to use my personal initiative or judgment in carrying out the work.	1. Работа позволяет мне действовать инициативно и в соответствии со своими представлениями о выполнении задач
33	2. The job allows me to make a lot of decisions on my own.	2. Многие решения на работе я могу принимать самостоятельно
41	3. The job provides me with significant autonomy in making decisions	3. При принятии рабочих решений многое остаётся на моё усмотрение
WMA	Work Methods Autonomy	Автономия в выборе методов работы
49	1. The job allows me to make decisions about what methods I use to complete my work.	1. Работа позволяет мне решать, каким способом выполнить ту или иную задачу
57	2. The job gives me considerable opportunity for independence and freedom in how I do the work.	2. На работе у меня есть возможность действовать самостоятельно и независимо
65	3. The job allows me to decide on my own how to go about doing my work	3. Работа позволяет мне определять подход к решению задач

	In English	In Russian
TV	Task Variety	Разнообразие задач
2	1. The job involves a great deal of task variety.	1. Моя работа предполагает большое разнообразие задач
10	2. The job involves doing a number of different things.	2. На работе я делаю много самых разных вещей
18	3. The job requires the performance of a wide range of tasks.	3. Работа требует от меня справляться с широким кругом задач
26	4. The job involves performing a variety of tasks.	4. Моя работа требует эффективно выполнять разнообразные задачи
TS	Task Significance	Значимость задач
34	1. The results of my work are likely to significantly affect the lives of other people.	1. Результаты моей работы могут оказывать существенное влияние на жизнь других людей
42	2. The job itself is very significant and important in the broader scheme of things.	2. Такая работа, как моя, очень важна в самом широком смысле этого слова
50	3. The job has a large impact on people outside the organization.	3. Моя работа значима для людей, важна за пределами моей организации
58	4. The work performed on the job has a significant impact on people outside the organization.	4. Результаты моей работы заметны и важны для людей за рамками моей организации
TI	Task Identity	Цельность задач
3	1. The job involves completing a piece of work that has an obvious beginning and end.	1. На работе я выполняю такие задачи, где начало и конец процесса очевидны
11	2. The job is arranged so that I can do an entire piece of work from beginning to end.	2. Моя работа даёт возможность выполнять задачи целиком, от начала до конца
66	3. The job provides me the chance to completely finish the pieces of work I begin.	3. Работа позволяет мне финализировать задачи, за которые я берусь
72	4. The job allows me to complete work I start.	4. На работе у меня есть возможность доводить начатое до конца
FFJ	Feedback From Job	Обратная связь об эффективности
19	1. The work activities themselves provide direct and clear information about the effectiveness (e.g., quality and quantity) of my job performance.	1. Характер моих рабочих задач таков, что результативность и эффективность их выполнения очевидны для меня (например, с точки зрения качественных и количественных показателей)
27	2. The job itself provides feedback on my performance.	2. В работе я постоянно получаю обратную связь о моих результатах
35	3. The job itself provides me with information about my performance.	3. У меня есть возможность без дополнительных усилий получать информацию о качестве моей работы

	In English	In Russian
	Knowledge Characteristics / Особенности знания	
JC	Job Complexity	Сложность действий и задач
43	1. The job requires that I only do one task or activity at a time (reverse scored).	1. Работа предполагает, что я занимаюсь только одним делом или задачей в один момент времени (подсчитывается по обратной шкале)
51	2. The tasks on the job are simple and uncomplicated (reverse scored).	2. Мои рабочие задачи просты, в них нет ничего сложного (подсчитывается по обратной шкале)
59	3. The job comprises relatively uncomplicated tasks (reverse scored).	3. Моя работа раскладывается на относительно простые задачи (подсчитывается по обратной шкале)
67	4. The job involves performing relatively simple tasks (reverse scored).	4. Работа требует от меня выполнения несложных действий (подсчитывается по обратной шкале)
IP	Information Processing	Обработка информации
4	1. The job requires me to monitor a great deal of information.	1. На работе через меня проходит большой объём информации
12	2. The job requires that I engage in a large amount of thinking.	2. На работе от меня часто требуется прикладывать умственные усилия
20	3. The job requires me to keep track of more than one thing at a time.	3. Работа предполагает, что я слежу за несколькими задачами параллельно
73	4. The job requires me to analyze a lot of information.	4. На работе я занимаюсь анализом большого объёма информации
PS	Problem Solving	Решение проблем
28	1. The job involves solving problems that have no obvious correct answer.	1. На работе я занимаюсь выполнением таких задач, для которых нет очевидного правильного решения
36	2. The job requires me to be creative.	2. Работа требует от меня креативности
44	3. The job often involves dealing with problems that I have not met before.	3. На работе мне часто приходится решать такие проблемы, с которыми я до этого не сталкивался
52	4. The job requires unique ideas or solutions to problems.	4. Работа требует от меня уникальных идей и решений

	In English	In Russian
SV	Skill Variety	Разнообразие навыков
5	1. The job requires a variety of skills.	1. Работа требует от меня разноплановых навыков
60	2. The job requires me to utilize a variety of different skills in order to complete the work.	2. Чтобы успешно справиться со своими задачами, мне необходимы разные по своему характеру знания и навыки
68	3. The job requires me to use a number of complex or high-level skills.	3. На работе от меня требуется мастерски владеть целым рядом сложных навыков
74	4. The job requires the use of a number of skills.	4. Мне необходимо много навыков для выполнения работы
Spec	Specialization	Специализация
13	1. The job is highly specialized in terms of purpose, tasks, or activities. *	1. Мои рабочие цели, задачи и деятельность узкоспециализированы *
21	2. The tools, procedures, materials, and so forth used on this job are highly specialized in terms of purpose.	2. Инструменты, процедуры, материалы и пр. в моей работе является специфическим именно для неё, заточенным под её цели
29	3. The job requires very specialized knowledge and skills.	3. Моя работа требует узкопрофильных знаний и навыков
37	4. The job requires a depth of knowledge and expertise.	4. Моя работа требует глубоких экспертных знаний
	Social Characteristics / Особенности социальной среды	
SS	Social Support	Социальная поддержка
6	1. I have the opportunity to develop close friendships in my job.	1. У меня есть возможность развивать близкие дружеские отношения на работе
45	2. I have the chance in my job to get to know other people.	2. Работа позволяет мне познакомиться и хорошо узнать своих коллег
53	3. I have the opportunity to meet with others in my work.	3. Работа позволяет мне встречаться и общаться с другими людьми
61	4. My supervisor is concerned about the welfare of the people that work for him/her.	4. Мой руководитель заботится о благополучии своих сотрудников
69	5. People I work with take a personal interest in me.	5. Я интересен моим коллегам как человек
75	6. People I work with are friendly.	6. Мои коллеги дружелюбны

	In English	In Russian
	Interdependence / Взаимозависимость	
II	Initiated Interdependence	Зависимость других от моей работы
14	1. The job requires me to accomplish my job before others complete their job.	1. Чтобы другие могли выполнить задачи, от меня требуется сначала закончить свои
22	2. Other jobs depend directly on my job.e	2. Работа других зависит напрямую от моей
30	3. Unless my job gets done, other jobs cannot be completed	3. Пока я не выполню свои задачи, другие люди не смогут завершить свои
RI	Received Interdependence	Зависимость моей работы от работы других
38	1. The job activities are greatly affected by the work of other people.	1. Работа других людей оказывает большое влияние на рабочие процессы в целом
46	2. The job depends on the work of many different people for its completion.	2. Успешное выполнение работы зависит от участия большого количества разных людей
54	3. My job cannot be done unless others do their work.	3. Я не смогу выполнить свою работу, если другие не выполнят свою
IOO	Interaction Outside Organization	Взаимодействие вне организации
7	1. The job requires spending a great deal of time with people outside my organization.	1. Для выполнения работы необходимо проводить много времени с людьми, не работающими в нашей компании
62	2. The job involves interaction with people who are not members of my organization.	2. Работа предполагает взаимодействие с людьми, которые не входят в нашу организацию
70	3. On the job, I frequently communicate with people who do not work for the same organization as I do.	3. Я часто по работе общаюсь с людьми, не являющимися сотрудниками нашей компании
76	4. The job involves a great deal of interaction with people outside my organization.	4. Взаимодействие с людьми вне нашей организации составляет львиную долю моего общения по работе
FFO	Feedback From Others	Обратная связь от других людей
15	1. I receive a great deal of information from my manager and coworkers about my job performance.	1. От своего руководителя и коллег я получаю очень много информации о том, как я справляюсь со своей работой
23	2. Other people in the organization, such as managers and coworkers, provide information about the effectiveness (e.g., quality and quantity) of my job performance.	2. Другие сотрудники организации, в том числе руководители и коллеги, предоставляют мне информацию об эффективности моей работы (в качественных и количественных показателях)
31	3. I receive feedback on my performance from other people in my organization (such as my manager or coworkers).	3. Я получаю обратную связь о результатах моей работы от других людей в компании (таких как мой руководитель и коллеги)

	In English	In Russian
	Work Context / Рабочий контекст (Рабочая среда)	
Ergo	Ergonomics	Эргономика
39	1. The seating arrangements on the job are adequate (e.g., ample opportunities to sit, comfortable chairs, good postural support).	1. Сидячие рабочие места организованы удобно (например, есть достаточное количество посадочных мест, комфортные стулья, кресла с удобными спинками с поддержкой)
47	2. The work place allows for all size differences between people in terms of clearance, reach, eye height, leg room, etc.	2. Рабочее пространство приспособлено для людей с разным ростом и комплекцией: с точки зрения расстояний между мебелью, доступностью объектов, высоты, пространства для ног и т. д.
55	3. The job involves excessive reaching (reverse scored).*	3. Часто используемые предметы или объекты расположены неудобно: приходится прикладывать усилия, чтобы ими воспользоваться (подсчитывается по обратной шкале) *
PD	Physical Demands	Требования к физической форме
63	1. The job requires a great deal of muscular endurance.	1. Выполнение работы требует большой физической выносливости
71	2. The job requires a great deal of muscular strength.	2. Выполнение работы требует сильных мышц
77	3. The job requires a lot of physical effort.	3. Выполнение работы требует значительных физических усилий
WC	Work Conditions	Условия труда
8	1. The work place is free from excessive noise.	1. На рабочем месте не шумно
16	2. The climate at the work place is comfortable in terms of temperature and humidity.	2. На рабочем месте комфортный микроклимат с точки зрения температуры и влажности
24	3. The job has a low risk of accident.	3. Риск несчастного случая на моей работе незначителен
32	4. The job takes place in an environment free from health hazards (e.g., chemicals, fumes, etc.).	4. Работа проходит в безопасной для здоровья среде (например, нет угроз, связанных с химикатами, испарениями и т. д.)
40	5. The job occurs in a clean environment.	5. В рабочем пространстве чисто
EU	Equipment Use	Использование технологий и оборудования
48	1. The job involves the use of a variety of different equipment.	1. Работа связана с использованием разнообразного оборудования
56	2. The job involves the use of complex equipment or technology.	2. Выполнение работы требует использования сложного оборудования или технологий
64	3. A lot of time was required to learn the equipment used on the job.	3. Чтобы разобраться с оборудованием, используемым в работе, требуется много времени

Appendix 3

Study participant profile (N=500)

Sex	Female	323 ppl. (64,6%)
	Male	174 ppl. (34,8%)
	No answer	3 ppl. (0,6%)
Age	< 22 лет	17 ppl. (3,4%)
	22 .. 30	80 ppl. (16,0%)
	30 .. 40	174 ppl. (34,8%)
	> 40	229 ppl. (48,8%)
Education	High school	143 ppl. (28,6%)
	University	336 ppl. (67,2%)
	PhD	21 ppl. (4,2%)
Industry	trade and commerce	92 ppl. (18,4%)
	manufacturing	62 ppl. (12,4%)
	science and education	54 ppl. (10,8%)
	health care and socialмsecurity	39 ppl. (7,8%)
	constructing	32 ppl. (6,4%)
	IT	26 ppl. (5,2%)
	other	178 ppl. (35,6%)
	no answer	17 ppl. (3,4%)
TTL Staff number in organization	< 20 employees	106 ppl. (21,2%)
	20 .. 50	67 ppl. (13,4%)
	50 .. 100	74 ppl. (14,8%)
	100 .. 300	80 ppl. (16,0%)
	300 .. 1000	51 ppl. (10,2%)
	> 1000	106 ppl. (21,2%)
Position level	ordinary employee	220 ppl. (44.0%)
	specialist	161 ppl. (32,2%)
	middle management	54 ppl. (10,8%)
	top management	44 ppl. (8,8%)
	no answer	21 ppl. (4,2%)

Appendix 4

Difference in mean values (and standard deviations) of scales in the category "Industry of the employing organization"

scale	trade and commerce N=92	manu-facturing N=62	science and education N=54	health care N=39	con-structing N=32	IT N=26	Max diffe-rence
WSA	4,84 (1,12)	4,88 (1,04)	4,92 (0,96)	4,81 (1,13)	5,52 (0,85)	4,99 (1,15)	0,71
DMA	4,87 (1,13)	4,96 (0,99)	5,1 (0,97)	4,98 (1,15)	5,5 (0,77)	4,79 (1,22)	0,71
WMA	4,93 (1,11)	5,12 (0,92)	5,22 (0,93)	4,93 (1,23)	5,63 (0,68)	4,97 (1,22)	0,70
TV	4,82 (1,17)	5,07 (1,1)	5,36 (0,95)	5,32 (0,92)	5,43 (0,95)	4,87 (1,04)	0,61
TS	4,68 (1,15)	5,12 (1,12)	5,63 (0,94)	5,72 (1,06)	5,3 (0,89)	4,64 (1,12)	1,08
TI	5,06 (0,96)	5,25 (0,76)	5,29 (0,77)	5,38 (0,93)	5,51 (0,83)	5,2 (0,96)	0,45
FFJ	4,76 (1,14)	4,93 (0,94)	4,96 (1,08)	5,17 (0,84)	5,36 (0,84)	4,91 (1,13)	0,60
JC	3,49 (0,99)	4,15 (1,28)	4,05 (1,03)	3,96 (1,19)	3,82 (1,35)	3,73 (1,21)	0,66
IP	4,83 (1,21)	5,11 (1,28)	5,51 (1,02)	5,7 (0,96)	5,58 (1,01)	5,22 (0,88)	0,87
PS	4,17 (1,21)	4,35 (1,23)	4,86 (1,02)	4,69 (1,13)	4,65 (0,96)	4,59 (1,15)	0,69
SV	4,63 (1,12)	5,08 (1,15)	5,4 (0,94)	5,47 (0,84)	5,45 (0,83)	4,86 (1,08)	0,84
Spec	4,03 (1,08)	4,67 (0,89)	4,6 (0,86)	4,94 (1,01)	4,84 (0,95)	4,54 (1,04)	0,91
SS	4,92 (0,95)	4,88 (0,89)	5,06 (0,98)	5 (0,91)	5,24 (0,84)	4,74 (1,13)	0,50
II	3,92 (1,29)	4,69 (1,28)	3,89 (1,13)	4,38 (1,27)	4,82 (0,98)	4,17 (1,28)	0,93

scale	trade and commerce N=92	manu-facturing N=62	science and education N=54	health care N=39	con-structing N=32	IT N=26	Max diffe-rence
RI	4,38 (1,18)	4,84 (1)	4,25 (1,06)	4,68 (1,03)	4,65 (0,88)	4,58 (1,02)	0,59
IOO	4,63 (1,31)	3,71 (1,4)	4 (1,19)	4,79 (1,26)	4,23 (1,57)	4,26 (1,45)	1,08
FFO	4,33 (1,36)	4,17 (1,29)	4,23 (1,25)	4,51 (1,19)	4,26 (1,31)	4,42 (1,29)	0,34
Ergo	4,29 (1,24)	4,41 (1,26)	4,34 (1,21)	4,21 (1,23)	4,54 (1,14)	4,64 (1,15)	0,43
PD	3,8 (1,51)	3,79 (1,68)	3,09 (1,41)	3,51 (1,53)	3,58 (1,83)	3,12 (1,6)	0,71
WC	4,94 (1,17)	4,7 (1,16)	4,94 (1)	4,66 (1,2)	5,14 (1,21)	5,5 (0,8)	0,84
EU	3,54 (1,27)	4,13 (1,31)	3,5 (1,22)	3,95 (1,28)	3,97 (1,19)	3,72 (1,15)	0,63

Appendix 5

Difference in mean values (and standard deviations) of scales in the category "Position Level"

Scale	Top management N=44	Middle management N=54	Specialist N=161	Ordinary employee N=220	Max difference
WSA	5,58 (0,88)	5,46 (0,99)	4,88 (0,97)	4,68 (1,19)	0,9
DMA	5,67 (0,93)	5,47 (0,83)	4,96 (0,97)	4,7 (1,24)	0,97
WMA	5,74 (0,83)	5,53 (0,91)	5,06 (0,95)	4,8 (1,22)	0,94

Scale	Top management N=44	Middle management N=54	Specialist N=161	Ordinary employee N=220	Max difference
TV	5,65 (0,91)	5,63 (0,76)	5,19 (0,91)	4,75 (1,14)	0,9
TS	5,63 (1)	5,23 (1,15)	5,07 (1,05)	4,81 (1,33)	0,82
TI	5,73 (0,84)	5,45 (0,77)	5,11 (0,87)	5,07 (1,00)	0,66
FFJ	5,52 (0,97)	5,06 (1,02)	4,9 (0,99)	4,72 (1,13)	0,8
JC	3,9 (1,27)	4,06 (1,22)	4,05 (1,18)	3,63 (1,09)	0,43
IP	5,81 (0,71)	5,8 (0,91)	5,36 (0,91)	4,78 (1,24)	1,03
PS	5,11 (1,02)	4,8 (1,01)	4,62 (0,97)	4,1 (1,19)	1,01
SV	5,64 (0,75)	5,39 (0,91)	5,24 (0,95)	4,75 (1,22)	0,89
Spec	4,70 (1,10)	4,58 (0,98)	4,6 (0,94)	4,31 (1,07)	0,39
SS	5,46 (0,78)	5,31 (0,88)	4,98 (0,85)	4,71 (1,08)	0,75
II	4,46 (1,32)	4,53 (1,16)	4,14 (1,12)	4,10 (1,32)	0,43
RI	4,77 (1,26)	4,81 (1,08)	4,4 (0,95)	4,48 (1,2)	0,41
IOO	4,86 (1,04)	4,78 (1,25)	4,23 (1,39)	4,12 (1,48)	0,74

Scale	Top management N=44	Middle management N=54	Specialist N=161	Ordinary employee N=220	Max difference
FFO	4,59 (1,49)	4,37 (1,29)	4,17 (1,24)	4,17 (1,35)	0,42
Ergo	5,26 (0,94)	4,60 (1,41)	4,45 (1,08)	4,42 (1,24)	0,84
PD	3,61 (1,36)	3,40 (1,52)	3,31 (1,5)	3,61 (1,72)	0,3
WC	5,46 (0,84)	5,09 (1,3)	4,92 (1,12)	4,78 (1,26)	0,34
EU	3,83 (1,29)	3,82 (1,32)	3,94 (1,25)	3,6 (1,31)	0,68

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Andrey V. Smolyanov – the manuscript writing and editing, validation and statistical processing, data analysis and interpretation.

Larisa V. Mararitsa – conceptualization, methodology development and conduct of the study, writing-reviewing and editing of the manuscript.

Tamara A. Kinunen – methodology development and conduct of the study.

Svetlana D. Gurieva – Scientific supervision of the study, funding, conceptualization, final text approval, revision according to journal requirements.

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Standardization of the Personality Potential Questionnaire for Athletes

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Abstract

Introduction. The procedure of standardization of the author's questionnaire "Personality Potential" for athletes was carried out for the first time. The five-factor structure of the personal potential is revealed: "inclusion" (consists of the indicators of the "Test of Resilience" and "Test of General Self-Efficacy", "meaningfulness" (combines the indicators of the "Test of Meaning-Life Orientations"), "internality" (includes the indicators of the test "Level of Subjective Control"), "independence" and "positivity" (consists of the scales of the self-actualization test). **Methods.** The standardized sample consisted of 531 people, members of Russian national teams in martial arts, speed-power, cyclic, complex-coordination and team sports. CNORM module was used to determine data norms; analysis of variance (ANOVA) was used to determine the number of standardized groups; confirmatory factor analysis was used to check the degree of consistency of the standardized questionnaire structure; Cronbach's Alpha test was used to assess the internal consistency of each of the scales separately and of the total scale. The sample was stratified with respect to gender and age. **Results.** As a result of the study, unified criteria for evaluating the results of diagnostic tests in relation to gender were determined, standardized groups were identified: "male", "female", "juniors (f)". To determine the norms of the male sample, the explanatory variable was used - the age of the athlete from the lower to the higher, for the female sample the grouping age variable was used, distinguishing the norms for the groups "female" and "juniors (f)". **Discussion.** Stratification of the sample allowed for three standardization groups. In the male sample, "juniors (m)" and "males" are combined

due to the lack of significant differences in the components and the overall measure of personality potential. With the exception of the "meaningfulness" component, the males' scores have slight variations in the lower range, a floor effect, while there is a ceiling effect for personality potential. In the female sample, the monotonic correlation of values by age is maintained. Regression modeling made it possible to calculate the T-score for each raw score in the studied groups. The standardization procedure of the questionnaire was performed as required.

Keywords

standardization of the questionnaire, personality potential, athletes, inclusion, meaningfulness, internality, independence, positivity

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Introduction

Nowadays in psychological practice there is an urgent need for standardized diagnostic tools that allow obtaining reliable empirical data. Most researchers prefer to modify methods, avoiding the standardization procedure, which, of course, significantly impoverishes the practical psychologist's toolkit.

Standardization includes formulation of instructions, description of the research procedure, rules of data processing with conversion of raw scores into normative ones, mathematical processing of research results, psychological interpretation of data (Baturin, Melnikova, 2010; Anastasi, 2009; Mitina, 2013; Kline, 1994; Shmelev, 2013).

The conducted analysis of the methods studying various manifestations of personal potential has revealed the fact that for its assessment it is necessary to carry out a whole set of diagnostic procedures, occupying a significant time period. Thus, standardization of the questionnaire "Personality potential" will optimize psychological diagnostics.

For realization of all stages of standardization it is necessary to have a clear understanding of the content of the concept of "personal potential".

The concept of "personal potential" is revealed in two contexts:

1. Through the notions of personal characteristics:

- The degree of development of personality abilities and the possibility of their realization (Reznik, 2007);

- Natural talents that determine the degree of effectiveness (Feldman & Katzir, 1998), manifested in self-regulated learning (McCardle, Young & Baker, 2017);
- athlete's tasks, the realization of which is possible only with the development of certain personal qualities (Safonov, 2017);
- manifestations of individual capabilities (Lozhkin, Kolosov, 2014; Littlejohn & Young, 2019);
- as an assessment of suitability for certain activities (Kyllonen, 2008);
- striving to process information about a difficult situation in order to find the most effective ways to overcome it (Odintsova, 2015).

2. From the position of the resource approach:

- self-managed system of internal renewable resources of the personality, manifested in activity and aimed at obtaining a socially significant result (Markov, 2004);
- personal resource realized in certain situations (Koval, 2003);
- psychological resources and limitations arising on the way to success, which are caused by a combination of personality traits (Gorskaya, 2020; Stones & Baker, 2020);
- personal resources, their development and utilization at the stages of sports improvement and higher achievements (Bagadirova, 2019);
- adaptation resources, contributing to the preservation of performance efficiency in changing conditions and successful achievement of goals (Leontiev, 2011);
- dynamic resources that ensure high performance in sports activities regardless of external circumstances (Kamilov, 2016).

The construct of the standardized questionnaire consists of five components of personal potential, confirmed by the results of factor analysis (Kharitonova, Klimova, 2024):

1. The first component - "inclusion" - consists of the indicators of the "Test of Resilience" (Leontiev, Rasskazova, 2006) and the "Test of General Self-Efficacy" by R. Schwarzer and M. Yerusalem (adapted by W. Romek) (Schwarzer, Yerusalem, Romek, 1996):

- Resilience is a personal resource that allows athletes to achieve higher levels of skill (Malkin et al, 2019); coping skills to perform at high levels (Pires, Lima & Penna, 2019); contributes to the growth of personal athletic performance (Pavlova, 2020); is correlated with performance in individual sports (França, Codonhato & Vieira, 2020); success in sport activities (Bushmanova, Bushmanov, & Ulyanov, 2022; Pulmanovskaya, 2021); and resilience in different sports (Chacón Cuberos et al., 2016);
- Self-efficacy is the most predictively valid criterion that has a decisive influence on performance improvement (Bulynko, 2022); determines readiness for constructive

coping with stressful situations (Kadyrova, 2017); is related to sports performance (Moritz et al, 2000; Castro et al., 2018); success of sports activity (Ezhova & Karpova, 2021); coping strategies and competitive anxiety (Porjavid et al., 2020); mental toughness (Ramolale, Malete & Ju, 2021).

2. The second component - "meaningfulness" - combined the indicators of the "Test of Meaning-Life Orientations") (Leontiev, 2006):

- meaning-life orientations is one of the factors influencing professional success (Bakunyaeva, 2014); interrelated with mastery (Tahtinen et al., 2019); with the general structure of life meaning (Ronkainen et al., 2020); influences the level of professional success (Sukhareva, Oboznov, 2019).

3. The third component - "internality" - includes indicators of the test "Level of subjective control") (Fetiskin, Kozlov, Manuilov, 2005):

- locus of control determines the effectiveness of self-analysis of the results of successes and failures (Ogorodova, 2013; Filipiak & Łubianka, 2020); competitive performance (Romanina, Kuzina, 2020; Piepiora, 2020; Ferreira et al., 2020); professional success (Gemonova, Kukurudziak, 2012).

4. The fourth and fifth components consist of scales of the self-actualization test (Gozman, Kroz, Latin, 1995):

- "Independence" consists of the scales: supportiveness, self-esteem, spontaneity, acceptance of aggression, behavioral flexibility and sensitivity;
- "Positivity": synergy, perceptions of human nature, value orientations and cognitive needs.

The mentioned components are manifested through the aspiration to achieve sports excellence through the maximum realization of their own natural talents (Tkachev & Zhilina, 2015); the process of overcoming extreme situations in sport (Andreev & Andreev, 2019); development and achievement of results (Dementieva, Kravchenko, 2016); inner life aspirations (Janke & Dickhäuser, 2019); anxiety level (Mirzeoğlu & Çetinkanat, 2005); performance (Gyömbér, Kovács & Lenart, 2016), self-actualization in sports activities (Nepopalov, Atamas, 2017) .

Methods

The following methods were applied:

- to determine the norms of the standardized questionnaire - CNORM module implemented in the Jamovi program (Lenhard, Lenhard & Gary, 2018). CNORM can be characterized as a semi-parametric method. We make no assumptions about the distribution of raw scores, instead assuming that the raw score is the result of the interaction between the latent measurement ability and the applied test item set (Lenhard, Lenhard & Gary, 2019); to determine the granularity of the norm tables, statistical normalization models (Lenhard & Lenhard, 2021)

- to assess the fit of statistical models - RMSE and adjusted R^2, which capture all kinds of global and local differences between observed and modeled data. For a good model fit, the RMSE should be below 10, the adjusted R^2should be close to 0.99 (Lenhard et al., 2018);
- to determine the number of groups to be standardized, analysis of variance (ANOVA) with a posteriori comparison of groups in pairs, taking into account the Bonferroni correction;
- to check the degree of consistency of the structure of the standardized questionnaire - confirmatory factor analysis;
- to assess the internal consistency of each of the scales separately and of the total scale - Cronbach's Alpha.

Sample

The sample consisted of 531 people, members of Russian national teams in different sports (martial arts, speed and strength, cyclic, complex-coordination and team sports).

The sample was stratified only by sex differences and age categories, juniors from 17 to 21 years old and adults from 22 to 40 years old, the detailed characteristics of the sample are presented in Table 1.

Table 1
Characterization of the sample of athletes

Group	Number (n)	Mean age (M)	Standard deviation (SD)	CMS	MS	MSIC	HMS
Juniors(m)	104	19,154	1,147	31	65	7	1
Juniors(f)	148	18,980	1,264	60	79	9	0
Men	126	27,762	4,757	6	53	48	19
Female	153	27,464	4,645	0	59	55	39
Total	531	-	-	97	256	119	59

Note: *CMS - Candidate Master of Sports; MS - Master of Sports; MSIC - Master of Sports International Class; HMS - Honored Master of Sports.*

Results

The primary processing of empirical data made it possible to determine mean values, standard deviations, minimum and maximum indices, asymmetries, excesses for all the studied indicators (Table 2).

Table 2
Results of primary mathematical processing of data

Scales	Average	St. Deviation	Min.	Max.	Asymmetry	Excess
Inclusion	44,527	5,259	27	56	-0,491	0,263
Meaningfulness	28,401	3,543	17	35	-0,777	0,466
Independence	27,126	3,852	14	35	-0,554	-0,035
Positivity	23,793	4,076	12	34	-0,137	-0,195
Internality	27,667	3,368	13	35	-0,360	0,485
Personality potential	151,514	13,588	111	188	-0,221	0,252

Confirmatory factor analysis fit index results obtained: $\chi^2 = 497.821$; df = 311; p<.001; CFI = 0.906; SRMR = 0.043; RMSEA = 0.034, which confirms the acceptable fit of the model to the empirical data and the highlighted five-factor structure of the questionnaire.

The Cronbach's Alpha criterion scores for the "meaningfulness", "independence", "positivity" and "internalizing" scales lie between 0.438 and 0.487, indicating low consistency. For the "inclusion" scale, the score is 0.728 and the total scale is 0.781, showing good consistency of all items.

Analysis of variance (ANOVA) with posterior comparison of groups in pairs with Bonferroni correction:

- For the entire study sample: "inclusion" F(3, 527) = 8.292, p<0.001; "meaningfulness" F(3, 527) = 3.2921, p<0.05; "independence" F(3, 527) = 4.125, p<0.01; "positivity" F(3, 527) = 11.205, p<0.001; "internalization" F(3, 527) = 0.944, p = 0.419; "personality potential" F(3, 527) = 9.619, p<0.001. Thus, statistically significant differences between the groups were found in all components except "internality";
- by gender, there are differences between male and female groups in the components of "inclusion" (F(1, 527) = 17.427, p<0.001, η^2 = 0.032; t(527) = 4.175, p<0.001, d = 0.367), "positivity" (F(1, 527) = 29.501, p<0.001, η^2 = 0.052; t(527) = 5.431, p<0.001, d = 0.477), "personality potential" (F(1, 527) = 19.446, p<0.001, η^2 = 0.035; t(527) = 4.432, p<0.001, d = 0.389);

- in the groups "juniors (f)" and "female" there are differences in the components "meaningfulness" t (527) = 2.962, p<0.05, d = 0.337; "independence" t (527) = 3.00, p<0.05, d = 0.346 and in "personality potential" t (527) = 3.061, p<0.01, d = 0.353. There are no significant differences in the components "inclusion", "internalization" and "positivity";
- between the groups "juniors (m)" and "male" there are no significant differences in the components and the general indicator of personal potential.

Based on the results of the comparison of empirical data, it was decided to combine "juniors(m)" and "males" into one group, thus in further analysis the groups used are males, juniors (f), females (Table 3).

Table 3

Comparative results of the data obtained during mathematical processing (mean, standard deviation, confidence interval)

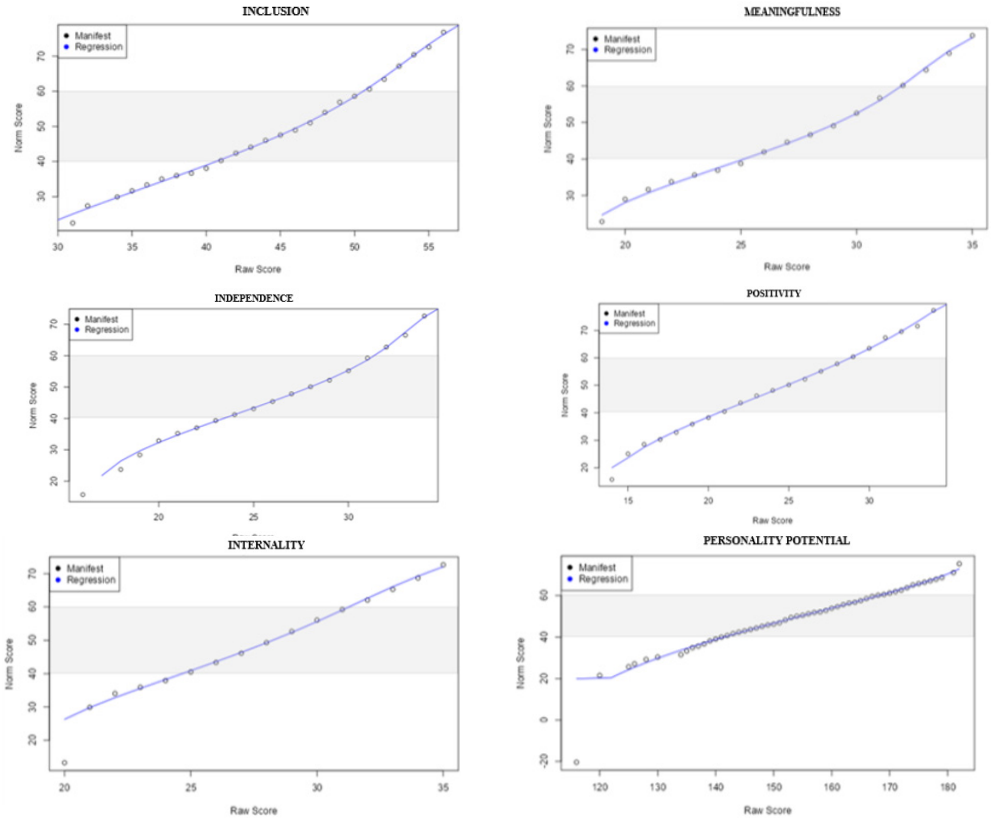
Scales	Male n = 230 mean, (standard deviation) [CI].	Juniors(f) n = 148 mean, (standard deviation) [CI]	Female n = 153 mean, (standard deviation) [CI]
Inclusion	45,604 (5,256) [44,925; 46,284]	42,926 (5,277) [42,074; 43,776]	44,458 (4,861) [43,687; 45,228]
Meaningfulness	28,578 (3,570) [28,117; 29,040]	27,662 (3,885) [27,036; 28,288]	28,850 (3,030) [28,370; 29,330]
Independence	27,474 (3,918) [26,968; 27,980]	26,189 (3,773) [25,581; 27,797]	27,510 (3,696) [26,924; 28,095]
Positivity	24,835 (4,059) [24,310; 25,359]	22,655 (3,924) [22,023; 23,288]	23,327 (3,883) [22,712; 23,942]
Internality	27,930 (3,438) [27,486; 28,375]	27,480 (3,092) [26,982; 27,978]	27,451 (3,509) [26,895; 28,007]
Personality potential	154,422 (13,522) [152,674; 156,169]	146,912 (13,229) [144,781; 149,043]	151,595 (12,870) [149,556; 153,634]

The component "inclusion" between males and juniors, the component "positivity" between males and juniors with females, "personality potential" between males and juniors and between juniors and females do not overlap with respect to the confidence interval, which is further evidence of significant differences in the studied indicators.

Continuous norming for the male sample

In order to develop norms for the male sample, the explanatory variable, age of the athlete, was used. Figure 1 presents a graphical visualization of the model fit between predicted and observed values.

Figure 1
Observed (raw) and predicted (T-score) norms



Note: *Norms in T-scores are highlighted in gray.*

When graphing the data with a good model fit, all observed variables are as close to the regression line as possible, and deviations in the extremely upper and lower ranges are indicative of floor or ceiling effects (Gary, Lenhard & Lenhard, 2021).

For the component "inclusion" RMSE: 0.257, $R^{(2)}_{adj}$ = 0.997, "meaningfulness" RMSE: 0.188, $R^{(2)}_{adj}$ = 0.997, "independence" RMSE: 0.136, $R^{(2)}_{adj}$ = 0.999, "positivity" RMSE: 0.154, $R^{(2)}_{adj}$ = 0.998, "internalizing" RMSE: 0.156, $R^{(2)}_{adj}$ = 0.998, "personality potential" RMSE: 0.684, $R^{(2)}_{adj}$ = 0.997.

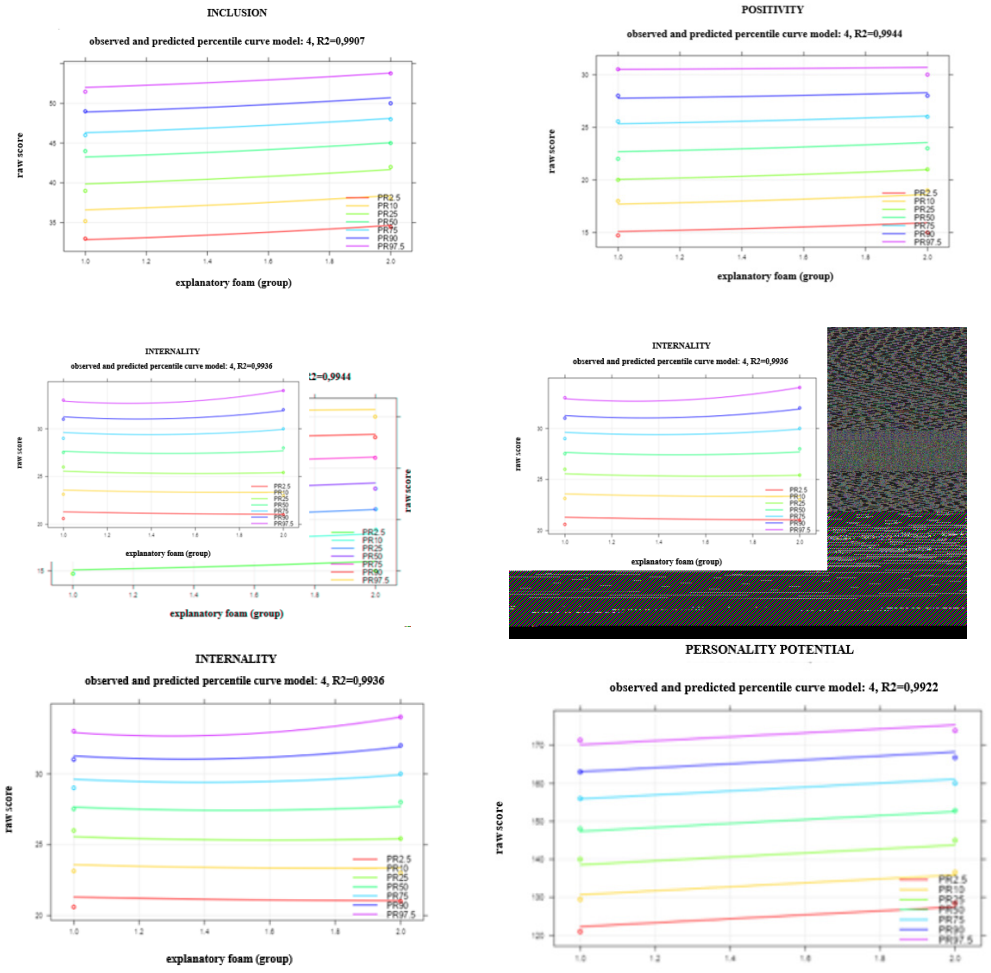
Regression modeling allowed us to calculate each raw score with a corresponding T-score based on regression (Appendix 1).

Continuous normalization for the female sample

The grouping age variable was used to obtain norms for the female sample (Figure 2).

Figure 2

Observed and predicted percentile curves



The absence of intersections of percentile curves, means that the monotonic relationship between normal scores and raw scores at certain age levels is not broken (Lenhard, Lenhard & Gary, 2019).

Visual analysis of the percentile curve plots revealed only a small deviation between observed and predicted raw scores, consistent with high correlation and small standard error of mean. The use of k predictors in the regression analysis, = 4, provided a sufficient normalizing model, with simultaneously smoothed percentile curves and eliminated sampling error variance.

For the "inclusion" component, the RMSE was 0.497, and $R^2 = 0.991$, "meaningfulness" RMSE = 0.270, and $R^2 = 0.994$, "independence" RMSE= 0,317, and $R^2 = 0.992$, "positivity" RMSE = 0.269, $R^2 = 0.994$, "internality" RMSE = 0.264, $R^2 = 0.994$, personality potential RMSE = 1.115, $R^2 = 0.992$.

Regression modeling allowed us to calculate a different T-score for each raw score (Appendix 2).

Table 4 presents the norms of the scales for the male sample and Table 5 for the female sample.

Table 4

Norms for assessing the expression of indicators of the scales of the questionnaire "Personal Potential" (male)

	Weakly expressed	Average (norm)	Strongly expressed
Inclusion	40 and below	41-50	51 and above
Meaningfulness	25 and below	26-31	32 and above
Independence	23 and below	24-31	32 and above
Positivity	20 and below	21-28	29 and above
Internality	24 and below	25-31	32 and above

	T-score				
	20 - 39		40 - 59		60-80
	Low	Below average	Average	Above average	High
Personality potential	128 and below	129-141	142-167	168-179	180 and above
	T-score				
	20-29	30-39	40-59	60-69	70-80

Table 5

Norms for assessing the expression of indicators of the scales of the questionnaire "Personality potential" (Female)

	Weakly expressed		Medium (normal)		Strongly expressed	
	Juniors(f)	female	Juniors(f)	female	Juniors(f)	female
Inclusion	38-low	39-low	39-47	40-49	48-higher	50-higher
Meaningfulness	23-low	25-low	24-31	26-31	32-up	32-up
Independence	22-lower	24-lower	23-30	25-31	31-higher	32-higher
Positivity	18-lower	19-lower	19-26	20-27	27-higher	28-higher
Internality	24-under	24-under	25-30	25-30	31-higher	31-higher

	T-score		
	20 - 39	40 - 59	60 - 80

	Indicators of personal potential				
	low	below average	average	above average	high
Juniors(f)	121 and below	122-134	135-159	160-170	171 and above
Female	127 and below	128-139	140-164	165-175	176 and above
	T-score				
	20-29	30-39	40-59	60-69	70-80

Discussion

We consider it important to note that we implemented an increase in the sample size for the standardization of the questionnaire in contrast to its size for the development and initial testing of the methodology (Kharitonova, Klimova, 2024). The results of the primary mathematical processing of the data showed small differences in psychometric characteristics according to the results of confirmatory factor analysis and reliability of the questionnaire scales, but confirmed the acceptable correspondence of the model to the empirical data and the five-factor structure of the questionnaire.

Stratification of the sample by sex differences and age categories allowed us to identify three standardization groups, and we singled out only one group among the male sample, since no significant differences were found between the groups "juniors (m)" and "male" in terms of components and the general indicator of personality potential. According to the authors (Baturin, Melnikova, 2010) stratification is chosen depending on the content and practical purpose of the test, so the final allocation of those groups does not contradict the logic of the study.

When analyzing the obtained empirical data, we used the statistical package of continuous normalization CNorm, since the modeling is based on the full set of data, which requires, from our point of view, the use of methods of increased statistical power.

Our analysis of the presented charts on the male sample revealed only minor deviations between the observed scores and the regression line, in accordance with a high coefficient of determination and a small mean square error (Gary, Lenhard & Lenhard, 2021). Except for the meaningfulness component, all scores have small deviations in the lower range, a floor effect, and a ceiling effect is also observed for personality potential. This effect could have been caused by combining "juniors" and "males" into one group, which is characterized by a larger age range and skill level of the athletes.

According to the graph, there are only small deviations between observed and predicted values in the female sample, which can be interpreted as a first indication of a good model fit (Lenhard, Lenhard & Gary, 2019). The monotonic relationship between these values at certain age levels is not disturbed.

The resulting models adequately represent the maximum effect of the standardized questionnaire on the scales and the total scale where baseline scores are not exceeded.

Conclusions

The procedure of standardization of the questionnaire "Personality Potential" for athletes that we have carried out allowed us to:

1. to identify standardized groups: male, female, juniors(f);
2. to define uniform criteria for evaluating the results of diagnostic tests in relation to gender, and for the female sample we managed to identify norms for the subgroups "juniors (f)" and "female";
3. calculate for each raw score a corresponding T-score based on modeling of diagnostic results using the CNORM module;

Thus, the conducted research allowed us to compile tables of conversion of raw scores into T-scores for use in the practical activity of sports psychologists.

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Appendix 1

Table of conversion to T-scores. Male

Raw score	INCL (T-point)	MEAN (T-point)	INDEP (T-point)	POSIT (T-score)	INT (T-point)	Raw score	PP (T-score)	Raw score	PP (T-score)
12						114		160	53,9
13						115		161	54,7
14				20		116		162	55,4
15				23,6		117		163	56,2
16		20	20	27,4		118	20	164	56,9
17		22,3	21,7	30,5		119	20	165	57,7
18		24,6	26,4	33,3	21,5	120	21,1	166	58,4
19		26,8	29,6	36	24,6	121	22,2	167	59,2
20		29	32,3	38,4	27,5	122	23,3	168	60
21		31,1	34,7	40,9	30,3	123	24,3	169	60,8
22		33,2	36,9	43,2	32,9	124	25,3	170	61,6
23		35,3	39,1	45,5	35,6	125	26,3	171	62,4

Raw score	INCL (T-point)	MEAN (T-point)	INDEP (T-point)	POSIT (T-score)	INT (T-point)		Raw score	PP (T-score)		Raw score	PP (T-score)
24		37,4	41,2	47,9	38,2		126	27,3		172	63,2
25		39,6	43,3	50,3	40,9		127	28,2		173	64
26		41,9	45,4	52,7	43,6		128	29,1		174	64,8
27		44,3	47,7	55,1	46,5		129	30		175	65,7
28	20	46,8	50	57,7	49,4		130	30,9		176	66,6
29	21,6	49,5	52,5	60,4	52,4		131	31,8		177	67,5
30	23,3	52,6	55,3	63,3	55,6		132	32,6		178	68,4
31	25	56	58,6	66,3	58,9		133	33,5		179	69,4
32	26,6	60	62,6	69,6	62,4		134	34,3		180	70,4
33	28,2	64,6	67,5	73,1	65,8		135	35,1		181	71,4
34	29,7	69,4	72,3	76,9	69,2		136	35,9		182	72,5
35	31,2	73,5	75,8	80	72,2		137	36,7		183	73,6
36	32,7	76,8	78,3		75		138	37,5		184	74,9
37	34,3				77,5		139	38,3		185	76,2
38	35,8						140	39,1		186	77,7
39	37,3						141	39,9		187	
40	38,9						142	40,6			
41	40,5						143	41,4			
42	42,1						144	42,1			
43	43,8						145	42,9			
44	45,6						146	43,6			
45	47,4						147	44,4			
46	49,4						148	45,1			
47	51,4						149	45,9			
48	53,6						150	46,6			
49	55,9						151	47,3			
50	58,4						152	48,1			
51	61,1						153	48,8			
52	64						154	49,5			
53	67,1						155	50,3			
54	70,2						156	51			
55	73,3						157	51,7			
56	76,1						158	52,5			
57	78,7						159	53,2			

Appendix 2

Table of conversion to T-scores. Female

raw scores	INCL (T-point)		MEAN (T-point)		INDEP (T-point)		POSIT (T-score)		INT (T-point)		Personality potential (T-score)					
	jun	fem	jun	fem	jun	fem	jun	fem	jun	fem	raw scores	jun	fem	raw scores	jun	fem
12											112	21		157	57,6	53,4
13							24,9	23,1			113	22		158	58,4	54,2
14							27,5	25,5			114	23		159	59,3	55
15							30,1	28,0			115	23,9	20	160	60,1	55,8
16							32,7	30,5			116	24,9	20	161	61	55,6
17			23,7		24,8	22,3	35,3	33,1			117	25,8	20,8	162	61,9	57,5
18			26,3		27,9	25	37,9	35,6	20,9	21,5	118	26,7	21,8	163	62,7	58,3
19			28,7	20	30,8	27,7	40,5	38,1	23,7	24,4	119	27,5	22,8	164	63,6	59,1
20			31,1	23,3	33,5	30,2	43,1	40,7	26,6	27,3	120	28,4	23,7	165	64,5	60
21			33,4	26,5	36,2	32,7	45,7	43,3	29,5	30,2	121	29,3	24,7	166	65,5	60,8
22			35,7	29,5	38,8	35,1	48,2	45,9	32,4	33,2	122	30,1	25,6	167	66,4	61,7
23			38	32,3	41,4	37,5	50,8	48,5	35,4	36,1	123	30,9	26,5	168	67,4	62,6
24			40,2	35,1	43,9	39,9	53,3	51,1	38,4	39	124	31,8	27,4	169	68,4	63,5
25			42,5	37,8	46,5	42,3	55,9	53,8	41,5	42	125	32,6	28,2	170	69,4	64,4
26			44,9	40,6	49	44,8	58,4	56,5	44,6	44,9	126	33,4	29,1	171	70,5	65,3
27			47,2	43,3	51,6	47,3	60,9	59,2	47,8	47,9	127	34,2	29,9	172	71,6	66,2
28	20,9		49,7	46,2	54,2	49,9	63,4	62	51,1	50,9	128	35	30,8	173	72,7	67,2
29	23	20	52,3	49,1	56,9	52,7	65,9	64,8	54,5	53,9	129	35,8	31,6	174	73,9	68,2
30	25	21,3	55	52,3	59,7	55,7	68,3	67,6	58,1	56,9	130	36,6	32,4	175	75,1	69,2
31	26,9	23,4	58	55,8	62,6	59	70,8	70,4	61,8	60	131	37,4	33,2	176	76,4	70,3
32	28,8	25,4	61,5	60	65,7	63	73,2	73,3	65,7	63,1	132	38,2	34	177	77,8	71,4
33	30,6	27,3	65,9	66	69,1	68,5			70	66,3	133	38,9	34,8	178	79,3	72,5
34	32,4	29,1	75,1	71,8	73	75,1			74,7	69,6	134	39,7	35,6	179	80	73,7
35	34,2	31,	75,1	71,8					80	72,9	135	40,5	36,4	180		74,9
36	36	32,8									136	41,2	37,2	181		76,2
37	37,9	34,6									137	42	38	182		77,5
38	39,7	36,4									138	42,8	38,8	183		79
39	41,5	38,2									139	43,5	39,6	184		80
40	43,4	40,1									140	44,3	40,3	185		80
41	45,4	41,9									141	45,1	41,1	186		
42	47,4	43,8									142	45,8	41,9	187		
43	49,4	45,8									143	46,6	42,6			

44	51,6	47,8									144	47,4	43,4			
45	53,7	49,9									145	48,1	44,2			
46	56	52,									146	48,9	44,9			
47	58,3	54,2									147	49,7	45,7			
48	60,6	56,5									148	50,5	46,5			
49	63	58,8									149	51,2	47,2			
50	65,3	61,1									150	52	48			
51	67,5	63,4									151	52,8	48,8			
52	69,5	65,7									152	53,6	49,5			
53	71,5	67,9									153	54,4	50,3			
54	73,3	69,9									154	55,2	51,1			
55	74,9	71,8									155	56	51,9			
56	76,4	73,6									156	56,8	52,6			

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The Place of Satisfaction with Relationship Quality in the Parental Family within the Value Consciousness Structure of Contemporary Russian Youth

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Abstract

Introduction. There is currently a scarcity of research examining the interconnections between the quality of young people's intra-family relationships and their value consciousness. We hypothesize that youth's level of satisfaction with the quality of relationships in their parental family (Relationship Quality Satisfaction, RQS) is associated with a specific set of structural and processual characteristics of family bonds, as well as with a complex of prosocial values. **Methods.** A survey involved 121 humanities students (psychology, economics) from Saint Petersburg, average age 19 years (30% male, 70% female). Assessment tools: "Family Relationships and Home" Questionnaire (Kunitsyna, Yumkina, 2015), "Value Orientations - 36" (Kunitsyna, 2010), PCRIF (Parent-Child Relationships in the Family) (Kunitsyna, 2015). **Results.** A definition of family relationship quality was formulated, and substantive criteria for its analysis were identified: structural (leadership and attachments); processual (family communication and activities); cognitive (collective family representations and values). Quality differences in intra-family relationships were revealed between young men and women with varying degrees of satisfaction with parental family relationships; the structure of youth value orientations and the place of RQS within it were demonstrated; 4 predictors of satisfaction with family relationships were identified: emotional attachments, mutual understanding, hospitality, and constructive conflict resolution. High satisfaction with parental family relationship quality mediates the significance of values related to trusting close relationships, creating

an emotional foundation for confidence in building lasting bonds of love and friendship. Low satisfaction is associated with an increased youth focus on seeking pleasures, heightened attention to personal appearance and internal experiences. **Discussion.** The obtained results are consistent with Russian and international research indicating that mutual understanding and conflicts are the strongest predictors in models describing family relationship quality and factors enhancing the significance of family values. The inclusion of hospitality as a predictor in the model is practically promising, as it can be considered a resource for the family system.

Keywords

youth value orientations, quality of intra-family relationships, family atmosphere, family conflicts, hospitality

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Introduction

Recent decades in Russia have witnessed transformations within the family institution, which, according to sociologists, have led to an increase in "trial marriages," the proportion of cohabiting couples, and childfree people (Vishnevsky & Yachmeneva, 2018). The reasons cited for this situation include the prolonged state of uncertainty in Russian society (Vishnevsky & Yachmeneva, 2018; Kasarkina et al., 2018), further exacerbated during the pandemic. Uncertainty about the future calls into question not so much the value of family relationships itself, but rather young people's perceptions of their own capabilities and abilities to take responsibility for their couple relationships and raising children (Zakharova et al., 2019). This perception represents the integration of young people's experience of life within their parental family (Heinze et al., 2020; Prioste et al., 2020). Consequently, a pertinent question arises: which specific qualitative aspects of relationships with parents prove to be the most significant in transmitting prosocial values to youth? To answer this, it is crucial first to define the concept of relationship quality itself.

Note that an increasing number of researchers are addressing the problem of subjective well-being, where the question of close relationship quality occupies an important place (Saif, 2014; Trahan, Morley & Shafer, 2021; Szkody & McKinney, 2021; LaFreniere & Ledbetter, 2021; Ekimchik, Smirnova, 2021; Ryabichenko, Lebedeva & Plotka, 2018; Narbut & Trotsuk, 2018; Padilla et al., 2020; Sasser et al., 2021). This term

encompasses the totality of objective and subjective aspects of interpersonal relationships (Hardie & Lucas, 2010). The parameters used to assess interpersonal relationship quality include:

a) Positive aspects indicating high relationship quality (support, warmth, affection, care) (Lucier-Greer, Howard, & Mancini, 2021)

b) Negative aspects indicating low relationship quality (conflicts, antagonism, excessive control, coercion) (Saif, 2014; Ebbert, Infurna & Luthar, 2018).

Among the socio-psychological prerequisites determining interpersonal relationship quality in adults are: love styles, capacity for self-improvement, personality traits, the specifics of family relationships (Konshina & Sadovnikova, 2022), emotional intelligence, partner support, positive attitudes, accuracy of interpersonal perception, level of depression (Groot et al., 2022), social status, and economic status (Saif, 2014). It is noted that the most substantial influence on subjective evaluations of relationship quality is exerted by the stability of the parent's (or substitute caregiver's) attitude towards the child (Bornstein & Putnick, 2021; Zhou et al., 2021; Martin-Storey et al., 2021; Krasnova, Kholmogorova, 2011; Islami, 2019) and the child's own reflection on this stability (Szkody & McKinney, 2021).

Literature analysis reveals a lack of consensus in defining family relationship quality, despite acknowledging its heuristic value for theoretical and applied purposes. Reference to philosophical literature shows that the concept of the quality of a phenomenon captures its most essential aspects and simultaneously the very possibility of its existence in that specific form (Nikiforov, 2001). Consequently, when addressing family relationship quality, it is necessary to identify parameters characterizing aspects of the family's life activity as a collective subject, i.e., reflecting its unity.

Within the context of studying the family as a small group, key factors include cohesion and group conflicts (Fosco, Caruthers & Dishion, 2012). In domestic literature, A.V. Petrovsky understands the essence of cohesion as the value-orientational unity of the group, where the alignment of values, judgments, and opinions among its members indicates the intencity of their joint activity. Importantly for our reasoning, groups with high levels of cohesion exhibit a pronounced striving for self-determination, both for each individual participant and the group as a whole, as opposed to conformity (Petrovsky, 2008).

Zhuravlev A.L. proposes a different set of criteria for a small group as a collective subject: interconnectedness of group members (intensity, closeness, content, and subject of mutual ties), joint activity (encompassing a broad spectrum of the group's joint activities), and group self-reflexivity (Zhuravlev, 2009, p. 76). The latter includes a developed sense of "we-ness," social representations about the group (its history, resources, capabilities, development).

A crucial commonality in these concepts is that at the level of specific subjects, the group's unity manifests in such a way that the representation of the group, formed through

joint activity, functions to determine each participant's behavioral line (i.e., becomes a value orientation). The dialectical link between these aspects is noteworthy, which lays within the continuum of non-conformism -- conformism -- mature self-determination.

These theoretical considerations are important both for justifying the relevance of our research and for proposing a definition of intra-family relationship quality. Intra-family relationship quality is a stable state within the system of connections between family members, reflecting both the degree of their unity in joint life activities and the level of each member's well-being. In general terms, the qualitative uniqueness of family relationships can be understood as a gradual movement towards a state minimizing contradictions in joint communication and activity, enabling the full self-determination and development of each family member.

Next, it is necessary to identify the most essential properties of family relationships from a socio-psychological perspective. As noted in the definition, these should be properties ensuring the unity of joint life activity. Viewing the family through a systemic approach and drawing on the concept of family lifestyle (Kunitsyna, Yumkina, 2015), we propose the following list of parameters satisfying the criteria of a collective subject (see Table 1).

Table 1

Correspondence between Family Relationship Parameters and Criteria of a Collective Subject

Characteristic of Collective Subject (according to A.L. Zhuravlev)	Parameter of Family Relationships
Interconnectedness of group members	Structural aspects of family bonds (marital, intergenerational): - Hierarchy (formal) - Attachments (informal)
Joint activity	Processual components of family communication and activity: - Family communication - Care for the living environment - Hospitality

Characteristic of Collective Subject| (according to A.L. Zhuravlev)	Parameter of Family Relationships
Group self-reflexivity	Cognitive components of family self-consciousness:
	- Collective family representations
	- Family scripts and attitudes
	- Family values
	- Relationship satisfaction

The first parameter – interconnectedness of group members – characterizes the structural aspects of bonds within the family, expressing their mutual subordination and coordination. Here, we can speak of the hierarchy of bonds as the more formalized aspect, and attachment as the less formalized, emotional aspect of family relationships.

Joint activities of family members can be highly diverse. We have identified the most generalized and fundamental aspects: family communication (expressing attention among family members), care for their living environment; hospitality (care for the broader social environment).

Finally, group self-reflection among family members encompasses the results of generalizing the entire shared life experience by each subject and manifests itself in the family consciousness and development of family scripts, family attitudes and values, as well as a general sense of satisfaction or dissatisfaction with the relationships.

As noted by A.L. Zhuravlev (2009), these factors, when analyzing a group, can either manifest in unity (indicating a high level of collective subject development) or have varying degrees at different stages of group development. The focus of our analysis was the specific situation characterizing student youth: on one hand, many years of family life have formed a holistic image of this group and their place within it; on the other hand, they are preparing to leave this group to build their own family unit. Consequently, the question arises: how does satisfaction with the quality of life in the parental family mediate the structure of the young person's value-and-meaning sphere? **The aim** of this study was to seek a solution to this question and develop a predictive model of young people's satisfaction with intra-family relationship quality.

Methods

To test our assumptions, a survey was organized among humanities students (psychology, economics) in Saint-Petersburg, Russia. Total number of participants: 121 individuals, average age was 19 years old (30% male, 70% female). Considering the numerical predominance of females over males, we conducted an analysis of sex differences using the Student's t-test for independent samples. No significant differences were found on the identified aspects of intra-family relationships; therefore, it was decided to analyze the aggregated sample of young men and women.

Our main research hypothesis was that the level of youth satisfaction with relationship quality in the parental family (RQS) is associated with a specific set of structural and processual characteristics of family bonds, as well as with a complex of prosocial values.

Each respondent completed the questionnaires listed in Table 2.

Table 2
Description of Research Objectives and Methods

Research Objective	Diagnostic Method
Analysis of qualitative aspects of intra-family relationships	"Family Relationships and Home" Questionnaire (Kunitsyna, Yumkina, 2015; abbreviated FRH)
Evaluation of satisfaction with relationships in the parental family	Evaluation of "Family Atmosphere" using relevant scale of the PCRIF Questionnaire --"Parent-Child Relationships in the Family" (Kunitsyna, 2015)
Analysis of value orientations	"Value Orientations -- 36" Questionnaire (Kunitsyna, 2010, abbreviated VO-36)

The Family Relationships and Home Questionnaire (abbreviated FRH) is designed to study family lifestyle as a set of stable forms of family relationships, daily life, rules, attitudes, and the inheritance of specific (ethnic, spiritual, religious, generational) values and traditions. The questionnaire is based on a theoretical model comprising interrelated aspects of family lifestyle: a) connections with the social environment external to the family; b) intra-family relationships; c) family activities. Completion involves retrospective assessment by the respondent of their experience in the parental family, recording the presence or absence of regularity in specific family practices and behavioral patterns.

The "Family Atmosphere" scale included 6 questions from the PCRIF Questionnaire (Kunitsyna, Yumkina, 2015) and integrates an evaluation of the degree of general emotional comfort within the family circle and satisfaction with family relationships. Each question requires either agreement (1 point) or disagreement (0 points). Examples of scale items: "I had an unhappy childhood due to a generally tense atmosphere in the family" (reverse-scored); "We were a very close-knit family." This method was chosen to mitigate potential effects of social desirability bias or excessive criticality of the child towards parents. Thus, we achieve greater objectification of emotionally charged feelings. It is worth noting that in research on parent-child relationship quality satisfaction, this parameter is typically operationalized through direct questions to the respondent about how happy and satisfied they are with their relationships with parents (Hong et al., 2021).

The choice of the VO-36 Questionnaire was due to its expansion, compared to the original S. Schwartz questionnaire, of the block of values related to interpersonal and family relationships (Kunitsyna, 2010).

Data were checked for normality of distribution. Subsequent processing was conducted in several stages for a more detailed analysis of the interrelations among the studied parameters.

In the first stage, mean values were compared in two contrast groups differing in the degree of satisfaction with relationship quality in the parental family (Family atmosphere Scale of PCRIF Questionnaire). Group formation followed the principle of $M \pm SD$, where M was the mean value for the selected characteristic (in this case M = 8.2), and SD was the standard deviation (in this case SD = 2.5). Group 1 comprised 24 individuals with low values on the satisfaction scale (i.e., below M-SD = 8.2-2.5 = 5.7). Group 2 comprised 59 individuals with high mean values on the satisfaction scale (i.e., above M+SD = 8.2+2.5 = 10.7). The maximum possible score on the scale was 12 points. The Mann-Whitney U test for independent samples was used for data processing.

In the second stage, the nature of the relationships between satisfaction with relationship quality in the parental family (RQS) and value orientations was analyzed on the combined sample (n = 121). For this purpose, correlational analysis (Spearman's rho) and exploratory factor analysis were applied. Factor extraction was performed using the principal component method, with Kaiser-normalized Varimax rotation.

In the third stage, a predictive model for satisfaction with relationship quality in the parental family was calculated using multiple regression analysis.

Data processing was performed using IBM SPSS-Statistics 22.0 software.

Results

Results comparing two youth groups contrasting in satisfaction with relationship quality in the parental family are presented in Table 3.

Table 3

Comparison of Youth Groups with Low and High Satisfaction with Parental Family Relationships (RQS)

Parameters	Gr1 (Low RQS) (n=24)		Gr2 (High RQS) (n=59)		Difference in Means	Sig. Level
	M	SD	M	SD	Δ	p
Indicators of Interconnectedness						
Symmetry of bonds in the marital system	6,46	2,96	8,59	2,35	2,13	0,00
Intergenerational bonds	5,71	2,85	8,49	2,45	2,78	0,00
Indicators of Activity						
Constructiveness of conflict resolution	5,54	2,54	9,07	1,95	3,53	0,00
Mutual understanding	5,83	2,16	9,17	1,96	3,34	0,00
Care for the home	5,38	2,39	8,49	2,32	3,12	0,00
Space belonging	7,92	2,73	10,10	1,76	2,19	0,00
Joint activities	4,67	2,48	6,47	2,35	1,81	0,01
Preparing for guests	6,33	2,22	8,73	2,20	2,40	0,00
Communication with guests	6,67	3,42	10,32	2,15	3,66	0,00
Value Orientations						
Family protection	8,33	2,33	10,25	2,08	1,92	0,00
Self-care	7,71	2,73	6,54	2,22	-1,17	0,01
Usefulness	5,75	2,51	7,19	2,30	1,44	0,03
Understanding and trust in the family	7,88	2,92	9,32	1,71	1,45	0,03
Religiosity	2,38	2,95	4,20	3,12	1,83	0,01
Inner harmony	9,54	2,08	7,92	2,69	-1,63	0,01
Pleasure	7,38	2,30	6,37	2,11	-1,00	0,05
Legend: M -- Mean, SD -- Standard Deviation						

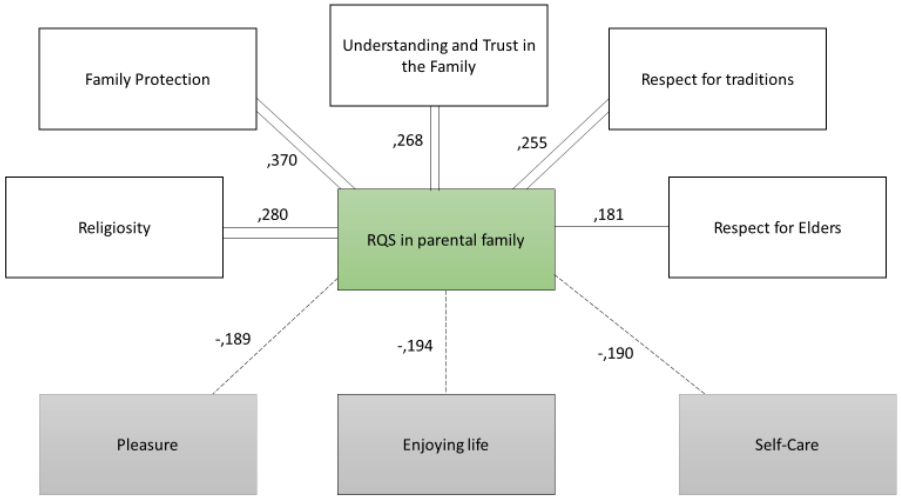
As can be seen, differences in the qualitative parameters of family relationships were significant at a high level. Youth with low satisfaction have exhibited: more pronounced asymmetry in their parents' marital system bonds (i.e., dominance of one spouse), greater alienation in bonds with the older generation, relative poverty of joint activities, and pronounced spatial boundaries within the home. Parameters where differences between groups exceed 3 points are highlighted in bold. Collectively, these aspects could be termed "Emotional Involvement of family members in each other's lives." Evidently, families of youth in Gr1 (low RQS group) were characterized by more acute conflicts, lower levels of mutual understanding, lack of unity in creating a comfortable home environment, and dissatisfaction with guest communication.

Significant differences were also found in the value-and-meaning sphere between the compared youth groups regarding the Significance of family and Close trusting relationships (higher in Group 2) and seeking pleasure (higher in Group 1). Values of Inner harmony (higher in Group 1) and Self-care (higher in Group 1) served as peculiar markers of potential contradictions in these meanings.

Correlational analysis revealed the general nature of the relationships between satisfaction with parental family relationship quality (RQS) and specific value ratings (Fig. 1), most of which were also identified during the contrast group comparison.

Figure 1

Correlations between Satisfaction with Parental Family Relationship Quality and Value Orientations

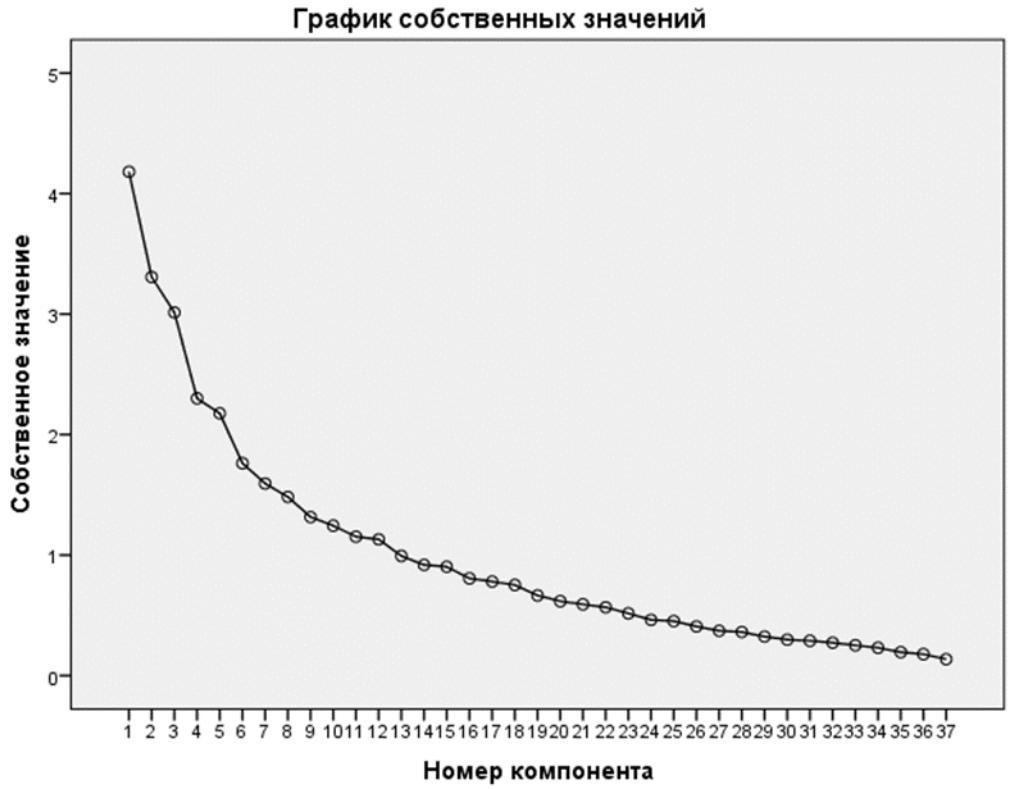


Note: *Solid line -- positive correlation; Dashed line -- negative correlation; Double line -- $p < 0.01$; Single line -- $p < 0.05$.*

The strongest correlations mediated by RQS were found for the values "Family Protection," "Religiosity," and "Understanding and Trust in the family." The discovered weak negative correlations with hedonistic values suggest a non-linear nature in their mediation. Overall, a pattern emerges: higher RQS is associated with higher significance of family value clusters and lower significance of hedonistic and individualistic values.

Factor analysis (demonstrating adequacy for the sample: Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy = 0.586, P = 0.000) provided insight into the place of family relationship quality satisfaction within the overall values-and-meanings sphere of youth. Based on the scree plot (Fig. 2), we identified 6 leading factors constituting the main structural components in the analyzed youth sample (Table 4).

Figure 2
Scree Plot of Factor Eigenvalues



Legend: *Y-axis – Eigenvalues; X-axis - Component number*

Table 4

Factor Loadings of Youth Value Orientations

Rotated Component Matrix[a]						
Parameters (Values & RQS)	Components					
	1	2	3	4	5	6
Choosing own goals	,772					
Intellect	,723					
Broad-mindedness	,575				,332	
Patience		,738				
Social justice		,664				
Usefulness		,506		-,371		
Tolerance		,457				-,389
Understanding and trust in family			,773			
Family protection			,614			
Mature love			,602		,497	
True friendship		,360	,518			
Relationship Quality Satisfaction (RQS)			,444	-,242		-,202
Enjoying life				,800		
Pleasure				,731		
Prosperity			,320	,617		
Inner harmony					,701	
Appreciating beauty					,639	
Wisdom	,357				,592	
Health						,731
Self-respect						,712
Self-care						,689

The first factor reflected the dominant need for self-determination among youth.

The second factor indicated the relevance for young people of developing self-regulation skills in a wide range of social situations they encounter (the leading value here is patience, as the ability to withstand irritation, self-possession).

The third factor, which included the parameter of our interest – RQS in the parental family – could be termed the "Significance of Close trusting Relationships." As seen, it encompassed not only family values but also values reflecting a broader orientation towards selective, deep, emotionally rich ties with other people.

The fourth factor emphasized the significance of satisfying personal desires. Notably, RQS, albeit with low loadings, entered this factor with a negative sign.

The fifth factor pointed to the importance of aesthetic and ethical activities in harmonizing one's state.

The sixth factor incorporated values of attentive attitude towards one's health and inner world. RQS also entered here with low loadings and an inverse sign.

As a result of regression analysis (Table 5), a model of subjective satisfaction with family relationships was obtained, explaining over 40% of the variance ($R^2 = 0.409$) and including the following aspects of family lifestyle:

Satisfaction with Family Relationships = 0.31 + 0.304 × Mutual Understanding + 0.297 × Satisfaction with Guest Communication + 0.246 × Constructive Conflict Resolution

The contribution of β-regression coefficients for the first two variables was significant at $p < 0.001$, and for conflict resolution at $p < 0.01$.

Table 5
Multiple Correlation Coefficient R Values for the Obtained Model

Model Summary				
Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	0,640[d]	0,409	0,393	2,36
1. Predictors: (Constant), Mutual Understanding, Satisfaction with Guest Communication, Constructive Conflict Resolution				

Out of sixteen components diagnosed by the FRH Questionnaire, three entered the predictive model. All of them described features of family communication: intra-familial and extra-familial (communication with guests). The links with the hospitality component were particularly interesting and unexpected.

Discussion

The study demonstrated that satisfaction with relationship quality in the parental family is a very capacious, generalized construct characterizing young people's (both male

and female) orientation towards building stable attachment relationships. Moreover, we succeeded in identifying parameters of the family system that contribute most significantly to forming this construct. To structure them, let's return to Table 1, which proposed a correspondence between characteristics of a collective subject and family relationship parameters.

Among family activity characteristics, communication among family members, its processual aspects such as mutual understanding and constructiveness in resolving contradictions, proved to be the key factors. Mutual understanding reflects the degree of safety and trustworthiness in communications between family members due to a shared readiness to understand each other's needs. Conflict resolution characterizes the degree of tension or harmony in family relationships, orientation towards discussion, persuasion, and peaceful resolution of arising contradictions. The inclusion of these two aspects of family lifestyle in the model aligns with research by other authors. For instance, Heinze J.E. et al. (Heinze et al., 2020), on a large sample including disadvantaged families, showed that young people who reported higher levels of family conflict during adolescence less frequently reported closeness and support from parents. Moreover, this correlated with the frequency of reporting support from partners or spouses (also lower with high conflict in the parental family). In other words, a transfer effect of negative experience from the parental family to one's own family was observed. Conversely, correlations between these parameters were not observed in the case of positively colored relationships.

Sillars A., Canary D.J., Tafoya M. (2003) also emphasize that mutual understanding and constructive conflict resolution methods are significant predictors of overall family relationship quality. According to the results of this and another study (Schrodt et al., 2009), discussing difficult moments helps the child to develop a skill set integrated into their general social competence: listening skills, clarifying, reconciling one's own needs with others', respectful interaction while maintaining one's own position, etc. Thus, RQS serves as a generalized indicator of an individual's communicative and broader social competence.

Given that predictors of youth relationship quality satisfaction in our case were parameters of family communication, it is important to mention the research by M. Cui, H. Janhonen-Abruquah, and C.A. Darling (2022). They analyzed the interrelation between psychological well-being of young women, communication quality, and relationship quality with parents in the USA and Finland. The result was quite interesting: in the USA, communication quality (as subjective perception of actual communicative practices) predicted high levels of psychological well-being, whereas in Finland, it was relationship quality (as subjective perception of the entire child-parent interaction experience) that became the predictor. Our result aligned more closely with the American sample. This highlights cultural differences, indicating that in different socio-historical contexts, the specific set of parameters defining the qualitative specificity of relationships within the family group can vary, thereby reflecting the current demands young people place on the family institution.

We found it particularly interesting that satisfaction with guest relationships entered the set of RQS predictors. Unfortunately, family (non-commercial) hospitality currently receives insufficient attention. In our earlier work (Kunitsyna, Yumkina, 2022), it was shown that this type of purposeful activity significantly contributes to young people's perception of their family as an integral system. Preparing for guests, considering their needs and tastes, planning joint activities and discussion topics becomes an important component of the "we-ness" feeling. Just as interaction with others is crucial for personality development, intergroup interaction is vital for the formation of a collective subject. In an extensive study by R. Biswas-Diener and colleagues (Biswas-Diener et al., 2019), hospitality was linked to higher indicators of quality of life and subjective well-being. On the other hand, one study noted that the relationship between hospitality and subjective well-being significantly depends on the culture and traditions of the specific family (Biswas-Diener & Diener, 2024). In relation to our results, this might correlate with the finding that the contribution of family hospitality to the predictive model of intra-family relationship quality satisfaction was not as high as, for instance, of mutual understanding. Presumably, if a family is internally conflicted and alienated, communication with guests cannot be fulfilling.

In general discussion of our regression model, we would like to note the research by S. C. Chiang and S. Bai, (Chiang & Bai, 2022), which expands the understanding of the chain of interrelations within the family system. They established a direct dependence between the quality of relationships with parents and the severity of depressive symptoms in adolescents, where the mediating variable was the quality of the relationship between the spouses. Cui M., H. Janhonen-Abruquah, and C.A. Darling (2022) reached similar conclusions: deterioration in parental relationships leads to a decrease in perceived communication quality and relationship quality of young women with their parents, regardless of cultural affiliation. Thus, a promising direction of further research is the inclusion of additional variables in the analysis to represent the family holistically.

Our research showed that satisfaction with parental family relationship quality characterizes the place which values of interpersonal relationships occupy among other values and meanings. While the regression model allowed us to describe the main practices of life in the parental family that give rise to the general feeling of satisfaction among young people, correlational and factor analyses point to the result where this feeling is constituted. Empirically, it is demonstrated that the more satisfied young people were with their parental family relationships, the higher they valued understanding and trust within the family, family traditions, the authority of elders, and the safety of loved ones. Longitudinal studies by foreign colleagues confirm (Padilla et al., 2016; Padilla et al., 2020) that higher significance of family values among young people correlates with lower conflict levels and higher mutual understanding with parents. However, low significance of family values alone does not necessarily indicate low relationship quality with parents. As research by foreign and domestic authors shows, the structure of family and broader prosocial values appears to be dynamic between ages 18 and 25 (Padilla et al., 2016;

Lyubtsova, 2020), although its core remains stably linked to family members (Liders, 2012). Therefore, researchers' conclusions about the quality of relationship with parents and its connection to values should primarily be based on the analysis of family interaction parameters.

Conclusion

In summary, we can note that by relying on clear criteria of a collective subject, we proposed a system for analyzing the essential aspects of family relationship quality. Empirical analysis revealed that not all these aspects carried equal weight in developing predictive models. For the Russian youth sample, parameters characterizing the quality of communication with parents made the most significant contribution. Satisfaction with relationship quality in the parental family functions as an extremely generalized personal attitude, stemming from characteristics of mutual understanding, constructive experience of conflictual communication (i.e., communication emotionally threatening to positive relationships), and the unity of family members in interacting with other collective subjects or the extended kinship group.

Our main hypothesis was confirmed: in terms of values, the qualitative difference in satisfaction with intra-family relationships in youth perceptions stems from their parents' transmission of a general attitude of respect for the other person's personality (both at the spousal level and in intergenerational bonds), implying the use of specific family communication practices aimed at clarifying each other's needs and resolving contradictions. A high degree of satisfaction with family relationship quality creates a foundation for perceiving close, trusting interpersonal relationships as a value and orients towards protecting them. It is important to note that this does not imply an absence of critics or exclusive conformity among youth towards certain aspects of their relationships with parents.

The discovered interrelations with individual values have an ambiguous nature of mediation. For instance, an adequate need for self-care and pleasure-seeking is a normal state for a mature personality. However, if these meanings gravitate towards becoming leading personal values, this situation may reflect deprivation of young people's basic needs within the family and reduced quality of their relationships with parents.

In practical terms, it is essential not to limit the assessment of the family's place in youth value priorities solely to diagnosing value orientations. A comprehensive approach, supplementing values with an analysis of the young person's real-world diverse communication practices within the parental family (in our study, FRH Questionnaire served these objectives), proved to be highly heuristic.

A limitation of this study was the gender imbalance in the sample and the retrospective nature of the survey. It would be crucial to continue this research plan with married couples and parent-child dyads or triads, comparing the predictive models obtained in these cases with the one presented in this article.

Future research should incorporate gender, age and other sociodemographic, as well as cultural, parameters, to dive into a more detailed analysis of the predictive power of the obtained empirical model.

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Tatiana V. Kazantseva — Formation of the empirical research design, data interpretation, substantive editing of the article text.

Tatyana B. Pozdnyakova — Statistical data analysis, technical editing of the article text.

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Features of Conspirativist Mentality of Students of the Southern and Northern Regions

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Abstract

Introduction. In the modern world, one of the trends of public consciousness is the belief in conspiracy theories, which is a social risk that can damage social stability. Conspirativist mentality is a conspiracy adherent's mindset directed toward the object of the conspiracy, which is attributed special negative consequences for personal or public safety. Research on conspirativist mentality is sparse and has not previously examined the cross-regional aspect. The purpose of the study is to compare the peculiarities of conspirativist mentality and students of the southern and Northern regions of Russia. **Methods.** The sample was 768 people, 55% of the them girls; the age of respondents was 19-35 years (M = 31). The following methods were used: "Methodology for measuring the type of mentality" (MITM, V. I. Pishchik, 2019), "Methodology for measuring values through fears" (V. I. Pishchik, 2022), "Anxiety Scale" (J. Taylor), "Methodology for measuring belief in conspiracy" (S. Sh. Mutalimova, V. I. Pishchik, 2014, supplemented by V. I. Pishchik, 2019), "Methodology for measuring conspirativist mentality" (V. I. Pishchik, 2023). Statistical methods: descriptive statistics, Mann-Whitney test, correlation analysis, regression analysis. **Results.** It was revealed that conspirativism is more represented in male respondents, predominantly in the Northern region. The type of mentality "resistant to belief in conspiracies" received the highest number of negative relations for all types of belief in conspiracies. Differences were found for the belief in clones, in informational conspiracy related to vaccination, with predominance in the southern region. Differences in belief in pharmaceutical conspiracy,

level of anxiety, values; expression of the "ready-made" type of conspirativist mentality were found in the Northern region. The construct of conspirativist mentality is defined by a two-factor structure. **Discussion.** Gender, age, and anxiety are consistent factors conditioning the conspirativist mentality of students. At the same time, the regional factor was also confirmed. The results can be a starting point for building educational work with students.

Keywords

conspiracy belief, conspirativist mentality, anxiety, fears, values, region, generations

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Introduction

International research on belief in conspiracy theories and conspiracy culture has experienced explosive growth over the past decade (Butter & Knight, 2020; Nestik, Zhuravlev, 2020; Kazun, Porshnev, 2021; Kazun, 2022; Douglas & Sutton, 2023). Throughout history, belief in conspiracies has been closely associated with prejudice, witch hunts, revolutions, genocide, and pandemics. Today conspirativism acts as an international trend, a carrier of a large number of risks (Nestik, Zhuravlev, 2020). The collective monograph presents a wide range of problems related to belief in conspiracy theories (history, semiotics of conspiracies; cosmology; psychonalism and conspiracy theories; anthropology, sociology and social psychology of belief in conspiracy theories; personality traits, motivation, social cognitions of conspirativism) (Butter & Knight, 2020). Factors (age, level of education, influence of television programs, female gender) of propensity to conspiracy thinking in Russia, Kazakhstan, and Ukraine are found (Kazun & Porshnev, 2021). A.D. Kazun (2022) raised questions about the problematic nature of studying conspirativism. Some ontology of conspiracy theories and belief in them

is presented in (Douglas & Sutton, 2023), it is noted that conspiracy theories construct not only a version of events, but also a version of social groups, including between perpetrators and their victims, the enlightened and the ignorant.

Many perpetrators of terrorist acts have been found to be ardent supporters of conspiracy theories (Kruglanski et al., 2022). Conspiracy theories have caused people to abandon traditional medicine to the extent that once-cured diseases are now making a comeback in some parts of the world. Additionally, conspiracy theories encourage people to reject scientific consensus, most notably the consensus on anthropogenic climate change (Douglas et al., 2019; Nestick et al., 2021). It is becoming increasingly clear that belief in conspiracy theories is now becoming part of normal human psychology and is based on human ability (Brotherton, 2015; Nestik, Deineka, 2020; Zholdasov, Pishchik, 2022; Pishchik, 2023). At the same time, belief in conspiracies can be part of extremist influence on young people, who are the most vulnerable part of the population (Lyubtsova, 2020; Oettingen et al., 2022).

In the act of belief, we deal with the ambiguity of the indubitable when it comes to groundless certainty, emphasized J. Lacan (1972). Faith is based on a lack of belief. That is, the faith is no longer there and we are trying to produce it. In fact, this confirms that belief in conspiracies is something that we construct again each time. Belief in conspiracy theory is a construct that unites a person's beliefs in the existence of a threatening action coming from a person or group of persons who have the goal of destabilizing the situation in society. Conspiracies are usually aimed at usurping political or economic power, violating rights, breaking established agreements, withholding vital secrets, or changing fundamental institutions. Researchers have identified a particular conspirativist mentality (CM), expressed by the fact that people are characterized by their general tendency to support conspiracy theories (Swami et al., 2016; Lazarević et al., 2021; Imhoff et al., 2022). CM is a broad concept that suggests that a particular community has a set of beliefs in conspiracy theories that support their value and meaning cohesion.

Today, based on the studies mentioned above, predictors that condition CM, conspirativist beliefs, and belief in conspiracies. These include anxiety, formal indicators (gender, age, education, cultural background), memory performance, situation, time, social relations, individual and personal characteristics, general predisposition to conspiracy ideas, thinking style, peculiarities of formation of delusions, beliefs, degree of religiosity, political preferences, level of anxiety, and other more specific ones. Unfortunately, a considerable number of predictors are not confirmed in repeated studies. These studies were conducted mainly on samples from other countries.

Many conclusions made by scientists remain ambiguous and limited, with insufficient research on Russian samples. Due to these circumstances, the purpose of our study was to compare the characteristics of the CM of students in the southern and Northern regions of Russia. Especially since it has already been established that in different regions the values orientations of young people are different (Atamanova et al., 2021). The subject

of the study, thus, is the relationship between the features of CM, belief in conspiracies, and gender, age, values, fears, and anxiety of students of the two regions.

Methods

To identify the types of mentality, among which traditional, transitional, innovative, post-innovation types are distinguished, the "Methodology for measuring the type of mentality" (MITM, V. I. Pishchik, 2019) was used. This methodology made it possible to establish which archetypes, world image, way of life, way of thinking, attitudes, and interactions determine the lives of generations Y and Z. "The methodology of measuring values through fears" (V. I. Pishchik, 2022) reveals the leading values of generations: the value of "Self", "Others", "Nature", "Technology", "Mystical", "Culture". Since the degree of influence of the level of anxiety on belief in conspiracies remains under question, we applied the technique "Anxiety Scale" by J. Taylor (adaptation of V. G. Norakidze, 1975). It allowed us to determine the level of anxiety in generational groups and its close relationship with the belief in conspiracies. Answering the question of what types of belief in conspiracies are common among generational groups, we applied the "Methodology for measuring belief in conspiracies" (S. Sh. Mutalimova, V. I. Pishchik, 2014, supplemented by V. I. Pishchik, 2019); the methodology includes scales of conspiracy types - belief in social conspiracy, political, state, belief in secret activities, belief in secret organizations, pharmaceutical conspiracy, belief in harmfulness of vaccination, food conspiracy, belief in clones, belief in aliens, belief in globality, belief in the end of the world, belief in information conspiracy. We also applied the new "Methodology for measuring conspirativist mentality" (V. I. Pishchik, 2023), which allows us to determine the expression of types of CM: ready to believe in conspiracies; resistant to believing in conspiracies; looking for reasons for conspiracies; productive type, puzzled by the consequences of believing in conspiracies on life.

Statistical processing of the data was performed with the free access statistical software package R 4.2.0. Initially, descriptive statistics were analyzed and the normality of the distribution of signs was determined using the Kolmogorov-Smirnov criterion. The Mann-Whitney criterion was calculated to prove the significance of differences. Correlation analysis was used to determine the closeness of the relationship between the indicators; dispersion one-factor analysis allowed to determine the relationship between the indicators age, sex, region, and the measured variables. Regression analysis was used.

The sample consisted of 768 people, divided by region:

- Rostov-on-Don, Rostov Oblast, Krasnodar, Krasnodar Oblast (Southern Federal District),
- Arkhangelsk, Arkhangelsk Oblast (Northwestern Federal District).

Men made up 45% of the total sample and women 55%, respectively. The group of respondents consisted of students aged 19-24 years of age of generation Z; 25-35 years of age – generation Y.

We made a number of assumptions:

- H1 - female students will be more inclined towards the ready type of CM;
- H2 - the age (generation) of the students is correlated with the expression of CM;
- H3 - students in the Southern FO will have a more pronounced willingness to believe in conspiracies;
- H4 - a close relationship can be found between anxiety, CM, belief in conspiracies, values, and age of respondents;
- H5 - predictors of CM of students in the two regions can be found.

Results

At the initial stage of statistical analysis, the normality of the distribution of signs was checked. By calculating the Kolmogorov-Smirnov criterion with the Liljefors correction, it was found that for all diagnosed indicators the distribution of the trait significantly differs from the normal one, which determined the choice of nonparametric criteria for statistical processing of the collected data (Mann-Whitney criterion and Spearman correlation analysis).

The results indicate that the general sample is dominated by belief in political conspiracy (M = 8.0753 ± 2.53144), belief in social conspiracy (M = 7.8433 ± 2.43627), belief in pharmaceutical conspiracy (M = 7.0154 ± 2.88227) and belief in food conspiracy (M = 7.0061 ± 2.70156). At the middle level among the study participants are belief in government conspiracy (M = 6.3548 ± 2.58249), belief in secret activities (M = 6.1551 ± 2.46743), belief in secret organizations (M = 6,2304 ± 2.84022), belief in globality (M = 5.4731 ± 2.84802), belief in information conspiracy (M = 5.6175 ± 2.49854), belief in vaccination related conspiracy (M = 5.3533 ± 3.18427). The belief in clones (M = 2.9647 ± 2.64755), the belief in aliens (M = 2.7896 ± 2.43442), and the belief in the end of the world (M = 3.7481 ± 2.83187) are at a low level of significance. Regarding CM type, the sample profile is dominated by CM type "stable" (M = 3.2504 ± 0.89631), followed by CM type "seeking" (M = 3.1321 ± 0.99587), "ready" (M = 3.0753 ± 0.95861) and "productive", represented by the lowest values (M = 2.5422 ± 1.04041). The value profile is dominated by the "value of the self" (M = 15.3917 ± 2.83036), then in decreasing order of importance diagnosed the "value of nature" (M = 11.3518 ± 1.99324), the "value of the mystical" (M = 11.1613 ± 1.87947), the "value of culture" (M = 11.1260 ± 2.00985) and completing the profile are the "value of others" (M = 10.86 ± 1.67177), the "value of technology" (M = 10.4962 ± 1.70553). In the profile of mentality type, the sample is dominated by innovation mentality (M = 11.7834 ± 3.01087), while traditional mentality (M = 6.6283 ± 3.18169), transition mentality (M = 5.9263 ± 2.55176) and post-innovation mentality (M = 5.6621 ± 2.20058) are weakly expressed.

The groups of men and women (age M = 22) differed in belief in political conspiracy ($p \leq 0.05$), belief in aliens ($p \leq 0.01$), anxiety level ($p \leq 0.01$), CM by type of "persistent"

(p ≤0.05), by type of "ready" (p ≤0.01), by type "productive" (p ≤0.05), value of self (p ≤0.01), value of technology (p ≤0.01), value of mystical (p ≤0.01), value of culture (p ≤0.01), innovation mentality (p ≤0.01), post-innovation mentality (p ≤0.01) (Table 1).

Table 1

Statistical analysis of the significance of differences in different-sex groups

Indicator	Groups	Mean value by groups ($\bar{x} \pm \sigma$)	Mann-Whitney U-criterion, significance
Belief in political conspiracy	Men	7,5038±2,99583	U=30057,500; p=0.035
	Women	8,2192±2,38210	
Belief in aliens	Men	3,4351±2,78485	U=28713,000; p=0.003
	Women	2,6269±2,31258	
Anxiety level	Men	14,3511±6,42658	U=24644.500; p=0.000
	Women	18,9558±9,73483	
CM type "stable"	Men	3,0916±0,97231	U=29702,000; p=0.017
	Women	3,2904±0,87257	
CM type "ready"	Men	3,2977±0,99765	U=28694.500; p=0.003
	Women	3,0192±0,94125	
CM type "productive"	Men	2,3511±0,96016	U=30201,500; p=0.037
	Women	2,5904±1,05508	
Value of self	Men	14,3969±3,49214	U=27597,500; p=0.000
	Women	15,6423±2,58179	
Value of technology	Men	10,0305±2,01891	U=27277,000; p=0.000
	Women	10,6135±1,59799	
Value of the mystical	Men	10,6641±2,16123	U=28547.500; p=0.004
	Women	11,25865±1,7821	
Value of culture	Men	10,4809±2,12802	U=26866,000; p=0.000
	Women	11,2885±1,94764	
Innovative mentality	Men	10,9466±3,29408	U=27282,000; p=0.000
	Women	11,9942±2,90073	
Post-innovation mentality	Men	6,2214±2,34780	U=28082,500; p=0.002
	Women	5,5212±2,14133	

Note. Abbreviation adopted: CM - conspirativist mentality

Table 1 shows the following differences. Women are more likely to believe in political conspiracy than men; belief in aliens is statistically higher in the male sample. In other measures of adherence to different conspiracy theories, no differences were found between the male and female groups. The level of anxiety is statistically significantly higher in the female group. The ready type of CM is more represented in men than in women. The stable and productive types of CM are more represented in women. Women have statistically significantly higher values. Women have a higher level of innovative mentality and men have a higher level of post-innovation mentality. Hence, hypothesis H1 is rejected.

Next, it was necessary to determine the expression of CM in generations Y and Z. Table 2 shows the significant correlations related to the age of the respondents.

Table 2

Correlations of Indicators in groups of generations

Indicators	Correlations with the variable "age of respondents"	Significance of correlations
Belief in political conspiracy	0,172**	0,000
Belief in pharmaceutical conspiracy	0,231**	0,000
Belief in clones	-0,163**	0,000
Belief in aliens	-0,147**	0,000
Belief in globalization	-0,207**	0,000
Belief in the end of the world	-0,187**	0,000
Anxiety level	-0,100*	0,010
Resilient	0,080*	0,043
Value I	0,250**	0,000
Value of others	0,077*	0,049
Value of nature	0,103**	0,009
Value of technology	0,143**	0,000
Value of the mystical	0,115**	0,003
Value of culture	0,198**	0,000
Innovation mentality	0,080*	0,040
Post-innovation mentality	-0,104**	0,008

$^{**}p \le 0.01$; $^{*}p \le 0.05$

It turns out that the older the generation (Y), the more they believe in political ($p \leq 0.01$) and pharmaceutical ($p \leq 0.01$) conspiracies, the younger the generation (Z), the more they believe in clones ($p \leq 0.01$), aliens ($p \leq 0.01$), globality ($p \leq 0.01$) and the end of the world ($p \leq 0.01$). The level of anxiety decreased with age ($p \leq 0.05$). The stable type of CM is characterized by older age ($p \leq 0.05$). The level of values increases with age ($p \leq 0.01$). Age is positively related to innovation mentality ($p \leq 0.05$) and negatively related to post-innovation mentality ($p \leq 0.01$). Hence, to some extent, it can be argued that generation Y is more resistant to CM. Hypothesis H2 is rejected.

A cross-sectional study was conducted among different generations living in different regions of Russia to verify the proposed theoretical model. The Mann-Whitney criterion was calculated on groups divided by region: Rostov-on-Don (Southern region); Arkhangelsk (Northwestern region). The results are presented in Table 3.

Table 3
Significance of differences in indicators between regions

Indicators	Mann-Whitney difference criterion (U)	Reliability (p)
	Prevalence in the Southern region	
Belief in clones	44356,5	0,006
Belief in information conspiracy	43198,5	0,015
Belief in vaccination conspiracy	44262,5	0,05
Belief in pharmaceutical conspiracy	Prevalence in the Northern region	
	40970,0	0,001
Level of anxiety	39518,0	0,001
Self value	41334,5	0,001
Threat from others	46966,5	0,002
Lack of information	46599,5	0,00
Belief in dark forces	48159,5	0,002
Fear of loss of tradition	46250,5	0,00
Ready type	41551,5	0,001

Differences were found in belief in clones, belief in informational conspiracy, in conspiracy related to vaccination, prevailed in the generation of the Southern region. Differences were found in belief in pharmaceutical conspiracy), level of the anxiety, expression of value of self, value of Others (Threat from others), value of technology (lack of information), value of Mystical (belief in dark forces), value of culture (fear of loss of tradition), expression of CM type Ready, prevailed in the generation of the North West region. Hypothesis H3 is rejected.

The results of correlation analysis between CM types and diagnosed indicators are presented in Table 4.

Table 4

Correlation interrelations of CM types, anxiety and values through fears

Indicators	Stable	Seeking	Ready	Effective
Belief in government conspiracy	-	-	-	0,109**
Belief in secret organizations	-0,108**	-0,085*	0,085*	-
Belief in pharmaceutical conspiracy	-0,098**	-	-	-
Belief in clones	-0,084*	-	-	-
Belief in aliens	-0,133**	-	0,121**	-
Belief in globalization	-0,172**	-0,115**	0,171**	0,100*
Belief in the end of the world	-0,158**	-0,086*	0,145**	0,097*
Belief in information conspiracy	-0,111**	-	-	-
Anxiety level	-0,213**	-0,438**	0,151**	0,457**

Indicators	Stable	Seeking	Ready	Effective
Value of others	-	-	0,088*	-
Value of nature	-	-	-	-0,120**
Traditional mentality	-	0,138**	-0,078*	-0,095*
Innovative mentality	0,126**	-	-0,079*	-0,116**
Transition mentality	-0,125**	-0,121**	0,109**	0,128**
Post-innovation mentality	-0,108**	-0,144**	0,108**	0,131**

*Note. **p ≤0.01; *p ≤0.05*

Application of the methodology revealed the degree of expression of the following types of belief in conspiracies in the "ready" type of CM: belief in secret organizations ($p \leq 0,05$), aliens ($p \leq 0,01$), belief in globality ($p \leq 0,01$), belief in the end of the world ($p \leq 0,01$). The value of others, which is correlated with the "ready" type of CM, shows a person's detachment from everything new, makes it difficult to make choices in one's life and to be oriented towards others. "Ready" type of CM is negatively related to traditional ($p \leq 0.05$) and innovative ($p \leq 0.05$) mentality, and positively related to transitional ($p \leq 0.01$) and post-innovation ($p \leq 0.01$) mentality. "Outcome" type of CM is positively related to belief in government conspiracy ($p \leq 0.01$), globality ($p \leq 0.05$) and the end of the world ($p \leq 0.05$), and negatively related to the value of nature ($p \leq 0.01$). "Result" type of CM is negatively associated with traditional ($p \leq 0.05$) and innovative ($p \leq 0.01$) mentality, and positively associated with transitional ($p \leq 0.01$) and post-innovation ($p \leq 0.01$) mentality. It was found that the higher the level of anxiety, the higher the indicators of "ready" ($p \leq 0.01$) and "productive" ($p \leq 0.01$) types of CM. "Resultant" type of CM is associated with anxiety to a greater extent. "Resilient" type of CM received the highest number of negative associations with types of belief in conspiracies: belief in secret organizations ($p \leq 0.01$), pharmaceutical conspiracy ($p \leq 0.01$), clones ($p \leq 0.05$), aliens ($p \leq 0.01$), globality ($p \leq 0.01$), end of the world ($p \leq 0.01$), information conspiracy ($p \leq 0.01$). "Sustainable" type of CM is positively related to innovation mentality ($p \leq 0.01$) and negatively to transition ($p \leq 0.01$) and post-innovation mentality ($p \leq 0.01$). The CM type "seeker" is associated negatively with belief in secret organizations ($p \leq 0.05$), globality ($p \leq 0.01$) and the end of the world ($p \leq 0.05$). The CM type "seeker" is positively related to traditional mentality and negatively related to transitional and post-innovation mentality. "Resilient" ($p \leq 0.01$) and "seeker" ($p \leq 0.01$) CM types are negatively related to anxiety levels.

By conducting regression analysis in the sample of students, we obtained the following results presented in Tables 5-6.

Table 5 shows the predictors for the models of CM types of SFD students.

Table 5
Data for the models of CM types (SFD students)

CM type	R	R^2	Significant change in F	Predictors	Significance of coefficients
Stable	0,392	0,154	0,000	Belief in secret organizations Belief in the end of the world	0,016 0,000
Seeker	0,616	0,379	0,000	Belief in a public conspiracy Belief in a government conspiracy Level of anxiety Value of nature	0,010 0,013 0,000 0,032
Finished	0,371	0,138	0,000	Belief in secret organizations Belief in the end of the world Belief in a vaccination conspiracy	0,004 0,001 0,022
Resultant	0,560	0,313	0,000	Belief in public conspiracy Faith in a government conspiracy Belief in an alien Anxiety level	0,037 0,008 0,019 0,000

In the CM types, the following dependencies are characteristic for SFD students: CM type "stable" depends on such factors as belief in globality and anxiety level; CM type "seeking" depends on such factors as belief in social conspiracy, belief in state conspiracy, anxiety level, value of nature; CM type "ready" depends on such factors as belief in secret organizations, belief in the end of the world, belief in the vaccination conspiracy; CM type "productive" depends on such factors as belief in social conspiracy, belief in state conspiracy, level of anxiety, value of nature.

Table 6 reflects the predictors for the models of NFD students' CM types.

Table 6
Data for models of CM types (students of NFD)

CM type	R	R^2	Significant change in F	Predictors	Significance of coefficients
Sustai-nable	0,290	0,084	0,000	Anxiety level	0,000
Seeking	0,500	0,250	0,000	Level of anxiety Value of the mystical	0,000 0,012
Ready	0,321	0,103	0,002	Belief in clones Belief in globality Level of anxiety	0,033 0,045 0,028
Outcome	0,539	0,290	0,000	Level of anxiety Value of the mystical	0,000 0,024

In the model of CM types, the following dependencies are characteristic for NFD students: CM type "stable" depends on such factors as belief in globality and level of anxiety; CM type "seeking" depends on such factors as belief in social conspiracy, belief in state conspiracy, level of anxiety, value of nature; CM type "ready" depends on factors such as belief in secret organizations, belief in the end of the world, belief in vaccination conspiracy; CM type "productive" depends on factors such as belief in social conspiracy, belief in government conspiracy, level of anxiety, value of nature.

Discussion

By comparing the groups of males and females in our study, it turned out that males are more likely to have the CM type "ready". This result is somewhat at variance with Swami, Chamorro-Premuzic & Furnham (2010), who show a greater degree of belief in conspiracies in women. In a study (Eidelman, 2016), it is shown that men are more likely than women to hold a "hopeless" stance in evaluating themselves and others in a group. This could also be an explanation for the result we obtained. It is possible that the situation related to SWO and world threats may to some extent explain some anxiety of men, their increased responsibility, and insecurity.

Many studies point to anxiety (for example, feelings of lack of control, subjective insecurity) and stress as prerequisites for belief in conspiracy theories (Brotherton, 2015; Swami et al., 2016; Douglas & Sutton, 2023), but this hypothesis was partially confirmed by the authors. In our study, it was confirmed; anxiety entered the CM model according to the results of the regression analysis. Krüppel, Yoon & Mokros (2023) found that conspiracy beliefs were associated with higher levels of dispositional but not situational anxiety.

Swami (2010) showed that the younger the age of the respondents, the higher the desire to expose conspirativism. Our result showed that members of Generation Z believe in different types of conspiracy beliefs.

Fatfouta et al. (2021) found that belief in conspiracies of certain external groups corresponds to a collective narcissistic stance of intergroup hostility, but collective narcissism is also related to other conspiracy theories because it simultaneously involves a belief (that the internal group is great) and a threatening belief (that the internal group is not recognized). A study (Molenda, Marchlewska & Rogoza, 2023) demonstrates the relationship between "national narcissism" (i.e., a defensive national identity that stems from unmet needs and is associated with hostile intra- and intergroup behavior) and the willingness to conspire against one's own group. This is supported in our study by the result that the type of mentality (mentality is interrelated with national narcissism) is related to belief in conspiracies.

In the study of R.M. Shamionov (2019) notes that the values of preservation and self-transcendence determine the formation of discriminatory attitudes in young people. In our study, the value of self is associated with belief in political conspiracy, predominantly in women. The stable type of CM had a negative correlation with belief in information conspiracy, which, in our opinion, confirms that they are no longer sensitive to information distortions. This result can be correlated with the study (Barababanshchikov et al., 2018), which found that participants in the study assessed the information reported by an active interlocutor as reliable.

Regionality was practically not considered as a factor in the problem under consideration earlier, however, turning to the study where the "psychological typhoon eye" ("psychological typhoon eye") was described (Yang et al., 2023), there is an interesting pattern: When people are at the epicenter of a crisis event (e.g., an earthquake), they are more appropriate and report lower risk perceptions than people on the periphery who are more anxious, as confirmed in our study on the prevalence of belief in conspiracies in the northern region.

The «ready» type of CM had different predictors across regions. However, it included both anxiety and different types of belief in conspiracies. T. A. Nestick et al. (2020) found conspiracy beliefs to be associated with belief in a just world, low self-efficacy, orientation to moral grounds of loyalty to one's group, and respect for authority, low institutional trust, and social cynicism. G. N. Eidelman (2016) empirically proved that the dominant life position is more related to subjective assessments of the world and self than to socioeconomic parameters.

Regarding the previous hypotheses, we can conclude that hypothesis 1 on the predominance of belief in conspiracy theories in women was rejected. Hypothesis 2 on the relationship between age and the expression of conspirativist mentality was accepted. Hypothesis 3 that conspirativist mentality is predominant in the southern region was rejected. Hypothesis 4 about the relationships between anxiety, CM, belief in conspiracies, values, and age of the respondents is accepted. The paper found predictors of CM of students from two regions, so hypothesis 5 is accepted.

Conclusion

The generalization of research on belief in conspiracies and CM has confirmed that certain factors have been identified that condition the actualization of CM in young people of predominantly foreign countries. At the same time, not all factors have found their empirical confirmation in repeated studies. The regional factor is not noted in the work, leading to a comparative analysis of two regions of Russia.

The empirical study of CM revealed such peculiarities as: the presence of gender differences in the adoption of conspirativist attitudes with predominance in men; a close relationship between age and the manifestation of belief in conspiracies; with the predominance of belief in conspiracy theories both in the older and younger generations; a vivid regional specificity in the predominance of negative manifestations of belief in conspiracies among young people in the northern region.

CM is an important part of the worldview of the modern young generation, which depends on the subjective perception of the world in general. The presented data can be taken into account in work with young people, in building youth policy in universities: by actively educating students, offering them reliable tools for information search, developing their critical thinking skills, psychologists and university teachers will contribute to the formation of a more mature, sober view of life events and their coverage in the media.

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Anti-Reflection as a Determinant of Managerial Effectiveness Parameters

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Abstract

Introduction. Research into the key determinants of managerial effectiveness is currently highly relevant. Particularly important is the role of reflection regulation and anti-reflection means in managerial activity. Their exploration is objectively necessary for the convergence of research in two important psychological fields – managerial psychology and reflection psychology. The study identified and interpreted the fundamental patterns of the determinative impact of anti-reflection as the structure of its partial components—metacognitive processes and qualities—on managerial effectiveness. The most important of these is the optimum-type relationship between the individual measure of anti-reflection and the most important of these parameters—effectiveness. **Methods.** The participants in the study (n = 310) were lower-, middle-, and top-level managers of government and commercial organizations and enterprises in Moscow, Yaroslavl, and Rybinsk. The study used assessment instruments developed by the authors, including the Questionnaire to Measure the Level of Anti-Reflection Means, the Questionnaire to Measure the Differentiated Expert Assessment of Basic Managerial Functions, the Comprehensive Questionnaire of Individual Metacognitive Potential (CQIMP), and a number of instruments developed in metacognitivism. **Results.** An inverted U-shaped (optimum-type) relationship exists between the main parameter of managerial activity—effectiveness—and the individual measure of the development of anti-reflection means, as well as their structural organization. Unlike a similar pattern associated with reflection research, the established relationship exhibits a leftward shift, which is due to the specific characteristics of anti-reflection, as well as its phenomenological content and functional focus. **Discussion.** The results are interpreted from the perspective of the fundamental tenets of modern managerial psychology, reflection psychology, and metacognitivism.

The conclusion is that the established patterns are based on functions specific to anti-reflection, which essence is in regulating voluntary control over the implementation of activities in general and its minimization in particular.

Keywords

managerial activity, anti-reflection, metacognitive parameters, metacognitive potential, reflection, inhibition, structural organization, autofunction, effectiveness

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Introduction

One of the key issues in managerial psychology is the nature and methods of expressing the basic parameters of managerial effectiveness, as well as the fundamental subjective determinants that exert a decisive influence on them. This issue is known to be one of the most important and traditional in managerial psychology and organizational psychology. Despite a considerable amount of data presented in the literature, it nevertheless remains insufficiently studied. Thus, the nature of the influence of the fundamental determinants—widely represented in general and cognitive psychology—on managerial effectiveness remains unclear. This primarily concerns procedural and strategic processes, as well as specific metacognitive processes and individual traits that are determinants of activity. These processes constitute the subject of research in one of the most important areas of cognitive psychology—modern metacognitivism (and, more broadly, metacognitive psychology). The main objective of the research carried out in its mainstream is to explicate the content and specificity of its *subject*, as well as to define its boundaries—the formulation of conceptual ideas aimed at revealing the subject area of metacognitivism (A. Nelson, A. Brown, J. Flavell, R. Kluwe, J. Metcalfe, R. Paris, E. Madigan, E. Tulving, B. L. Scwartz, A. Koriat et al.), the main models of metacognition (Anderson, 2002; Brown, 1987; Flavell & Miller, 1993; Dunlosky & Nelson, 1992; Dunlosky, Serra & Baker, 2007; Kluwe, 1982; Nelson, 1996), explication and description of metacognitive strategies and

skills (Metcalfe, 2008; Metcalfe & Eich, 2019; Tulving, 1985; Finn & Metcalfe, 2014), and the study of specific issues of metacognitivism (Schwartz, 2006; Paris, 1988; Touroutoglu & Efklides, 2010, Velychkovsky, 2006).

Furthermore, we should emphasize that our previous series of works formulated one possible approach to developing the fundamental problems of metacognitivism—a *structural-phenomenological* one. This approach has been applied to a wide range of professional and educational activity, and, in particular, to managerial activity. Its essence is as follows (A.A. Karpov, 2018): The key parameters of the individual's metacognitive sphere appear not only in their original status—as *phenomena*—but also in another, equally important status—secondary one. This is because they can be recognized by the subject of the activity and subsequently used as *means* of organizing activity and behavior, that is, in their operational status. In other words, emerging and developing in activity, these effects and phenomena are captured by the subject and can then be used as *means to optimize* this activity (A.A. Karpov, 2019). Recognizing and recording, as well as generalizing these phenomena, subsequently leads to the enrichment of the operational tools for regulating activity.

At the same time, our research shows that the degree of voluntary, reflection-related control over basic activity-related problem solving does not always need to be maximal. Moreover, the subject of managerial activity (the manager), as a rule, has already empirically—from his/her own experience—often notes the fact that excessively high conscious control can even be undesirable and even negative for the activity. Therefore, they begin to use this empirically discovered result as an operational tool for implementing the activity itself, consciously using various techniques and means that *minimize* the degree of reflection control over the activity. For these purposes, specific means are developed, aimed at *inhibiting* or even blocking conscious control (A.A. Karpov, 2018). At present, no generally accepted concept has been developed to designate them, so there is a terminological difficulty associated with its formulation. It should be taken into account that some functionally close phenomena have already been partially reported in previous studies. These are, for example, the concept of areflexia or the "dark side" of reflection (Kholodnaya, 2022); the concepts of quasi-reflexia and "bad" reflection (Leontiev et al., 2009; Leontiev, 2014); the concept of "metacognitive blockade" (A.V. Karpov, Skitiaeva, 2005); the concept of "moratorium of reflection" (Nebrodovskaya-Mazur, 2020); the concept of counter-reflection (Leontiev, 2014); the concept of the "metacognitive loop" (Anderson et al., 2006); the concept of "overconfidence" (Metcalfe, 2014; Butterfield, Metcalfe, 2001); reflection perfectionism and hyperreflection (A. A. Karpov, A. V. Karpov, 2015); the hypercorrection effect (Dodson, Bawa & Krueger, 2007).

In our opinion, given the essential nature of this phenomenon—its functional focus on minimizing reflection control and therefore acting as its *opposite*—it is more appropriate to use the concept of "*anti-reflection*". We are fully aware, however, that this term may not be the best conceptual tool and may be subject to further refinement.

In this regard, we should emphasize that modern managerial psychology has traditionally focused on the reflection aspects of managerial activity, and has interpreted reflection itself as one of the professionally important qualities (PIQ) of a manager. Reflection is generally viewed as a predominantly positive quality, and its high or above-average level, again according to a priori assumptions, is considered an important factor in ensuring high effectiveness indicators. However, to date, provisions have been formulated that indicate the existence of a significantly different, more general, pattern. It consists in the fact that the effectiveness of the implementation of the overwhelming majority of activity-related tasks and management functions is maximal at some average, that is, optimal level of reflection development (and not at its minimum or maximum level) (A.V. Karpov, V.V. Ponomareva, 2002; Chemyakina et al., 2018). The subject of the activity, recognizing this feature, uses it as a means of optimizing his/her activity and, as noted above, to do this, he/she uses specific means that minimize the degree of reflection control over the activity and its specific functions. These data, in fact, allow us to differentiate a very specific – opposite – mode of reflection. It can not only enhance–facilitate but also minimize–inhibit itself. We should note that such inhibition is achieved through means and mechanisms that are also emphatically reflection-related. As a result, a system of anti-reflection means emerges and develops within managerial activity, identified in our previous works as an *inhibitory subsystem* (A.A. Karpov, 2019).

All these provisions, on the one hand, indicate the need to establish patterns associated with "anti-reflection" regulation of managerial activity and to deepen research, primarily of a descriptive and ascertainable nature. On the other hand, it is necessary to explicate the mechanisms underlying possible relationships between managerial effectiveness and the overall level of the development of anti-reflection means. A similar task involves determining the relationship between the degree of structural organization of metacognitive parameters, which represent partial components of anti-reflection and effectiveness. To this end, in addition to establishing empirical data, it is necessary to conduct a comparative analysis of these data with a number of other relationships already established in managerial psychology.

Methods

Research and Measurement Procedure

Achieving the main objectives of the study requires obtaining three main empirical data sets. First, these are data on the individual measure of the subjects' anti-reflection means. Second, these are data on the individual measure of parameters of their metacognitive sphere. Third, these are data on assessing the effectiveness of the implementation of key management functions.

For these purposes, the following assessment instruments were used:

To determine the individual measure of anti-reflection, we used our own technique for diagnosing Metacognitive Inhibition (MI) (A.A. Karpov, 2019).

To diagnose the main metacognitive determinants, we used widely used and highly reliable assessment instruments, including:

- Metacognitive Awareness Inventory (MAI) (Schraw & Dennison, 1994; Yzerbyt et al., 2002), modified by A.V. Karpov (A.V. Karpov, Skityaeva, 2005))
- Individual Measure of the Development of Metathinking (MT) as basic and process-related (according to our technique) (A.A. Karpov, 2019)
- D. Everson Instrument for Diagnosing the Level of Metaplanning Development – MPlan (in A.A. Karpov, A.V. Karpov, 2015)
- Level of Development of Meta-Emotional Control (MEC) according to the scale of the Comprehensive Questionnaire of Individual Metacognitive Potential (A.A. Karpov, 2018)
- Metacognitive Behavior (MB) Self-Assessment Scale provided by LaCosta (in A.V. Karpov, 2016)
- Measure and Specificity of Metacognitive Monitoring of Knowledge (MK) according to the Metacognitive Awareness Inventory (MAI) (in A.V. Karpov, Skitiaeva, 2005), defined as the sum of scores on two scales: Metacognitive Knowledge and Metacognitive Regulation;
- Individual Measure of the Development of Metamemory as another key metacognitive process (according to the instrument developed in (Karpov, Skitiaeva, 2005)).

To determine effectiveness, we used the Questionnaire to Measure the Differentiated Expert Assessment of Basic Managerial Functions (A.A. Karpov, 2019).

We should especially emphasize that the selection of assessment instruments was carried out in such a way that, to the extent possible, to present a sufficiently broad range of the main metacognitive qualities that have been studied to date in managerial activity—not only cognitive, but also regulatory and knowledge-based.

Study Participants

The participants in the study (n = 310; 220 males, 90 females) were lower-, middle-, and top-level managers of government and commercial organizations and enterprises in Moscow, Yaroslavl, and Rybinsk, aged 29 to 59 years. The selection of subjects was conducted strictly in accordance with the traditional principles of managerial psychology, according to which the main characteristics of managerial activity remain unchanged regardless of managerial levels of managers, despite obvious formal differences in status.

Data Analysis

The study procedure included its implementation at two levels and, accordingly, stages—*analytical* and *structura*l. The first of these was aimed at establishing differences between the studied groups of managerial subjects with using the Kruskal-Wallis H-test. However, the analytical stage allows obtaining only individual, partial data and should be further supplemented by more specific assessment instruments with greater resolving power. Therefore, the second stage of the study was carried out – the structural one, which involves the implementation of the methodology of *structural-psychological* analysis. It, as is known, includes the polar groups method, which consists of differentiating the sample into contrasting groups, as well as subsequent processing and comparative analysis of the data in them according to a certain criterion. In our case, this was the individual measure of anti-reflection. Then, based on the data from the assessment instruments presented above, intercorrelation matrices were calculated. Each of them was determined on the basis of the identified groups of subjects. As a result, each of the three groups (with low, moderate, and high levels of anti-reflection) has its own intercorrelation matrix. Based on the results of constructing the matrices we calculated the indices of *coherence* (ICS), *divergence* (IDS) and general organization (IGO) of the structures of the main parameters of individual metacognitive sphere. The ICS was defined as a function of the number of positive significant correlations in the structure and the degree of their significance; the IDS was defined as a function of the number and significance of negative correlations in the structure; and the IOS was defined as a function of the ratio of the total number and significance of positive and negative correlations, that is, as the difference between the scores of the ICS and the IDS (Karpov, Skityaeva, 2005; A. A. Karpov, 2018).

Results

Table 1 presents the individual measures of the diagnosed basic metacognitive parameters, as well as their overall score, in the "polar" groups of subjects – those with the relatively lowest and highest levels of the development of anti-reflection means.

The analysis of the presented results enables us to state the following: First, in general, the individual measure of the development of almost all metacognitive parameters is higher in the group of individuals with moderate anti-reflection compared to the group with low anti-reflection. However (and this is second), these differences are not significant for all parameters, but only for 4 at a $p<0.10$ level. Third, and most important, group differences also exist for the overall metacognitive potential score; they are also significant only at a $p<0.10$ level.

Table 1
Means and Standard Deviations

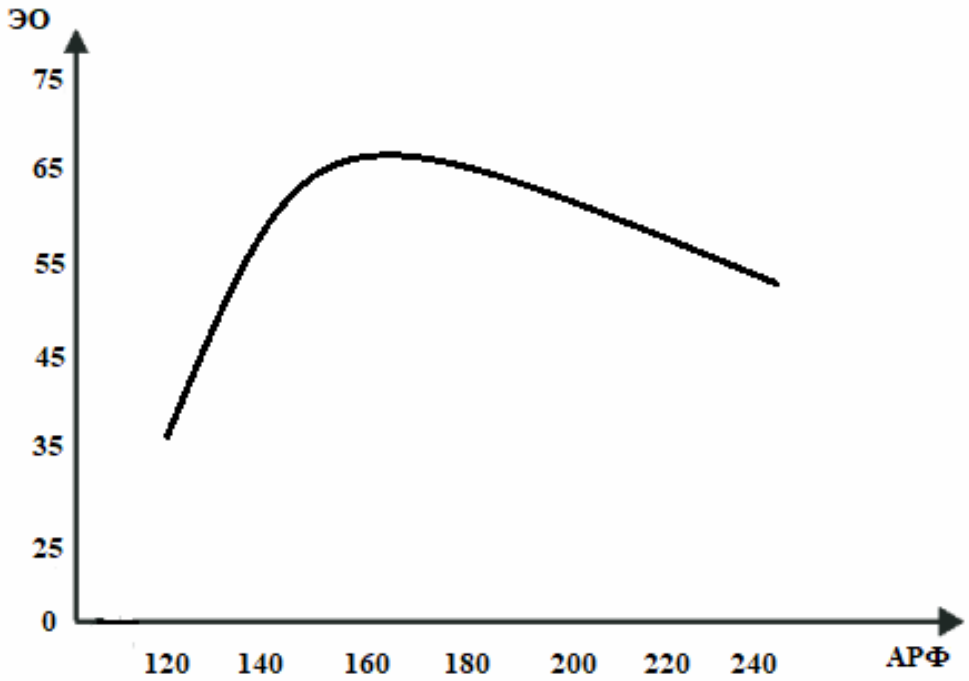
Variable	Overall sample (N = 310)	Comparison of Groups by Groups with Different Levels of Anti-Reflection		
		Low Anti-Reflection (n = 103)	Moderate Anti-Reflection (n = 115)	p
MAI	23.07 (5.78)	15.91 (5.80)	28.00 (5.95)	**.000**
MT	20.01 (5.66)	17.09 (4.62)	23.05 (5.85)	.328
MP	34.25 (4.99)	33.41 (4.64)	35.08 (4.22)	.461
MEC	44.18 (9.88)	43.36 (7.57)	44.02 (5.74)	.560
MB	12.29 (2.40)	10.14 (2.63)	19.47 (2.14)	**.000**
MM	36.59 (3.35)	30.39 (3.10)	35.07 (4.10)	.337
KC	39.43 (5.14)	35.77 (5.95)	45.09 (5.02)	**.000**
KMM	0.33 (0.11)	0.21 (0.08)	0.41 (0.15)	.331
MP	63.09 (6.62)	56.68 (7.34)	69.37 (7.05)	**.000**

Notes: MT – metathinking, MM – metamemory, MEC – meta-emotional control, MP – metaplanning, MB – metacognitive behavior, KC – knowledge about cognition according to the corresponding scale from the Metacognitive Awareness Inventory (MAI) (G. Shrow, R. Dennison), KMM – knowledge about metacognitive monitoring (according to KMAI by Z. Tobias), MCP – metacognitive potential (unlike all other parameters, it is presented not in scores from the corresponding assessment instruments, but as a superposition of sten scores for the 8 parameters of the CQIMP); p – asymptotic two-sided significance of differences according to the Mann-Whitney U test; scores of $p < 0.10$ are highlighted in bold.

Implementation of the differentiated expert assessment for basic management functions allowed us to obtain indicators of the overall effectiveness of managerial activity for three groups of subjects, differentiated according to the criterion of the level of anti-reflection. As a result, it was possible to determine the relationship between managerial effectiveness and the individual level of anti-reflection. Figure 1 shows this relationship.

Figure 1

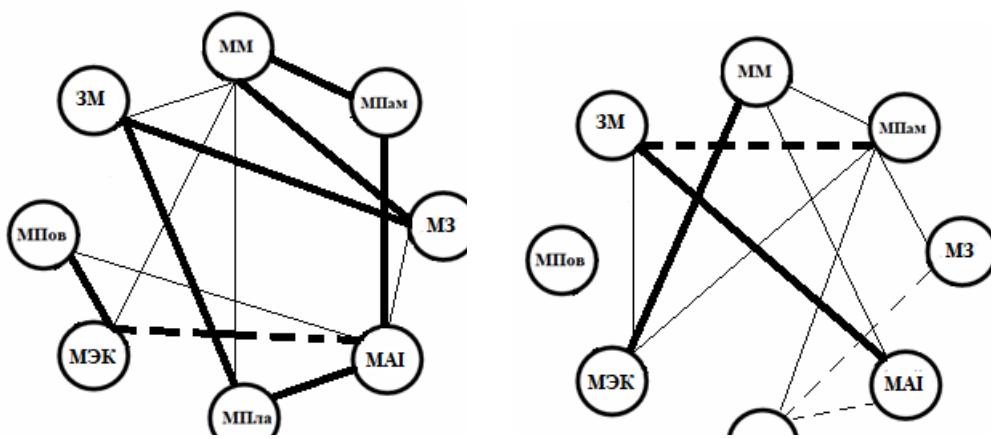
Relationship between managerial effectiveness and the level of anti-reflection (schematically)



Notes: ARM – individual measure of the development of anti-reflection means (in scores of the assessment instrument); EA – expert assessment of effectiveness (using a 75-point scale)

Using the Kruskal-Wallis H-test, we found that, at the analytical level, the three groups, differentiated according to the level of development of anti-reflection means, exhibited significant differences in the degree of managerial effectiveness ($p < 0.10$). The obtained data were then analyzed using multivariate correlation analysis, and intercorrelation matrices of the studied metacognitive parameters were determined for each group, which were used to construct their structurograms. Figure 2 shows structurograms for the groups of subjects with low and moderate levels of anti-reflection.

Figure 2
Structurograms of metacognitive parameters in the subgroups of low-level anti-reflection subjects (a) and moderate-level anti-reflection ones (b)



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Notes: The abbreviations in the structurogram correspond to the parameter designations given in the descriptions of the assessment instruments used; the bold line indicates relationships at $p < 0.01$ (they are assigned 3 points); the thin line indicates relationships at $p < 0.05$ (they are assigned 2 points); the dotted line indicates negative relationships. The relationships obtained for the entire 'weight' structure are summed, yielding the scores of the indicated indices.

Based on the resulting matrices and the corresponding structurograms, the scores of the structural indices of the metacognitive determinants of activity were determined for all three groups of subjects. Table 2 shows the results.

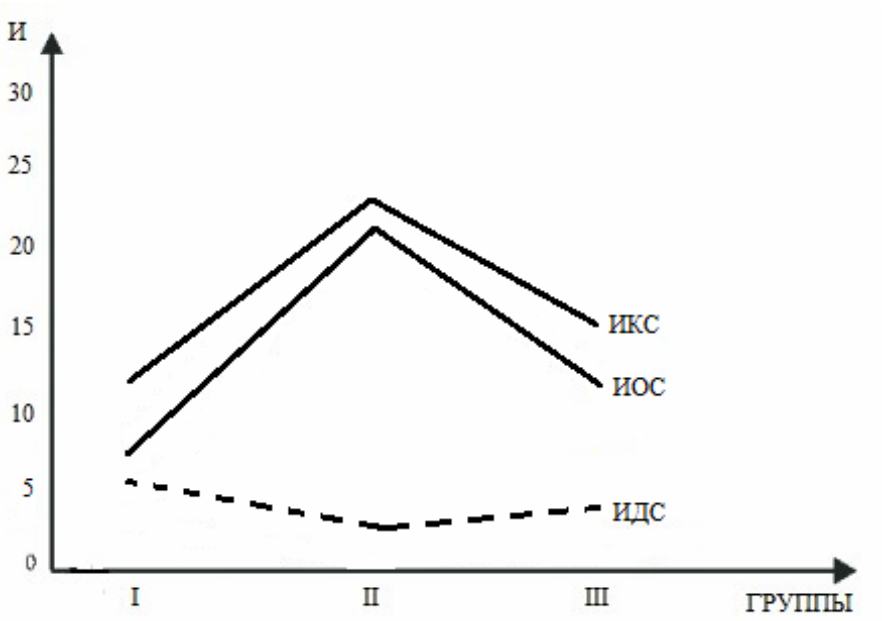
Table 2
Scores of structural indices of metacognitive parameters

	Low-Level Anti-Reflection Group	Moderate-Level Anti-Reflection Group	High-Level Anti-Reflection Group
Coherence Index (CIS)	12	22	14
Divergence Index (DIS)	5	3	4

	Low-Level Anti-Reflection Group	Moderate-Level Anti-Reflection Group	High-Level Anti-Reflection Group
Organization Index (OIS)	7	19	10

These data can also be presented graphically, enabling us to explicate the dependence of these indices on the individual level of anti-reflection (Figure 3).

Figure 3
Correlation between structural indices of metacognitive parameters and the level of anti-reflection



Notes: the abscissa axis shows groups of subjects differing in the level of anti-reflection, in ascending order; the ordinate axis shows the quantitative scores of the structural indices (I).

Discussion

All the results presented above enabled us to establish the following key features and patterns.

First, we should note that the relationship between managerial effectiveness and the level of anti-reflection is not a direct and unidirectional one. The most effective managers were those whose overall level of anti-reflection was at a moderate (albeit well-developed) level. Managers with low levels of anti-reflection appear to be insufficiently capable of performing basic management functions, thus being characterized as professionally ineffective. However, managers with the most pronounced anti-reflection traits should also be considered relatively less effective. In this regard, it becomes clear that the system of anti-reflection determinants has a direct, immediate, and highly significant impact on managerial effectiveness. This impact is most positive when the level of anti-reflection is characterized by certain average scores. In other words, this is nonlinear inverted *U-shaped relationship*. It is an optimum-type relationship.

At the same time, the obtained result should also be considered in the context of our previous research (Karpov, 2019). They demonstrate that reflection, being one of the most complex processes, and reflection, interpreted as a professionally important quality (PIQ) of a manager, are associated with the parameters of managerial activity by a nonlinear, *optimum-type* relationship. According to this relationship, activity parameters are high-scoring not at maximum, nor at minimum, levels of development, but at certain intermediate, optimal levels. At the same time, we note that, despite the fact that both results (established in relation to the levels of anti-reflection, on the one hand, and reflection, on the other) represent the relationship of the same type, they nevertheless possess very specific distinguishing features.

Thus, the relationship between managerial effectiveness and an individual measure of reflection is very similar to the traditional bell-shaped curve, where average scores are located approximately in the middle of the coordinate plane. Therefore, this relationship can indeed be a classic optimum-type relationship. However, the level of anti-reflection is related to the parameters of managerial effectiveness via a somewhat different relationship. As can be seen from the graph (Figure 1), it exhibits the so-called "*leftward shift*". This result is explained by the specific characteristics of anti-reflection and the inhibitory subsystem as a whole. These characteristics are such that a moderate (or rather, slightly below average) level of their development proves most beneficial in terms of ensuring effectiveness.

Secondly, an analysis of the obtained indices of the structural organization of the main parameters of the metacognitive sphere of personality in the three study groups, differentiated according to the criterion of the level of anti-reflection, enables us to conclude the following: First, the dynamics of the coherence index (CIS) are remarkable. The group of subjects with the lowest scores of anti-reflection means is characterized, again, by the lowest CIS and the score of the generalized structural index, calculated as a superposition of the CIS and the divergence index (DIS) – the index of general organization (IGO). Approximately the same results are observed for the group of managers with the highest level of anti-reflection. Despite this similarity, they are still expressed to a lesser

degree, which ultimately results in a leftward shift shown in the graph (Figure 1). In other words, managerial effectiveness in the context of the problem under consideration is decisively characterized not by the lowest, nor by the highest, degree of the organization of metacognitive parameters, but by certain average scores – or, more precisely, above-average scores. This, in many ways, underlies the fundamental difference between the dependence of managerial effectiveness on "simple" reflection, on the one hand, and on "anti-reflection", on the other. The first one, as noted above, is characterized by the classic optimum-type dependence, although the configuration of the two dependences and, accordingly, their general meaning are quite similar. This result finds its consistent explanation in the fundamental mechanisms of reflection and anti-reflection which, as is well known, are not simply similar but essentially identical. It is appropriate to consider anti-reflection means not in a negative way—not as the "absence" of reflection or properties antagonistic to it—but, on the contrary, as the same emphatically reflection-related means. However, they have the opposite functional focus—on suppressing and inhibiting reflection itself—and are apparently more complex in structure.

Thirdly, in order to explain the observed patterns, another obtained result should be considered. The finding is that the degree and specificity of the *structural* organization of the metacognitive parameters under study is related to the level of anti-reflection. Moreover, this level appears to be a significant determinant of this structural organization itself, which is consistent with similar relationships we previously obtained regarding the relationship between the degree of structural organization of intelligence and its overall level, as well as the relationship between the structural organization of creativity and its level of development (A.A. Karpov, 2018).

However, the converse is also apparently true. The structural organization of the metacognitive determinants of activity, and particularly its degree, is a determinant of the level of development of anti-reflection and, indirectly, the specificity of its influence on effectiveness. The latter is greatest at the intermediate level of anti-reflection because it is at this level that the degree of structural organization of the metacognitive parameters themselves is greatest. Consequently, the resulting systemic effects, leading to the generation of additional functional capabilities, are most obvious and effective here. In other words, the maximum organizational effects are associated not with the maximum (but certainly not with the minimum) scores of the level of anti-reflection, but with certain average or, in other words, optimal scores. Therefore, the identified association between the individual level of reflection and the degree of structural organization and, consequently, with the degree of representation of synergetic effects should be considered as an interpretative tool for explaining the fundamental features of its organization.

Fourth, in all three structures studied, the divergence index (DIS) scores were minimal. We emphasize that this situation is quite common in studies examining various metacognitive parameters; it is apparently entirely explainable and refers to the very nature of metacognitive determinants as special constructive means of enhancing an

individual's mental resources. Such a facilitating role, in our opinion, cannot be realized principally under conditions where the interrelations between individual metacognitive parameters are, for the most part, negative and, consequently, produce disintegrative tendencies and compensatory relationships within the structures. This, we repeat, would contradict the very essence and content of metacognitive determinants. Therefore, the extremely low DIS values and, against this background, the increase in synergistic effects, as well as the general consolidation of metacognitive potential, which, in turn, is expressed in objectively high scores of the general organization index (IGO), seem entirely natural.

Fifth, we should note that optimum-type dependencies, while widely represented in psychological research, can nevertheless undergo certain modifications. For example, in addition to the traditional version of these dependencies, another one has been identified that is also nonlinear—an inverted U-shaped one, but exhibits a *rightward shift.* This applies, in particular, to the already mentioned dependence of the level of development of psychometric intelligence on the degree of integration of the structure of metacognitive processes and personality traits. In relation to intellectual abilities, there is a significant decrease in the degree of organization of metacognitive parameters, and its highest values occur not at low (which is quite natural), but also not at very high scores of the level of intelligence. They have the highest scores at certain, albeit high, but still not polar scores (A.A. Karpov, A.V. Karpov, 2015; A.A. Karpov, 2018). Along with this, in relation to the relationship between effectiveness and the level of reflection, there is a classic version of the optimum-type dependence, in which the maximum scores of this effectiveness are associated with the average scores of reflection (A.V. Karpov, Ponomareva, 2000).

Thus, we can conclude that the optimum-type relationship, which is crucial for mental and activity organization, can be differentiated into at least three main varieties. Each of these is presented in the context of research in various aspects (reflection, anti-reflection, and psychometric intelligence) and was established primarily during the study of managerial activity.

Sixth, establishing and explaining the entire complex of identified effects in general and the dynamics of structural organization indices in particular presupposes another aspect of the general procedure of structural-psychological analysis. This involves implementing the χ^2 test, which, as is well known, allows for comparison of the matrices under study and their corresponding structures for their homogeneity-heterogeneity. In our case, implementing this method yielded the following results: The structure of metacognitive parameters of subjects belonging to three groups differentiated according to the criterion of the level of anti-reflection, when compared with each other, turned out to be fundamentally *homogeneous*—only *quantitative* differences were observed between them. This result can be considered entirely predictable, as it reflects the fundamental commonality of the structural organization of metacognitive potential, regardless of the degree of manifestation of anti-reflection means.

Therefore, despite the highly significant structural effects manifested in the rather significant differences in the structurograms found, they still cannot be overemphasized. The fact is that these differences themselves exist and manifest themselves against the backdrop of even more general and, essentially, fundamental patterns of the combination of two types (and levels) of determination—analytical and structural. And it is precisely in this regard that another fact obtained during the processing of the results provides important confirmation of this commonality. The result is that a comparison of the intercorrelation matrices of metacognitive parameters for their homogeneity/heterogeneity in the two groups using the χ^2 test revealed statistically significant *homogeneity*.

The entire set of data presented above creates the necessary and, in many ways, sufficient prerequisites for solving a number of purely applied problems. Their purpose lies in the development and implementation of special procedures and training programs aimed at developing operational anti-reflection means in professional activity in general and in managerial activity in particular. These are designed to minimize the use of reflection regulation means and, conversely, maximize the role of inhibitory means in supporting it. Moreover, it is very significant in this regard that the operational means identified by us (in A.A. Karpov, 2019), which are of a supra-normative nature and are referred to as activity heuristics, play a very important functional role in their formation and subsequent implementation. In general, their content is not limited to the goal of minimizing voluntary control over activity; however, specific heuristics of this nature also develop in relation to them. They play not just an important but, in many ways, a decisive role in the organization of activity—especially professional activity, and, above all, those types characterized by the greatest complexity. These means are also designated by other terms—concepts of informal rules, professional methods, "techniques", top skills, professional tricks, and so on. It is significant that they are often generated by the professionals themselves—those who carry out these activities. As a result, a kind of supra-normative operating fund of means is formed that allows for the optimization of its psychological support. As we demonstrated (in A.V. Karpov, A.A. Karpov, 2022), the main inhibitory heuristics include operational means designated by the concepts of cognitive blockade heuristics, reflection moratorium heuristics, metacognitive blockade heuristics, complexity reduction heuristics, schematization heuristics, voluntary (i.e., reflection) acceleration heuristics, effort reduction heuristics, fluency heuristics, and mental simplification heuristics. Based on these identifications, we developed specific procedures aimed at their explication and development in managerial activity, serving as means for its applied optimization.

Summarizing the above analysis, the following key *conclusions* can be formulated: *First,* research in two highly important fields—the psychology of reflection and metacognitivism, on the one hand, and managerial psychology, on the other—is characterized by increasing convergence and is gradually acquiring the necessary and

sufficient conditions for a consistent interdisciplinary synthesis. At the same time, one of the key features of such a gradual unification should be research aimed at exploring the place and role of anti-reflection means in managerial activity, as well as their identification as important determinants of their implementation.

Second, the validity of such a conceptualization objectively presupposes the implementation of empirical and experimental methods. This allows for the identification of new facts and, accordingly, the underlying patterns. Thus, it becomes possible to explicate a new generalized individual *quality*, designated by the concept of "anti-reflection", and to identify it as an integrative entity formed through the consolidation of the entire set of parameters of the individual metacognitive sphere. This constitutes its similarity to reflection. Moreover, anti-reflection means in their orientation should be viewed as emphatically reflection-related in their mechanisms. They are necessary for the conscious reduction—inhibition—of high and above-moderate levels of reflection. Such regulatory mechanisms are fundamentally important for management activity in general, and for the implementation of each management function in particular.

Thirdly, the established relationship between managerial effectiveness and the individual level of the development of anti-reflection means is an inverted U-shaped curve and the optimum-type relationship known in psychological research. A similar relationship exists between managerial effectiveness and the degree of development of reflection. However, in the first case, a leftward shift is observed, while in the second, there is a centering effect. This can be explained by the specific characteristics of anti-reflection, as well as the influence of individual phenomenological aspects of the metacognitive sphere.

Fourth, it was established that only quantitative differences are observed between the studied structures of metacognitive parameters, differentiated by the criterion of the individual level of anti-reflection development, and the structures themselves are therefore characterized as homogeneous. This, along with the low divergence index (DIS) scores, indicates that the metacognitive parameters function in a tight synergistic unity, with a minimal role for disintegrative tendencies, in order to achieve a common result—strengthening the individual's mental resources and improving the effectiveness of the "external criterion"—managerial effectiveness.

Highlights:

- Anti-reflection means have not only a significant but also a comprehensive impact on managerial effectiveness.
- The fundamental relationship between the main parameter of managerial activity—effectiveness—and the individual level of anti-reflection is an inverted U-shaped optimum-type relationship; it is based on a set of fundamentally specific characteristics of anti-reflection itself, as well as its phenomenological content.

- The fundamental relationship between managerial effectiveness and the degree of structural organization of the basic metacognitive processes and qualities underlying anti-reflection is a direct correlation between them.

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Author Contribution

Aleksandr Anatol'evich Karpov provided academic guidance for the study, based on the application of metacognitive methodology, contributed to the development of the reflection issues, and theoretical generalization of research findings.

Anastasiya Aleksandrovna Volchenkova developed the concept of the study using the methodology of structural analysis, analyzed data, and interpreted the results.

Sergei Olegovich Prisyazhnyuk contributed to the design of the empirical study, used the assessment instruments for reflection, collected the data, and interpreted the results.

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Hospital Pedagogy: Challenges and Development Prospects in Contemporary Society

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Abstract

Introduction. Hospital pedagogy is an interdisciplinary branch of pedagogical science and practice dedicated to providing comprehensive educational support to children and adolescents undergoing long-term treatment in medical institutions, with the primary aim of ensuring educational continuity. This study's objective was to conduct systematic monitoring and analysis of the student cohort involved in the "WeTeach/TheyLearn" hospital schools project across Russia. **Methods.** Data collection was performed at the regional sites of the "WeTeach/TheyLearn" hospital schools project located in Belgorod, Volgograd, Yekaterinburg, Izhevsk, Stavropol, Tambov, Chita, and Yaroslavl. The study included 250 children requiring long-term treatment. Methodologies employed encompassed content analysis of documentation, collection of statistical data, and comprehensive analysis of the gathered materials. **Results.** The sample predominantly consisted of children with chronic somatic conditions, chiefly malignant neoplasms (C) and diseases of the circulatory system (I). A substantial portion of the participants were officially recognized as children with disabilities and required tutor support and specialized educational methodologies. Nearly all students were undergoing prolonged inpatient treatment. Psychological and

pedagogical assessments revealed that the vast majority of students had no significant learning limitations, maintained preserved learning performance, and exhibited high levels of learning motivation. Most students were also prepared for collaborative activities with peers. Children officially registered with disabilities demonstrated comparatively lower learning motivation and more frequent learning performance challenges; however, their readiness for joint activities remained notably high. Education within the "WeTeach/TheyLearn" hospital schools is delivered according to individualized learning plans that accommodate the talents and educational aspirations of each student. **Discussion.** A personalized educational approach, tailored instruction, psychological support for both the child and their family, along with the implementation of the "caring school" concept, collectively contribute to mitigating the challenges associated with prolonged illness and promote the maintenance of a satisfactory quality of life during extended treatment periods. These findings underscore the high effectiveness of the hospital schools system in supporting children in need of long-term treatment.

Keywords

hospital pedagogy, children in need of long-term treatment, special educational needs, hospital schools

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Introduction

In 2024, children under 18 in poor or very poor health accounted for 5% of the total child population. During the same period, the proportion of children with disabilities increased from 2.3% in 2020 to 2.6%, representing 779,308 individuals, according to data from the Russian Federal State Statistics Service. Recent findings also indicate that fewer than one third of Russian children and adolescents are considered practically healthy, while the majority experience functional impairments or chronic conditions, some of which may result in disability (Loskutov & Purysheva, 2022).

This growing prevalence of health-related challenges among children has drawn increased attention from both the state and society to the developmental risks faced by children with life-threatening illnesses, as well as to the broader issue of educational inclusion (Sharikov & Volkova, 2023).

Severe illness in early childhood, along with associated adaptation difficulties resulting from prolonged hospitalization, disruption of daily routines, social isolation, uncertainty

and unpredictability of the disease trajectory, interruption of schooling, and a loss of confidence in the future, collectively contributes to a heightened risk of developmental disorders among children and adolescents with disabilities. In response to these challenges, the present research aims to identify effective methods for supporting the psycho-emotional well-being of hospitalized children with disabilities and for expanding their adaptive capacities (Di Padova et al., 2024; Almazroui, 2023; Sánchez-Jáuregui et al, 2023; Gorelov, 2024). Ensuring continuous access to quality education for all children—regardless of health status—remains a key priority, as it reflects the constitutional right of every child to receive an education (Sharikov & Volkova, 2023).

The Role of Hospital Schools in Ensuring Access to Quality Education for Hospitalized Children

Ensuring continuous, high-quality, and accessible education presents a significant challenge for the Russian Federation and other countries. Addressing this challenge requires, first, a deep understanding of the educational and psychological needs of children and adolescents undergoing hospitalization, and second, the development of effective hospital school models and practices.

Hospitalization is a stressful and potentially threatening event in a child's life, further intensified by social isolation, maladjustment, and disconnection from familiar daily routines (Palatkina & Batyrshin, 2023; Dubinina & Alekhin, 2023). Chronic or prolonged illness often results in frequent school absences, causing delays in curriculum mastery or repeated enrollment in the same grade (Hen & Gilan-Shochat, 2022). Extended isolation disrupts children's social ties with family and peers (Gusev, 2022). Moreover, illness and medical treatments may impair developmental processes and adversely affect academic performance (Shamionov et al., 2023).

Research indicates that educational and psychological difficulties are nearly twice as prevalent among children with special educational needs (SEN), referred to in Russian national documents as children with limited health conditions (LHC), compared to the general population (Martinez & Ercikan, 2009). Consequently, the demand for psychological support within this group significantly exceeds that of their peers (Palatkina & Batyrshin, 2023). Additionally, repeated and extended hospitalizations increase the risk of long-term developmental challenges (Buslaeva, 2019).

Education extends beyond mere knowledge acquisition; it is a fundamental factor shaping a child's personal, cognitive, and social development (Feldstein, 1985). Hospitalization, especially when long-term or chronic, disrupts a key condition for healthy development: the continuity of education (Badil & Lyubimov, 2012). Interruptions in learning, loss of routine, and forced separation from the educational environment and peers lead to decreased motivation and heighten the risk of disengagement from the educational system (Hen & Gilan-Shochat, 2022; Glozman & Plotnikova, 2021).

Within this context, the teacher assumes a dual role: not only as a knowledge provider but also as a vital source of support. The teacher helps the child to comprehend and

process the experience of hospitalization, while mediating between the child, medical staff, and the external environment (Hen & Gilan-Shochat, 2022).

Consequently, specially organized educational support through hospital schools is essential to ensure continuity of learning and psychosocial well-being for children undergoing hospitalization (Loskutov et al., 2023).

Hospital Pedagogy and the Russian Model of Hospital Schools

Currently, in nearly all developed countries worldwide, specialized educational institutions known as "hospital schools" (Inogamova, 2024) have been established within medical facilities to serve children and adolescents receiving treatment, regardless of their diagnosed illness or length of hospital stay. In Russia, hospital pedagogy—as a distinct field of scientific inquiry and an independent branch of pedagogy—gained significant momentum with the launch of the innovative project of Russian hospital schools, "WeTeach/TheyLearn," in 2014.

The "WeTeach/TheyLearn" project has since designed, tested, and implemented a nationwide model of hospital schools in the Russian Federation. Its primary objective is to safeguard children's constitutional right to quality education by providing both children and their parents with access to a comprehensive educational environment directly within the medical facilities where they must remain for extended periods due to life circumstances (Sharikov & Volkova, 2023).

Education within these hospital schools is organized through individualized educational trajectories based on an "Individual Needs Map" and delivered in hospital classrooms, wards, or remotely, with the involvement of specialized hospital teachers and tutors. Through these means, the "WeTeach/TheyLearn" project ensures the continuity of education, supports children's motivation to learn and their social adaptation, facilitates their reintegration into mainstream educational settings following treatment, and actively promotes hospital pedagogy as an independent academic discipline (Doluev & Arbuzova, 2017; Sharikov & Volkova, 2023).

The mission of hospital schools is "to ensure the continuity of physical, mental, and social development of children and adolescents undergoing long-term treatment in medical institutions" (Doluev, 2025, p. 7), as well as to integrate teaching and education within hospital settings. These schools create a comprehensive educational environment—including lessons, extracurricular activities, games, and events—directly within the children's hospital, tailored to the individual educational needs of each child. Educators must also recognize that hospitalized children and adolescents frequently face pain, fear, feelings of helplessness and insecurity, and loss of routine and autonomy (Hen & Gilan-Shochat, 2022). Accordingly, they adopt an individualized and supportive instructional approach designed to address these challenges.

"Hospital pedagogy" is defined as an educational practice within the hospital setting that extends beyond the traditional school environment, aiming to design and implement

pedagogical support adapted to the educational capacities and needs of hospitalized students (Oliveira et al., 2023; Äärelä et al., 2016). We conceptualize hospital pedagogy both as an emerging branch of pedagogy still under development and as a strategic approach that empowers children and adolescents with long-term illnesses to overcome their conditions while fostering interdisciplinary collaboration in recovery and health promotion. Moreover, it is understood as a process that "...goes beyond teaching formal content and takes on forms of expression and manifestation that are part of the evolution and comprehensive improvement of the human being" (Jimenéz et al., 2019).

According to researchers investigating best practices in educational support for hospitalized students in Queensland, Australia, the scholarship on hospital pedagogy is grounded in five core themes common across all countries. Around these central themes, additional, more specific topics arise, including those that reflect the unique national characteristics of education systems:

1. **Continuity of education** — ensuring smooth transitions between educational levels, consistent assessment, and active student engagement in learning activities;
2. **Access to education** — providing a comprehensive range of educational services throughout all stages of treatment and recovery, employing innovative teaching methods, ensuring adequate resources, and promoting equality among participants in the educational process;
3. **High quality of teaching and learning** — fostering a supportive educational environment, implementing federal educational programs, offering individualized and differentiated instruction, facilitating professional development for teachers, and incorporating social-emotional and vocational learning;
4. **Belonging to the educational community** — nurturing a cohesive educational community within the hospital school, including staff, students, families, and connections to both the school of residence and the wider teaching community;
5. **Interdisciplinary collaboration** — facilitating effective information exchange among healthcare professionals, educators, and parents, maintaining ongoing communication, fostering productive interactions, and clarifying roles and responsibilities (Bond, 2019).

In this article, we aim to systematically monitor and analyze the cohort of students enrolled in the hospital schools project "WeTeach/TheyLearn." We also explore existing challenges and prospects for the development of hospital pedagogy in modern society. To do this, we collect and analyze empirical data to describe the implementation of education for schoolchildren at regional sites of the "WeTeach/TheyLearn" project, as well as to identify current needs and challenges in the education and training of children with chronic somatic illnesses.

Methods

In the following section, we present statistical data on the implementation of education for schoolchildren at regional sites of the "WeTeach/TheyLearn" project who participated in this study, along with key operational and everyday characteristics of hospital schools. We consider periodic monitoring and analysis of data from this student cohort essential, as it enables us to identify (1) their educational needs, (2) individual personal characteristics, and (3) psychophysiological profiles—insights that directly inform the design of the educational process, the internal organization of school activities, and the provision of psychological support.

The empirical study was conducted at regional sites of the "WeTeach/TheyLearn" hospital schools project, covering various constituent entities of the Russian Federation. The participants included 250 students undergoing long-term treatment and receiving education within hospital schools. The study sample was drawn from the following Russian cities: Belgorod (n = 5), Volgograd (n = 119), Yekaterinburg (n = 7), Izhevsk (n = 35), Stavropol (n = 32), Tambov (n = 15), Chita (n = 10), and Yaroslavl (n = 27).

Data collection and analysis methods included content analysis of documentation, examination of primary sources, compilation of statistical indicators, and subsequent analysis of empirical data using descriptive statistical methods.

Results

Hospital School Students: Sociodemographic Characteristics

The total sample of students enrolled in hospital schools comprised 250 individuals. Among the participants, there were 135 boys and 115 girls.

The age range of the students (n = 250; mean age = 11.88 years) spanned from 7 to 17 years. The distribution by age was as follows: 7 years – 5 students (2.0%), 8 years – 30 students (12.0%), 9 years – 22 students (8.8%), 10 years – 30 students (12.0%), 11 years – 29 students (11.6%), 12 years – 22 students (8.8%), 13 years – 32 students (12.8%), 14 years – 31 students (12.4%), 15 years – 24 students (9.6%), 16 years – 22 students (8.8%), and 17 years – 3 students (1.2%).

The family status of the respondents reflects a variety of social environments in which they are raised. The majority of children (n = 183; 73.2%) live in two-parent families, whereas 53 children (21.2%) reside in single-parent households. Three participants (1.2%) come from large families. Another three children (1.2%) are raised by single mothers, and four children (1.6%) are under state guardianship. Family status information was unavailable for four respondents (1.6%).

The children attending hospital schools suffer from various somatic diseases. The distribution of respondents by disease category is presented in Table 1.

Table 1
Distribution of Hospital School Students by Disease Category

Disease category	Number of respondents (n)	Percentage of total respondents (%)
Malignant neoplasms (C)	135	54.0 %
Congenital malformations, deformations and chromosomal abnormalities (Q)	3	1.2 %
Diseases of the endocrine system, nutritional and metabolic disorders (E)	6	2.4 %
Diseases of the circulatory system (I)	47	18.8 %
Diseases of the digestive system (K)	7	2.8 %
Diseases of the nervous system (G)	10	4.0 %
Diseases of the musculoskeletal system and connective tissue (M)	6	2.4 %
Other somatic diseases	36	14.4 %

The data indicate that malignant neoplasms are the most prevalent conditions among children admitted for treatment in medical institutions and enrolled in hospital schools during their hospitalization. Diseases of the circulatory system and nervous system are also commonly observed. The category "other somatic diseases" encompasses conditions such as purpura and other hemorrhagic disorders (ICD-10 code D69), beta-thalassemia, diseases of the eye and its adnexa (ICD-10 codes H00-H59), skin diseases (ICD-10 code L), vasculitis, among others.

A total of 167 children have been officially recognized as having a disability, while 62 children have received conclusions from the Psychological-Medical-Pedagogical

Commission (PMPC). According to PMPC recommendations, 54 children require individual tutoring support. Additionally, 19 children necessitate specialized teaching methods, which include extended rest periods, reduced academic workload, additional time for task completion, emotional support, joint activities, structured activity planning, frequent task transitions, task orientation, visual aids, and supplementary explanations. Furthermore, 10 children require specialized textbooks and educational materials tailored for individuals with visual impairments, intellectual disabilities, locomotor disabilities (LLD), and electronic formats. Lastly, 9 children need special technical aids and adapted workspaces, such as assistive technology for the visually impaired, alternative communication devices, computer access, specialized desks, wheelchairs, standing frames, and canes.

An analysis of hospitalization durations among children at the regional sites of the "WeTeach/TheyLearn" Hospital Schools Project reveals a predominance of prolonged treatment courses: 232 students (92.8%) were hospitalized for more than 21 days, reflecting the chronic or extended nature of their conditions. Only 18 children (7.2%) experienced short-term hospitalization (21 days or fewer). These findings underscore the imperative for systematic and continuous educational support for children undergoing extended medical interventions.

Regarding schooling before hospitalization, the majority of participants (n = 221; 88.4 %) attended full-time in-person education. A small number received home-based schooling (n = 2; 0.8 %), part-time blended instruction (n = 22; 8.8 %), distance learning (n = 4; 1.6 %), and one participant (n = 1; 0.4 %) was self-taught.

Prior to hospitalization, educational settings were as follows: public or private educational institutions (n = 233; 92.8 %), home-based education (n = 10; 4.4 %), educational provision in medical settings (n = 5; 2.0 %), and other forms (n = 1; 0.8 %). For one participant (n = 1; 0.8 %), no information regarding prior educational setting was available.

Psychological-Pedagogical Assessment of Hospital School Students

Analysis of psychological and pedagogical assessment data of hospital school students revealed that the majority of respondents do not have significant limitations in learning activities: 224 children (89.6%) were assessed as having no learning limitations, 17 (6.8%) had mild limitations, 2 (0.8%) had moderate limitations, and 1 child (0.4%) had severe limitations. Six participants (2.4%) were not assessed.

The distribution of learning performance was as follows: preserved – in 205 students (82%), reduced – in 35 (14%), low – in 7 (2.8%), and not specified – in 3 (1.2%).

Readiness for joint activities with peers was observed in 237 children (94.8%), was absent in 9 children (3.6%), and not reported in 4 cases (1.6%).

The results of the students' learning motivation assessment are presented in Table 2.

Table 2

Findings from the Psychological and Educational Assessment of Learning Motivation among Students of Hospital Schools

Learning Motivation Level	Number of respondents (n)	Percentage of total respondents (%)
High	149	59.5 %
Moderate	74	29.6 %
Low	27	10.9 %

The majority of students demonstrate high learning motivation, observed in 59.5% of respondents. A moderate level of learning motivation was noted in 29.6%, while 10.9% exhibited low learning motivation.

For a more detailed analysis of learning motivation among hospital school students, we conducted an examination of motivation levels across different disease categories. The results are presented in Table 3.

Table 3

Results of the Analysis of Learning Motivation Levels among Students with Different Disease Categories

Disease category	High level of learning motivation, %	Moderate level of learning motivation, %	Low level of learning motivation, %
Malignant neoplasms (C)	60.6	30.3	9.1
Diseases of the circulatory system (I) (including blood diseases)	62.6	27.7	9.7
Diseases of the central nervous system (CNS) (G)	50.0	50.0	0.0
Diseases of the musculoskeletal system and connective tissue (M)	83.3	16.7	0.0

Disease category	High level of learning motivation, %	Moderate level of learning motivation, %	Low level of learning motivation, %
Diseases of the digestive system (K)	57.1	42.9	0.0
Diseases of the endocrine system, nutritional and metabolic disorders (E)	16.7	33.3	50.0
Congenital malformations, deformations and chromosomal abnormalities (Q)	0.0	33.3	66.7
Other somatic diseases	66.7	0.0	33.3

The analysis of the distribution of learning motivation levels across different disease groups revealed that the highest motivation levels were observed among children with diseases of the musculoskeletal system and connective tissue (83.3%), circulatory system diseases (65.5%), and malignant neoplasms (60.6%). In contrast, a predominance of low motivation was found among children with endocrine disorders (50.0%) and congenital malformations, deformations, and chromosomal abnormalities (66.7%).

Additionally, the characteristics of learning motivation, work capacity, and readiness for collaborative activities were analyzed separately for students with and without disability status; the results are presented in Table 4.

Table 4

Comparative Indicators of Learning Motivation, Learning Performance, and Readiness for Joint Activities Among Children with and without Official Disability Status

Indicator	Students officially recognized as children with disabilities, %	Students without disability status, %
Learning Motivation		
– high	54.2	69.4
– moderate	31.3	25.0
– low	12.7	5.6

Indicator	Students officially recognized as children with disabilities, %	Students without disability status, %
Learning performance		
– preserved	79.5	87.5
– reduced	17.5	8.3
– low	2.4	2.8
Readiness for joint activities		
– present	95.2	93.1
– absent	3.6	4.2

Children officially recognized as having disabilities demonstrate a substantially lower proportion of high learning motivation (54.2%) compared to their peers without disability status (69.4%). Conversely, the prevalence of low motivation among children with disabilities is more than double that of their non-disabled peers (12.7% vs. 5.6%). In terms of learning performance, children with disabilities show a lower rate of preserved performance (79.5% vs. 87.5%) and a higher incidence of reduced performance (17.5% vs. 8.3%), while rates of low performance are similar between the groups. Notably, readiness for joint activities with peers remains high and comparable in both groups, with 95.2% of children with disabilities and 93.1% of children without disabilities demonstrating this readiness.

Based on the psychological and pedagogical reports prepared for the students in the sample, the specialists of the "WeTeach/TheyLearn" Project identified the following priority areas for psychological work: harmonization of the emotional state (relevant for 72% of respondents); development of the emotional-volitional sphere and emotional regulation skills (50%); enhancement of self-awareness and increased self-confidence (46%); development of communication skills, expansion of social contacts, and formation of productive relationships (42%); support in adapting to new social conditions (40%); expansion of the motivational and needs sphere (26%); formation of motivational readiness for learning activities and the student's internal attitude (14%); development of independence and self-control skills (14%); formation of social and everyday orientation skills (8%); development of social competence and adherence to norms and behavioral rules (8%); and activation of personal and professional self-determination (12%).

Organization of classes at the hospital school

At the regional sites of the "WeTeach/TheyLearn" Hospital Schools Project, students study subjects including Mathematics, the World Around Us, Russian Language, Native Language, Literary Reading, Foreign Language, Visual Arts, Technology (Labour), Music, Basics of Religious Cultures and Secular Ethics, Native Literature, Second Foreign Language, Computer Science, History, Social Studies, Geography, Physics, Chemistry, Biology, and Basics of Safety and Homeland Defence.

The hospital school's timetable is developed collaboratively by the attending physician, teaching staff, the child, and their legal guardians. It remains highly flexible and may be adjusted in consultation with medical specialists to accommodate the child's current health status. Individual lessons are paused if the child's condition worsens or they become fatigued; during group sessions, the child may leave if continuing poses a health risk. Canceled or postponed classes are rescheduled for days when the child's condition stabilizes. Unlike traditional schools, the hospital school prepares its schedule on a weekly basis and continually refines it as needed—ensuring education adapts in real time to each child's needs and well-being.

For foreign hospital schools, the primary objective is to ensure a seamless transition from the hospital school to the student's regular school upon completion of treatment, with final examinations typically administered at the regular school (though, in rare cases, exams may be held directly in the hospital). In contrast, Russian hospital schools have the authority to conduct the final state certification (in various formats) at the hospital examination site itself, without involving the regular school, thereby facilitating a smooth transition between the hospital school and the school of residence.

Regional sites of the Hospital Schools Project "WeTeach/TheyLearn" also offer additional educational programs across diverse fields, including arts, sciences, sports, tourism, social studies, humanities, and technical disciplines.

Discussion

The total sample of our study included 250 students (135 boys and 115 girls) aged 7 to 17 years (mean age = 11.9 years). The most common medical diagnoses among students were malignant neoplasms (C) (54.0%), diseases of the circulatory system (I), including blood diseases (18.8%), as well as diseases of the central nervous system (CNS) (G) and other somatic diseases. For students diagnosed with cancer, who make up a significant portion of the sample, hospital-based learning is particularly important. According to the findings of Dinç et al. (2023), in situations where their lives are profoundly disrupted and everyday activities are restricted, attending hospital school serves as a crucial factor in supporting their psychoemotional well-being.

The majority of children (73.2%) are raised in two-parent families, 21.2% in single-parent families, 1.2% come from large families, and 4.4% are either under guardianship or

raised by a single mother. It is important to note that accounting for the sociodemographic backgrounds of respondents is essential, as predictors influencing learning outcomes in children with chronic illnesses include the child's attitude toward learning, consistent parenting style, and the family's socio-economic status. For children undergoing long-term hospital treatment, these factors significantly impact academic performance in later childhood (Barnett et al., 2018).

A total of 167 children were officially recognized as having disabilities, and 62 received conclusions from the Psychological-Medical-Pedagogical Commission (PMPC). Among them, 54 require tutor support, 19 need specialized teaching methods, 10 require adapted educational materials, and 9 rely on assistive technologies. The special educational needs of hospital school students have been highlighted in several studies (Holanda & Collet, 2011; Balfanz & Byrnes, 2012). An important task addressed by hospital school educational psychologists is the differentiation of these needs. In our study, the majority of students require psychological and pedagogical support aimed at harmonizing their emotional state, which is facilitated by creative and supplementary educational activities.

Among the participants, the majority experienced prolonged hospitalization — 92.8% of hospital school students had been hospitalized for more than 21 days. This underscores the significant role hospitalization plays in the lives of children and adolescents. As noted by Holanda and Collet (2011), it is essential that young patients do not perceive the hospital solely as a place of pain and suffering. Instead, the hospital environment should serve as a space for development, play, learning, and recreational activities to ensure that the child's development is not disrupted. Considering that 88.4% of the students in our sample were enrolled in full-time education prior to hospitalization, the experience of hospitalization represents a critical developmental juncture—a form of acute social deprivation—which demands the close attention of educators and psychologists in providing targeted support.

Learning performance was assessed as preserved in 82% of hospital school students, while 14% demonstrated reduced performance. A high level of learning motivation was identified in 59.5% of children, moderate in 29.6%, and low in 10.9%. Readiness for joint activities with peers was reported in 94.8% of respondents.

A comparison between children with and without officially recognized disabilities revealed a lower proportion of high learning motivation in the group with disabilities (54.2% vs. 69.4%), and a higher proportion of low motivation (12.7% vs. 5.6%). In terms of learning performance, children with disabilities were more likely to demonstrate reduced performance (17.5% vs. 8.3%) and less likely to demonstrate preserved performance (79.5% vs. 87.5%). Naeemya and Yoneda (2024) emphasize that students in hospital schools may exhibit relatively high levels of learning motivation, attributed to their desire to maintain a connection with the familiar educational environment, return to normal life, and continue their studies alongside their peers.

Absences from hospital school classes are typically due to valid and objective reasons related to the nature of the illness, periods of exacerbation, postoperative recovery, or

intensive medical procedures. According to the data obtained, the most common pattern is missing classes 1–2 times per academic year, reported by 65.4% of students. Absences once a month occur in 12.6% of cases, and once a quarter in 17.8%. Notably, 4.2% of students reported no absences at all. The duration of absences varies: approximately 20% of students miss classes for one week, 56.4% for two weeks, 9.6% for two to three weeks, and 14% for more than five weeks.

Repeated interruptions in the learning process during the school year, referred to as chronic absenteeism (typically defined as missing an average of 2 school days per month or 18 days per year, amounting to 10% of total school time), have significant negative effects on students. These include declines in academic performance and, in severe cases, expulsion from school due to persistent failure and inability to reintegrate into the educational process (Balfanz & Byrnes, 2012). Hospitalization, as a form of social isolation, may lead to disruption of peer relationships, reduced social interaction, and a lack of cognitive and emotional stimulation during treatment (Ludgerio et al., 2023).

Hospital schools are intended to mitigate the impact of school absences by enabling students to engage in learning at suitable times and at a pace aligned with their individual capabilities. Their primary aim is to minimize—or entirely eliminate—the negative academic consequences of unavoidable absences, particularly when regular school attendance is medically unfeasible.

Approaches to Studying the Effects of Hospital Pedagogy

Researchers primarily employ legal, inclusive, and sociocultural approaches to address the educational challenges faced by children in long-term care (Lizasoain & Polaino-Lorente, 1996; Souza & Rolim, 2019).

The legal approach emphasizes the continuous interaction among all educational stakeholders beyond the medical institution and addresses the regulatory framework governing hospital schools, taking into account the socio-economic conditions at both regional and national levels (Molero & Romero, 2019).

The inclusive approach focuses on ensuring the holistic development of the child and their active participation in society, emphasizing equitable access to education and the practical implementation of inclusion (Ganem & Silva, 2019). Research on inclusion in foreign contexts tends to be predominantly descriptive, often reflecting an inductive methodology.

A smaller subset of studies adopts a sociocultural perspective on the education of students with long-term illnesses, concentrating on the unique challenges faced by educators working within hospital wards (Gomes & Marchesan, 2009; Souza & Rolim, 2019; Lozano, 2020). Pedagogical practice in this context is examined through the lens of deterritorialization—signifying a paradigm shift associated with the relocation of the teacher's professional environment from conventional schools to hospital-based settings.

Effectiveness of Educational Practices in Hospital Pedagogy

The field of hospital pedagogy has accumulated numerous examples of educational practices that warrant systematic evaluation for their effectiveness. However, empirical evidence regarding the impact of educational support interventions on learning outcomes for children and adolescents with chronic conditions remains limited. One notable attempt to assess effectiveness was conducted by Barnett and colleagues, who performed a comprehensive review identifying four controlled studies focused primarily on educational support programs for pediatric oncology patients. The findings of this review were inconclusive with respect to the effectiveness of these interventions (Barnett, 2020). Specifically, the authors could not definitively conclude whether educational support programs lead to improved academic achievement or increased student engagement among learners with chronic illnesses. Furthermore, the reviewed studies did not provide clear evidence that such interventions facilitate students' successful return to school following treatment. Importantly, none of the analyzed studies employed standardized, validated measures of school engagement or quality of life. Given that quality of life is a critical outcome for both assessing the efficacy and the cost-effectiveness of educational support programs for children and adolescents with chronic health conditions, its systematic measurement is essential for advancing research in this area (Barnett et al., 2023).

When examining a systematic review of international publications presenting empirical research on the development of hospital pedagogy since 2000, it becomes apparent that descriptive studies predominate. This prevalence indirectly reflects the current state of pedagogical research abroad. The majority of these studies focus on the theoretical foundations of inclusive education for children with chronic illnesses and their civil rights.

Differences in the definition of "hospital pedagogy" in Russia and abroad, however, do not lead to significant distinctions in the focus of scientific research. This is because all educational programs, despite varying educational contexts, share a common goal—to provide academic support and continuity of education and development for children and adolescents with chronic illnesses, thereby improving their well-being.

Taking these factors into account, researchers have concluded that children and adolescents should be granted access to high-quality education during hospitalization: "Learning as the best medicine" (Almazroui, 2023).

An important aspect concerns the recruitment of personnel for the flagship site of the "WeTeach/TheyLearn" project, including the establishment of qualification criteria and the definition of required competencies, personal qualities, and values for hospital educators, as well as the development of an internal system for continuous professional development and methodological support (Sharikov & Volkova, 2023). Staff recruitment remains a critical challenge in the field of hospital pedagogy. The absence of clear policies and adequate teacher training specific to the hospital context, combined with the high

workload and challenging working conditions, significantly complicate the process of selecting qualified personnel (Ávalos & Fernández, 2021).

Development Prospects of Hospital Pedagogy in Contemporary Society

The contemporary development of hospital pedagogy encounters several challenges, foremost among them being the need for evidence-based evaluation of the effectiveness of educational practices. Despite considerable experience in various countries in organizing education for children with chronic illnesses in hospital settings, systematic empirical data on the actual outcomes of such interventions remain insufficient. Consequently, the future advancement of hospital pedagogy largely depends on expanding rigorous scientific research in this field.

Modern hospital pedagogy in Russia is shaped at the intersection of psychology and pedagogy, defining the key directions for scientific research in the education and development of children requiring long-term treatment both in hospitals and at home. This approach fully facilitates the integration of psychological knowledge into the pedagogical domain. The educational process in hospital schools is founded on the unity of upbringing and education, characterized by continuous interaction between teachers and students, with a focus on the harmonious development of the child's personality during prolonged treatment. The pedagogical system of a contemporary hospital school comprises a set of interrelated components aimed at ensuring high-quality, accessible, and continuous education that addresses the individual developmental and self-developmental needs of each child. Looking ahead, the advancement of hospital pedagogy in Russia is linked to the deepening of an interdisciplinary approach, wherein psychology and pedagogy collaborate to create a holistic educational environment that considers the cognitive, emotional, motivational, and personal characteristics of children undergoing long-term treatment (Crespo Molero & Sánchez Romero, 2019).

A key prospect for the advancement of hospital schools lies in enhancing staff training, as the primary driver of children's development is the individual who engages them daily in meaningful and productive activities (Holanda & Collet, 2011). The development of professional development programs, the establishment of a system for methodological support and mentoring, and the implementation of professional standards for hospital school educators are all critical directions for the future growth of this field.

Conclusion

Hospital pedagogy is an innovative field that still requires strengthening its theoretical foundations and accumulating empirical evidence, especially considering the current high-tech phase in the development of the human sciences.

Despite the diversity of national (state) approaches, the humanistic paradigm remains the systemic basis for educating children requiring long-term treatment. In the Russian

Federation, the most prevalent nosological group among children attending medical institutions comprises oncological and hematological diseases. Among hospital school students, there are children with disabilities, special health needs, palliative status, as well as those needing tutor support, psychological and pedagogical assistance, and corrective intervention from speech therapists, special educators, and social pedagogues. This underscores the urgent need to establish specialist positions within hospital school staff.

Analysis of individual learning plans demonstrated that all subjects included in the Federal State Educational Standard of the Russian Federation are taught to children receiving long-term care. Flexibility in scheduling, opportunities to implement hybrid instructional formats, individualized teaching or small group participation, conducting state final certification within the hospital setting, and a well-developed system of supplementary education are all key components of the educational environment in medical institutions serving children undergoing long-term treatment.

These elements unite hospital schools throughout Russia with the flagship site of the "WeTeach/TheyLearn" Russian Hospital Schools Project in Moscow.

It can be concluded that, thanks to the efforts of the "WeTeach/TheyLearn" Russian Hospital Schools Project, a program for the establishment and ongoing support of hospital schools is being implemented across the constituent entities of the Russian Federation.

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Ivan Yu. Doluev was responsible for conceptualizing the study, overseeing the collection and processing of empirical data, contributing to the interpretation of findings, and drafting the manuscript.

Ekaterina S. Zorina contributed to the study design, performed data analysis, actively participated in the interpretation and discussion of results, and took charge of the manuscript's linguistic and stylistic refinement.

Nataliya M. Kurikalova was involved in formulating the research objectives and tasks, systematically collected and organized the data, contributed to the analytical interpretation of results, and undertook critical editing of the manuscript.

Aleksander F. Loskutov participated in research planning, conducted data processing and analysis, contributed substantively to the formulation of conclusions, and was engaged in the preparation and editorial refinement of the manuscript.

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Personality Predictors of Oocyte Donation in Russia

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Abstract

Introduction. Oocyte donation has become an increasingly common approach to addressing infertility, making the identification of psychological predictors of this type of donation a highly relevant issue. Previous international studies have described the personality profiles of oocyte donors using MMPI-based methods. The aim of this article is to present the results of an investigation of the personality characteristics of oocyte donors in a Russian sample. **Methods.** The study included 67 oocyte donors (M = 28.70 years) and a control group of 75 women matched by demographic characteristics (M = 28.21 years), recruited in 2022–2023 in the Sverdlovsk Region. Personality traits were assessed using the SMOL clinical questionnaire, a short form of the MMPI. Data analysis was conducted using the Kolmogorov–Smirnov test, Mann–Whitney U test, exploratory factor analysis, and discriminant analysis. **Results.** A personality profile of oocyte donors was constructed, with all scales falling within the normative range, except for Depression (D), Hysteria (Hy), and Psychasthenia (Pt), which were lower. Overall, the donor profile was statistically significantly lower than that of the control group on all scales except the Psychopathic Deviate (Pd) scale. A two-factor structure of donor personality traits was identified, comprising the factors "Reflective, Conscious Self vs. Conversion Self" (first factor) and "Responsible, Confident Self vs. Intrapunitive, Self-Oriented Self" (second factor), which differed from the factor structure observed in the comparison group. Discriminant analysis indicated that emotional stability, frustration tolerance, adherence to social norms, and a responsible attitude toward health are key predictors of oocyte donation. **Discussion.** The results, reported for the first time in a Russian sample, are

consistent with findings from international studies, particularly regarding the placement of oocyte donors' personality profiles within normal or below-average ranges without pronounced peaks. The study's novelty lies in the identification of the factor structure of donor personality profiles and the development of a predictive model of personality traits for oocyte donation.

Keywords

oocyte donation, personality predictors, personality profile, Mini-Mult

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Introduction

In many countries, including Russia, raising the birth rate is a critical priority for maintaining population levels and supporting long-term socio-economic stability. Among the strategies aimed at achieving this goal, reproductive medicine has been gaining increasing prominence. Within this field, reproductive donation has emerged as a key method for addressing infertility, a condition affecting a steadily growing proportion of the population. In some cases, oocyte donation is the only means by which women suffering from pathologies related to folliculogenesis disorders—such as the complete absence of oocytes or their poor quality—can conceive. The use of donor material is also indicated when there is a risk of transmitting hereditary diseases. While infertility may result from a variety of causes, one notable trend with profound socio-demographic implications is the increasing tendency in developed countries to postpone childbearing until later in life.

However, assisted reproductive technology (ART) procedures in general, and oocyte donation in particular, involve not only medical and technological aspects but also place significant emphasis on the well-being of all participants, including donors and prospective parents. Almost invariably, both donors and recipients face a complex set of social and ethical challenges arising from modern society's ambivalent attitudes toward reproductive donation, the specific legal regulations governing this sociocultural phenomenon, and psychological concerns, including uncertainties regarding the future of children conceived through donor material.

As Kruchinina & Voronova (2020) demonstrate, ART is perceived differently across countries, being seen either as a potential threat to security or as a solution to demographic and economic challenges. In Russian academia, the legal and bioethical aspects of ART

are actively debated. Researchers have explored the relationship between property rights and reproductive rights (Belova, 2021), analyzed the shortcomings of the legal framework governing reproductive technologies (Kruchinina & Voronova, 2020; Pechegina, 2021; Semkina, 2021), and examined the challenges of assigning legal meaning to medical terminology (Krasnova, 2022). They have also raised questions regarding the future status of embryos stored in medical institutions (Yarosh, 2021) and discussed the need for legislative restrictions on the use of ART in Russia (Ustinkin & Rudakova, 2023). This selection represents only a portion of the relatively recent literature on these topics.

At the same time, it has been noted that "the current legal norms regulating legal relations in the use of ART address only certain aspects of the problems that arise. The situation is further complicated by a range of non-medical factors emerging in the course of demographic development, encompassing economic, social, legal, ethical, and psychological dimensions" (Albitskiy, Odinayeva & Mansimova, 2011, p. 14). Thus, from a sociological perspective, contemporary literature addresses issues related to public attitudes toward donation and ART, including attitudes toward the use of ART among young people (Dadaeva & Baranova, 2019) and among residents of large cities (Symaniuk, Polyakova & Mokerova, 2021). From a socio-psychological perspective, factors influencing individuals' readiness to donate are also examined, such as procedural risks, the anonymity of donation, the opinions of relatives or friends, financial compensation, and other considerations (Antonova, Eritsyan & Tsvetkova, 2019).

In the Russian psychological literature, research on assisted reproductive technologies (ART) has predominantly addressed the psychological characteristics of ART recipients and their children. Previous studies have examined potential risks for impaired cognitive development in children conceived through ART (Bokhan et al., 2023), demonstrated that parental relationships in IVF families are largely unaffected by other dimensions of family functioning (Leshchinskaia et al., 2022), and emphasized the role of medical and genetic counseling in enabling informed decision-making when selecting ART methods (Krechmar & Blokh, 2020). Further investigations have focused on the psychological dimensions of parenthood among mothers and fathers expecting or raising a child conceived via ART (Burina & Moshkivskaya, 2022; Moshkivskaya, 2021a, 2021b; Moshkivskaya & Burina, 2021), the attitudinal and emotional responses to pregnancy and the unborn child in women who conceived using ART (Likhachev, 2022), and the specific psychological effects of the IVF procedure on the mental health of prospective mothers (Tyuvina & Nikolaevskaya, 2020). Notably, the psychological profiles and personal characteristics of oocyte donors remain a largely unexplored domain within Russian scholarship, representing a significant gap in the current evidence base.

In countries where oocyte donation is strictly regulated, the procedure entails a rigorous screening process that includes comprehensive social, medical, and psychological evaluations of donor candidates (Practice Committee of the American Society for Reproductive Medicine, and the Practice Committee of the Society for Assisted Reproductive Technology, 2008; Gorrill et al., 2001). Such an approach suggests that a

donor's favorable socio-psychological profile is among the key factors contributing to the success of an ART cycle and the birth of a healthy child in individuals diagnosed with infertility who choose to use donor material. In the Russian Federation, however, Order No. 803n of the Ministry of Health, issued on 31 July 2020 and titled *On the Procedure for the Use of Assisted Reproductive Technologies, Contraindications, and Restrictions on Their Application*, does not require psychological assessment or support for oocyte donors. Instead, the regulations mandate only a "certificate from a psychiatric facility" and a "certificate from a narcological facility."

The issue of safeguarding the psychological and physical health of female oocyte donors, both during and after the donation process, is highly relevant, as oocyte donation entails significant health risks for the donor. International studies conducted over the years have consistently emphasized the need for psychological assessment and support prior to any donation procedure. For instance, in 2009 it was reported that, out of 315 telephone inquiries from potential donors, only 38 women (12%) were admitted to the pool of active donors (Gorrill et al., 2001), with mental health problems being the most common reason for refusal (24%) (Levy et al., 2007). A 2019 study found that many successful donors had a history of depression (52.9%, n = 9) and/or anxiety (58.8%, n = 10). None of the respondents reported treatment for, or a history of, bipolar disorder, schizophrenia, or ADHD, while 29.4% (n = 9) indicated other psychiatric symptoms. The vast majority of donors surveyed in the same study, 81.3% (n = 26), expressed interest in maintaining future contact regarding health, reproductive, and psychological matters (Blakemore et al., 2019). Additional evidence that oocyte donors may experience mental disorders regardless of age, education, employment status, or motivation for donation is provided by a 2023 study, which reported that eight women (20.5%) had at least one disorder. The most common was obsessive–compulsive disorder (n = 4, 10.3%), followed by severe depressive disorder (n = 2, 5.1%), persistent depressive disorder (n = 2, 5.1%), anxiety disorder (n = 1, 2.6%), mixed anxiety–depressive disorder (n = 1, 2.6%), and adjustment disorder (n = 1, 2.6%). Three donors had two psychiatric disorders concurrently (Sharafi et al., 2023).

This problem also acquires a specific dimension in light of recipients' expectations regarding the "quality" of donors. As noted by Grishanina, Narskaya, and Smirnova (2021, p. 96), "for families, criteria such as the health of the donor and their relatives, blood type, similar phenotype, as well as the personality type and character of the donor are important."

Based on these data, it can be concluded that, in addition to medical and social parameters, it is essential to thoroughly evaluate the psychological characteristics of potential donors. Researchers emphasize the importance of establishing advisory units in all oocyte donation centers and ensuring that donors are able to make informed decisions, taking into account potential risks to their social, physical, and mental well-being (Tulay & Atılan, 2019). At the same time, as early as 2019, it was noted that follow-up of oocyte donors has primarily focused on medical and physical parameters, while considerably less attention has been paid to assessing the long-term psychological impact of the

donation experience (Blakemore et al., 2019). According to Russian researchers, the scope of psychological counseling and testing conducted directly at ART centers varies across clinics, partly due to the absence of confirmed genetically transmitted mental illnesses. In clinics where psychological counseling is mandatory, the donor's personality type and motivation for donation are assessed (Grishanina, Narskaya, & Smirnova, 2021).

After completing the stimulation cycle, a female oocyte donor must preserve her reproductive health, maintain stable interpersonal relationships, and remain aligned with her moral values. Reproductive centers, in turn, seek donors who are both physically and mentally healthy, willing to undergo repeated donation, and capable of consciously weighing the risks and benefits for their psychological and physical well-being. In this context, investigating the psychological predictors of oocyte donation among mentally healthy women appears particularly relevant. A large-scale study conducted in 2010 demonstrated how an individual's psychological profile correlates with the outcomes of oocyte donation (Klock & Covington, 2010). The personality traits of identified oocyte donors were examined in a Swedish cohort in 2011 (Sydsjö et al., 2011) and in a French cohort in 2022 (Bujan et al., 2022). No comparable studies have been conducted in domestic samples. In our previous work, we analyzed the motivational characteristics of oocyte donation (Polyakova, 2022), described methods and tools for the psychological assessment of potential donors (Bashmakova et al., 2024), and outlined the typical features of candid communication between psychologists and donors (Vepreva, Polyakova, & Shalina, 2024). This study aims to characterize the psychological profile of oocyte donors and to identify personal predictors of oocyte donation in a Russian sample.

Methods

Methodology

Given the specificity of the phenomenon under study, the SMOL, Russian-language adaptation of the Mini-Mult—a short form of the Minnesota Multiphasic Personality Inventory (MMPI)—was employed to identify personality predictors of oocyte donation. This adaptation, developed by Zaitsev (1981, 2004), has been widely used in Russian psychological research and has demonstrated robust diagnostic validity in long-term practice. An important advantage of the SMOL questionnaire in the context of donor candidate selection is its efficiency and cost-effectiveness, as administration requires only 20–30 minutes.

Participants

The study sample comprised 148 women residing in the Sverdlovsk Region. The experimental group included 70 potential oocyte donors, all registered as donor candidates at a large medical center with an assisted reproductive technologies department, between

March 1, 2022, and March 1, 2024. Assessments were conducted prior to the participants' enrollment in the donation program and before they underwent mandatory medical and psychiatric evaluations. At this center, oocyte donation is conducted on a paid basis.

The control group consisted of 78 women with no history of oocyte donation, selected through randomization and stratification based on socio-demographic variables to minimize measurement error and improve the accuracy of population estimates. Recruitment and assessment of control participants occurred sequentially over the same period as the donor group: for each potential donor tested, a socio-demographically matched non-donor was subsequently examined.

Following analysis of the L (Lie) and F (Infrequency) scales, three respondents (4.29%) with elevated L-scale scores were excluded from the donor group, resulting in a final sample of 67 donors (M = 28.70 years, SD = 4.49). Likewise, three respondents (3.85%) with elevated F-scale scores were excluded from the control group, leaving 75 participants (M = 28.21 years, SD = 6.38).

The characteristics of the final sample (n = 142) are presented in Table 1. In both groups, participants with profiles exceeding the normative threshold (T > 65) were identified: in the donor group, 5 participants (13.9%), and in the control group, 6 participants (20.7%).

Table 1
Characteristics of the study participants

Category	Experimental group		Control group	
	N	%	N	%
Education				
Higher education	27	40.3	31	41.3
Vocational secondary education	31	46.3	19	25.3
Incomplete higher education	9	13.4	18	24.0
Secondary professional education	–	–	7	9.3
Professional field				
Medicine	17	25.4	16	21.3
Social sphere	19	28.4	21	28.0

Category	Experimental group		Control group	
	N	%	N	%
Arts	2	3.0	–	–
Education	10	14.9	8	10.7
Management and Economics	11	16.4	6	8.0
Military affairs	1	1.5	6	8.0
Technical field	1	1.5	3	4.0
On maternity leave	4	6.0	6	8.0
Unemployed	2	3.0	9	12.0
Marital status				
First marriage	34	50.7	40	53.3
Second marriage	2	3.0	–	–
Third marriage	2	3.0	1	1.3
Cohabitation	13	19.4	3	4.0
Not married	16	23.9	31	41.3
Number of children				
1	30	44.8	18	24.0
2	20	29.9	12	16.0
3	3	4.5	3	4.0
None	14	20.9	42	56.0

Statistical data analysis methods

Mathematical and statistical analysis of the study results was performed using the STATISTICA 12.0 software package. The normality of the distribution was tested using the Kolmogorov–Smirnov test with Lilliefors significance level correction. Group comparisons were conducted using the nonparametric Mann–Whitney U test. The structure of the personality profile of oocyte donors was examined through exploratory factor analysis, and a predictive model of oocyte donation–related personality traits was developed using discriminant analysis.

Results

An analysis of the normality of the distribution using the Kolmogorov–Smirnov test with Lilliefors significance level correction revealed statistically significant deviations from the normal distribution across all questionnaire scales (Table 2). Examination of the data skewness indicated that, overall, the sample tended toward below-average values. The kurtosis values demonstrated a flattened distribution on the Schizophrenia scale (Sc) and a peak on the Hypomania scale (Ma). Given these distribution characteristics, nonparametric statistical methods were employed for all subsequent analyses.

Table 2
Results of the distribution normality analysis

Variables	Indicators			
	max D	Significance Level	Skewness	Kurtosis
Hypochondriasis, Hs	0.17	p < 0.01	*0.640*	0.038
Depression, D	0.11	p < 0.01	*0.403*	-0.171
Hysteria, Hy	0.11	p < 0.01	*0.417*	*-0.557*
Psychopathic Deviate, Pd	0.10	p < 0.01	0.168	-0.192
Paranoia, Pa	0.18	p < 0.01	*0.392*	-0.128
Psychasthenia, Pt	0.11	p < 0.01	*0.365*	-0.283
Schizophrenia, Sc	0.13	p < 0.01	*0.352*	*-0.419*
Hypomania, Ma	0.17	p < 0.01	*0.608*	*0.847*

Note. Italicized values indicate statistically significant deviations from their standard error (standard error of skewness = 0.203, standard error of kurtosis = 0.404).

The diagrams depicting the range of personality characteristics for the experimental and control groups, presented in Figures 1–2, indicate that the overall profiles of both groups fall within normative values. In the experimental group, several scales—Depression (D), Hysteria (Hy), and Psychasthenia (Pt)—show reduced scores (T < 40).

Figure 1

Range of Personality Characteristics in the Experimental Group

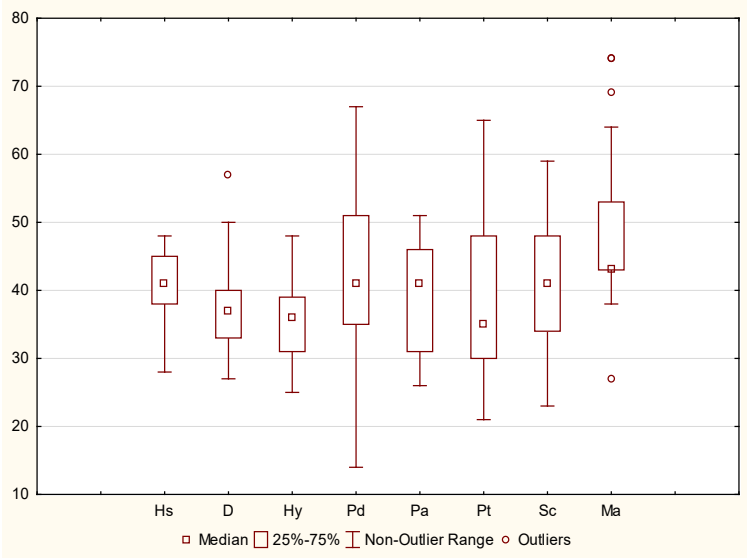
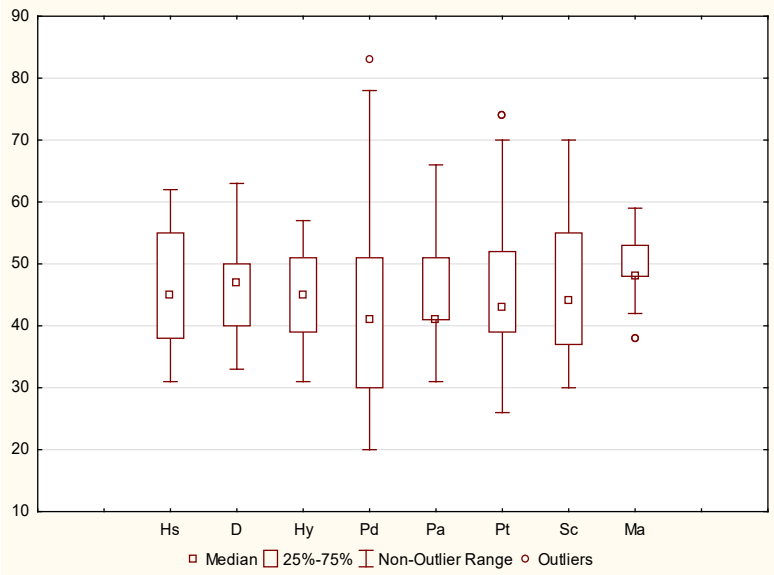


Figure 2

Range of Personality Characteristics in the Control Group



To examine differences between group profiles, a comparative analysis using the Mann–Whitney U test was conducted, which revealed significant differences across all scales except the Psychopathic Deviate (Pd) scale (Table 3).

Table 3
Results of the comparative analysis between groups

Variables	Rank Sum, Experimental Group	Rank Sum, Control Group	U	Z	p
Hypochondriasis, Hs	3646.00	6507.00	1368.00	-4.67	0.000
Depression, D	3118.50	7034.50	840.50	-6.83	0.000
Hysteria, Hy	3042.50	7110.50	764.50	-7.14	0.000
Psychopathic Deviate, Pd	4621.50	5531.50	2343.50	-0.69	0.491
Paranoia, Pa	3862.00	6291.00	1584.00	-3.79	0.000
Psychasthenia, Pt	3899.50	6253.50	1621.50	-3.64	0.000
Schizophrenia, Sc	4308.00	5845.00	2030.00	-1.97	0.049
Hypomania, Ma	3980.00	6173.00	1702.00	-3.31	0.001

Analysis of the standardized Z-scores presented in Table 3 indicates that on the Hypochondriasis (Hs), Depression (D), Hysteria (Hy), Paranoia (Pa), Psychasthenia (Pt), Schizophrenia (Sc), and Hypomania (Ma) scales, the control group demonstrates statistically significant elevations. These traits are notably less pronounced in oocyte donors compared to non-donor women.

To examine the structure of personality profiles in the studied samples, an exploratory factor analysis was conducted using the principal component method with Varimax rotation (Table 4).

Table 4

Factor structures of personality profiles in the experimental and control groups

Experimental Group			Control Group		
Variables	Factor 1	Factor 2	Variables	Factor 1	Factor 2
Hysteria, Hy	0.92		Schizophrenia, Sc	0.85	
Hypochondriasis, Hs	0.86		Psychasthenia, Pt	0.81	
Psychopathic Deviate, Pd	0.84		Psychopathic Deviate, Pd	0.77	
Schizophrenia, Sc	0.82		Hypomania, Ma	0.70	
Psychasthenia, Pt	0.71	0.53	Paranoia, Pa	0.67	
Depression, D		0.73	Hypochondriasis, Hs		0.94
Paranoia, Pa		0.65	Hysteria, Hy		0.90
Hypomania, Ma		0.61	Depression, D		0.68
Variance percentage	0.44	0.22	Variance percentage	0.40	0.32

To identify personal predictors of oocyte donation, a discriminant analysis was conducted. This approach enabled the identification of variables exerting the strongest influence on the decision to become an oocyte donor, as well as the classification of new participants into donor or non-donor categories through the construction of classification functions. The grouping variable was dichotomous: donor (experimental group) versus non-donor (control group), with the SMOL, Russian-language adaptation of the Mini-Mult test, scales employed as discriminant variables.

The resulting discriminant model demonstrated a high statistical significance in differentiating between the groups using the selected set of variables (Wilks' $\lambda = 0.461$, $F(4,137) = 40.122$, $p < 0.00001$). The overall accuracy of classification was 86.68%. Among the variables, the Hysteria (Hy) scale exhibited the strongest predictive power (Wilks' $\lambda = 0.641$).

Table 5
Discriminant Analysis Results

Variables	Wilks' λ	Partial λ	F-remove (1.137)	p	R^2
Hypochondriasis, Hs	0.506	0.910	13.63	< 0.0001	0.710
Depression, D	0.509	0.905	14.39	< 0.0001	0.194
Hysteria, Hy	0.641	0.719	53.64	< 0.0001	0.799
Psychopathic Deviate, Pd	0.565	0.815	31.06	< 0.0001	0.463

Table 6
Classification Equation Coefficients

Variables	Experimental Group	Control Group
Hypochondriasis, Hs	0.4131	0.1695
Depression, D	0.5080	0.6567
Hysteria, Hy	0.4278	0.9945
Psychopathic Deviate, Pd	-0.0607	-0.1826
Constant	-24.7004	-37.9052

Discussion

The personality profile of oocyte donors revealed average scores on the Hypomania (Ma), Schizophrenia (Sc), Hypochondriasis (Hs), Paranoia (Pa), and Psychopathic Deviate (Pd) scales. This suggests that donors generally maintain a stable, elevated mood even in adverse situations, demonstrate heightened activity, and exhibit accelerated cognitive processing. They do not show tendencies toward social withdrawal or restricted emotional expression in interpersonal interactions. Donors display well-developed health awareness, focus on physical fitness and a healthy lifestyle, and strive to adopt a responsible approach to disease prevention and treatment, avoiding risks to their well-being. Overall, they are balanced, mature, and judicious, able to perceive and respond to life's challenges appropriately, showing loyalty, decisiveness, and self-control. While

donors are motivated to meet societal expectations, they may also demonstrate traits such as moralism, self-criticism, conformity, compliance, mediocrity, and low sexual expressiveness.

Low scores were observed on the Psychasthenia (Pt), Depression (D), and Hysteria (Hy) scales. Oocyte donors are not prone to excessive self-analysis, unrealistic self-demands, or harsh self-criticism rooted in low self-esteem. They do not experience acute distress in response to setbacks and assess their achievements objectively. Donors exhibit emotional stability, reduced sensitivity to environmental influences, and relatively low involvement in social microclimate issues, reflected in a more structured, less flexible style of interpersonal interaction.

Overall, the analysis of personality traits in the donor group indicates a moderate, balanced profile without any pronounced or accentuated characteristics. In contrast, the control group showed average scores across all scales. Comparative analysis revealed that, on most scales, donors scored significantly lower than the control group, with the only exception being the Psychopathic Deviate (Pd) scale. This suggests that donors are less passive, less rigid, more questioning rather than accepting things at face value, adapt more readily, handle changes effectively, and maintain composure in social conflicts.

Donors are less sensitive, less prone to anxiety, and do not become discouraged by minor setbacks. They exhibit low susceptibility to conversion-type neurological defense mechanisms and are unlikely to use somatic symptoms to avoid responsibility; they do not resolve problems by feigning illness. Their emotions are deeper, and their interests are stable. The donor group is less likely to develop overvalued ideas and tends to be more adaptable, less aggressive, and less vindictive. Although donors may be less attuned to subtle or abstract stimuli, they respond emotionally to everyday joys and sorrows. They tend to be less cheerful, less energetic, and less lively, preferring stable, predictable tasks over frequent social engagement. Nonetheless, their interests are deep and consistent, and they possess sufficient endurance and perseverance. Overall, oocyte donors demonstrate higher neuro-emotional stability, greater integration of personality traits, and superior adaptation to the social environment compared to the control group.

These results are consistent with previous international studies. Research indicates that donors' personality traits generally fall within the normative range (Bujan et al., 2022). Compared to control groups, donors exhibit lower levels of anxiety, fear of uncertainty, shyness, and fatigue, alongside higher persistence (Sydsjö et al., 2011). At the same time, MMPI-2 profiles of donors and controls are highly similar, reflecting the non-clinical, non-psychiatric nature of the sample (Klock & Covington, 2010). Similar findings, showing normative scores across all MMPI-2 scales, have been reported in surrogacy research (Klock & Covington, 2015).

Factor analysis revealed two-factor models of personality profiles in both study samples. In the control group, the first factor is interpreted as "Self-Oriented vs. Other-Oriented Self" and the second as "Rigid Self vs. Flexible, Adaptable Self." The first factor

includes the Schizophrenia, Psychasthenia, Psychopathic Deviate, Hypomania, and Paranoia scales, reflecting a focus on personal needs and maintenance of autonomy in behavior. The second factor, formed by the Hypochondriasis, Hysteria, and Depression scales, indicates behavioral conservatism and inflexibility. Considering that the average scores fall within the normative range on the SMOL, Russian-language adaptation of the Mini-Mult, scales, it can be concluded that non-donor women exhibit a psychologically healthy balance between self- and other-orientation, along with moderate stability and adaptive behavioral flexibility.

In the group of oocyte donors, the personality profile is structured around two factors: "Reflective, Conscious Self vs. Conversion Self" (first factor) and "Responsible, Confident Self vs. Intrapunitive, Self-Oriented Self" (second factor). The first factor encompasses the Hysteria, Hypochondriasis, Psychopathic Deviate, Schizophrenia, and Psychasthenia scales, which can be interpreted as reflecting the individual's capacity for self-reflection, awareness of one's mental and physical state, and sensitivity to internal experiences. The second factor includes the Depression, Paranoia, Hypomania, and Psychasthenia scales, with the first two contributing most significantly. This factor may indicate a well-developed sense of responsibility, an active personal stance, and high self-esteem. Conversely, in cases where scores on these scales are clinically elevated, it could reflect pronounced intrapunitive reactions, egocentric attitudes, vulnerability, and hostility.

The positioning of oocyte donors' personality profiles within the low to medium range indicates that women who are donors, or intend to become donors, demonstrate a well-developed capacity for self-reflection, responsibility, and self-confidence.

Discriminant analysis indicated that the key personal predictors of oocyte donation are the Hysteria (Hy), Psychopathic Deviate (Pd), Depression (D), and Hypochondriasis (Hs) scales, with the Hysteria (Hy) scale demonstrating the strongest predictive value. This indicates that psychological characteristics such as emotional stability and self-awareness, socially normative behavior, an adequate response to frustration, and a responsible attitude toward one's health constitute the core criteria for selecting oocyte donors.

The coefficients obtained enable the prediction of a positive decision to donate oocytes among new respondents using SMOL, Russian-language adaptation of the Mini-Mult, scores through classification equations:

$$Y_{\text{Experimental Group}} = 0.4131\text{Hs} + 0.508\text{D} + 0.4278\text{Hy} - 0.0607\text{Pd} - 24.7004;$$

$$Y_{\text{Control Group}} = 0.1695\text{Hs} + 0.6567\text{D} + 0.9945\text{Hy} - 0.1826\text{Pd} - 37.9052.$$

To predict a T-score using the SMOL, Russian-language adaptation of the Mini-Mult, method, the values are substituted into the classification equations. If the resulting inequality $Y_{\text{Experimental Group}} > Y_{\text{Control Group}}$ holds, there is an 86.68% probability that the woman under examination will decide to become an oocyte donor.

Conclusion

An empirical study of personality profiles and psychological predictors of oocyte donation in a Russian sample allows several conclusions to be drawn. Indicators of neuro-emotional stability, integration of personality traits, and adaptation to the social environment are significantly higher in the group of Russian donors compared to the control group. Oocyte donors exhibit greater stability and consistency in psycho-emotional characteristics than women in the general population.

The personality profiles of oocyte donors and non-donors differ. In donors, the profile is organized according to two factors: "Reflective, Conscious Self vs. Conversion Self" and "Responsible, Confident Self vs. Intrapunitive, Self-Oriented Self" Key personality predictors of oocyte donation include emotional stability and frustration tolerance, adherence to social norms and behavioral rules, and conscientiousness regarding health.

The practical significance of these findings lies in their application within clinical psychology: the derived classification equations allow psychologists to identify, based on personality parameters, individuals with a high likelihood of choosing to become oocyte donors. Furthermore, understanding the specific structural components of the personality profile that define the "ideal potential oocyte donor" enables reproductive centers to develop and implement not only psychological selection programs, but also targeted personality development programs for prospective donors.

Future research could involve replicating these findings in other regions of the Russian Federation, as well as examining the personality characteristics of oocyte donors in comparison with donors of other types of biological material.

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Irina G. Polyakova justified the relevance and objectives of the study, conducted a theoretical analysis of the current state of the problem, planned and carried out the empirical research, and collected psychodiagnostic data.

Tatiana V. Valieva performed the mathematical and statistical processing of the data, discussed the consistency of the results with other studies, and prepared and edited the manuscript.

Elvira E. Symaniuk revised the research methodology and critically edited the content of the article.

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Psychophysiological Mechanisms of Melody Perception and Internal Repetition in Healthy Individuals and Schizophrenia

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Abstract

Introduction. The study investigates the psychophysiological mechanisms of melody perception and internal repetition in healthy individuals and patients with schizophrenia. The study primarily focuses on differences in neural processing of monophonic and polyphonic musical stimuli, providing deeper insight into the cognitive and neural features associated with schizophrenia. **Methods.** The study involved 53 female participants divided into two groups: 25 patients diagnosed with schizophrenia (F20 according to ICD-10) and 28 healthy volunteers. Brain activity was recorded using 19-channel EEG, followed by data processing with the "Virtual Implanted Electrode" method, which allowed for the analysis of activity and functional connectivity in 53 brain structures. Participants performed a task involving the extraction and internal repetition of a monophonic line from polyphonic musical stimuli. **Results.** The experiment revealed that in healthy individuals, activation occurs in visual areas, the supramarginal gyrus, and the right basal ganglia, ensuring accurate internal reproduction of the musical motif. In schizophrenia, weakened connectivity was observed in the left supramarginal gyrus, along with heightened activity in areas associated with polyphony perception, indicating

difficulties in maintaining and reproducing relevant musical components. **Discussion.** The findings demonstrate differences in the neural mechanisms of musical stimulus processing in schizophrenia. Weakened connectivity in control areas and heightened activity in perception regions may explain difficulties in accurate melody reproduction. The results highlight the role of subcortical structures in compensatory processes and open new avenues for research into cognitive impairments in schizophrenia.

Keywords

melody perception, internal melody repetition, schizophrenia, reconstructed electrical activity

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Introduction

The internal representation of melodies, as part of inner speech, plays a key role in human cognitive processes. This topic has attracted scientific interest due to its complexity and importance in understanding brain mechanisms, particularly in the context of various mental disorders such as schizophrenia. A distinctive feature of music as a means of communication is that its psychophysiological, somatic, and subjective experience remains independent of the cultural backgrounds of performers and listeners, despite music itself being a cultural product (Putkinen et al., 2024). The mechanisms of music perception have traditionally been associated with right-lateralized activity in the temporal lobe, including the superior temporal gyrus, Heschl's gyrus, insular cortex, and striatum (Fujito et al., 2018). However, the psychophysiological mechanisms of music perception depend on the listener's familiarity with a given composition. A 2023 meta-analysis by Canadian researchers (Vuong et al., 2023) revealed distinct neural networks underlying the perception of familiar versus unfamiliar melodies. When processing familiar melodies, activation occurs in a left-lateralized cortico-subcortical network comprising three key

clusters: the supplementary motor area (Brodmann area 6), the inferior frontal gyrus (IFG, including area 44), and the insular cortex. The involvement of these regions has been interpreted within the framework of predictive coding theory, which posits the generation of hypotheses and their validation through comparison with sensory input. Musical stimuli are frequently used as models for studying neural networks within this theoretical framework (Olszewska et al., 2023; Senn, 2023). Most people have experienced the phenomenon of perceiving a familiar melody even when it is not actually playing (Liikkanen, 2008), but rather being mentally recalled (Gabriel et al., 2016)—a phenomenon known as musical imagery. These internal representations facilitate the prediction of melodic continuations (Eggermont, 2023), which may explain the overlapping neural structures involved in both perception and imagination of melodies (Gabriel et al., 2016). Internal melody repetition refers to the process in which a person mentally reproduces heard music without any external auditory stimulus. This process engages multiple cognitive functions, including attention, working memory, perception, and planning. Research indicates that the internal representation of melodies activates brain regions similar to those involved in actual music perception and production, such as the primary auditory cortex, premotor, and motor areas (Zatorre & Halpern, 2005). The processing and mental representation of melodies involve both cerebral hemispheres. Bilateral activation has been observed during interaction with familiar melodies accompanied by lyrics (Zatorre et al., 1996). For purely instrumental stimuli, greater right-hemisphere dominance has been reported (Halpern et al., 2004), whereas other nonverbal stimuli have elicited left-hemisphere activation without corresponding right-hemisphere engagement (Kraemer et al., 2005).

Electroencephalography (EEG) is one of the primary methods for investigating brain activity during the internal representation of melodies. This technique records the brain's electrical activity with high temporal resolution, making it particularly valuable for studying rapid cognitive processes. Research indicates that internal melody reproduction is associated with modulations in EEG alpha and beta rhythms. For instance, increased alpha rhythm amplitude (8–12 Hz) correlates with enhanced attention and concentration during mental music rehearsal (Schaefer et al., 2011). Meanwhile, beta rhythm fluctuations (13–30 Hz) may reflect activation in motor and premotor cortical areas, which are involved in planning and simulating movement sequences related to instrumental performance (Bhattacharya & Petsche, 2005).

Schizophrenia is one of the most complex mental disorders, characterized by impairments in thought processes, perception, and emotional regulation. A hallmark symptom of schizophrenia is auditory hallucinations, which frequently involve internal voices or sounds. These hallucinations may arise from disruptions in inner speech and the neural representation of auditory stimuli. Research indicates that patients with schizophrenia exhibit deficits in cognitive functions such as working memory and attention, which may impair their ability to mentally reproduce melodies (Ford & Mathalon, 2004). EEG studies in schizophrenia patients reveal abnormalities across multiple frequency bands, including reduced alpha rhythm power and increased delta

rhythm power (1–4 Hz). These alterations suggest impairments in cognitive processing and auditory perception (Uhlhaas & Singer, 2010). Such anomalies may reflect disrupted neural synchronization, compromising the efficient generation of inner speech and melodic representations.

Studies show that the internal representation of polyphonic melodies, consisting of multiple independent lines, requires higher cognitive resources compared to monophonic melodies. This is due to the need to simultaneously maintain and process multiple auditory stimuli, which complicates the process of internal reproduction (Deutsch, 1999). In patients with schizophrenia, this task may cause even greater difficulties due to deficits in cognitive processes such as attention and working memory.

Understanding the psychophysiological mechanisms of internal melody repetition may have important practical applications. For example, results of such studies could be used to develop new diagnostic and therapeutic methods for schizophrenia aimed at improving cognitive functions and reducing symptoms (Ford & Mathalon, 2004). Furthermore, data on internal melody representations may be useful for developing brain-computer interfaces that would enable people with disabilities to interact more effectively with their environment (Minguillon et al., 2017).

Thus, the study of internal melody repetition in healthy individuals and in schizophrenia represents an important direction in neuroscience and psychophysiology. It provides better understanding of brain mechanisms related to cognitive and emotional processes, and enables development of new diagnostic and therapeutic approaches for mental disorders.

Objective: To investigate the specificity of psychophysiological mechanisms underlying melody perception and internal repetition through comparison of healthy controls and schizophrenia patients.

Object of Study: Characteristics of polyphonic stimulus representation in healthy individuals and schizophrenia patients.

Subject of Study: Psychophysiological mechanisms of internal representation processes for polyphonic stimuli in healthy individuals and schizophrenia patients.

Hypothesis: The internal representation of polyphonic and monophonic auditory stimuli involves subcortical nuclei that provide core representation mechanisms, which remain less impaired in schizophrenia.

Methods

Sample

The study involved 53 female participants divided into two groups. The clinical group comprised 25 inpatients from Psychiatric Clinical Hospital No. 1 named after

N.A. Alekseev with schizophrenia spectrum disorders (ICD-10 code F20), presenting verbal pseudohallucinations and abstract thinking difficulties (mean age: 41 years). The control group consisted of 28 healthy volunteers without psychiatric or neurological disorders, all right-handed (mean age: 37 years). All clinical group patients were under long-term antipsychotic medication. Participants provided written informed consent after reviewing the study protocol. The study was approved by the Bioethics Committee of Psychiatric Clinical Hospital No. 1 named after N.A. Alekseev.

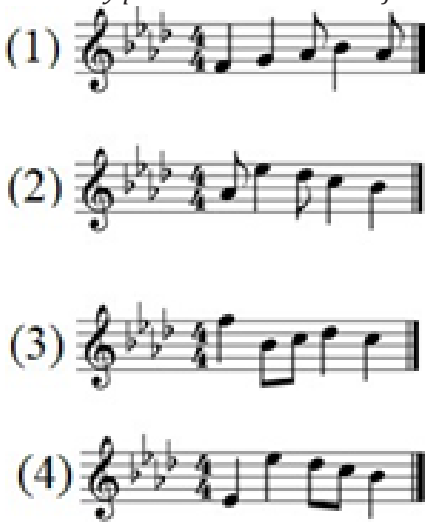
Equipment

EEG recordings were obtained from 19 channels according to the international 10-20 system using a Neuro-KM electroencephalograph (sampling rate: 1000 Hz, bandpass filter: 0.3-30 Hz). Primary EEG data processing was performed using licensed BrainSys software.

Stimuli

The stimulus set included recordings of 4 melodies and their combinations forming polyphonic stimuli. The melodies were composed such that simultaneous playback created harmonic fugue structures. Each melody was performed on two instruments: piano and glockenspiel. Polyphonic structures were created by pairing melodies with different instruments and distinct melodic patterns. Additionally, melodies were combined with word recordings to create verbal-melodic composite stimuli. The monophonic melodic constructions used for stimulus generation are presented in Figure 1.

Figure 1
Musical notation of stimulus materials. Each staff line displays a monophonic melodic construction. Polyphonic structures are generated by pairwise combination of these lines.



Research Procedure

Participants underwent briefing where the study objectives and procedures were explained, after which they signed informed consent forms. Their task was to listen to and identify a melodic line performed on piano, then mentally repeat it following a conditional signal. All stimuli were delivered through headphones. EEG recordings were obtained during the experimental sessions. Participants completed all trials with closed eyes to minimize eye movement and blink artifacts. They were also instructed to remain motionless during recordings.

Data Processing and Analysis Methods

The obtained data consisted of EEG recordings. The first processing stage involved visual artifact inspection (including eye movements) using Brainsys (BrainWin) software. Next, artifacts related to electrical equipment at 50 Hz frequencies were removed.

Subsequent analysis calculated localized activity in predetermined brain regions of interest using the novel "Virtual Implanted Electrode" method developed by A.V. Vartanov (Russian Patent No. 2 785 268). The algorithm is described in (Vartanov, 2022). Unlike existing approaches based on dipole models (which effectively describe high-frequency EEG components - gamma rhythms), this method utilizes a unipolar model (non-directional spatial charge) originating not from postsynaptic potentials but from afterpotentials reflecting active ion transport processes for neuronal membrane potential restoration (whose random summation explains low-frequency EEG components) (Masharov, 2019). The method has been validated through deep brain stimulation studies (Vartanov, 2023). The analysis examined activity and functional connectivity across 53 brain structures: hypothalamus, pons, midbrain, medulla oblongata, caudate nuclei (L, R), medial globus pallidus (L, R), putamen (L, R), thalamus (L, R), hippocampus (L, R), amygdala (L, R), ventral anterior cingulate cortex (BA24), dorsal anterior cingulate cortex (BA32), insular cortex (L, R), ventral striatum (BA25), dorsolateral prefrontal cortex (BA9: L, R), supramarginal gyrus (BA40: L, R), parietal cortex (BA7: L, R), Broca's area and its homolog (BA44: L, R), Wernicke's area and its homolog (BA22: L, R), cerebellum (L, R), angular gyrus (BA39: L, R), middle frontal gyrus (BA10: L, R), orbitofrontal gyrus (BA47: L, R), parahippocampal gyri PHC1 and PHC2 (L, R), visual areas (L, R): V1 (BA17), V4, V3v, VO1, VO2.

Using this technology, averaged evoked potentials (EPs) were obtained for each of the 53 brain structures (time-locked to stimulus presentation and internal repetition cues) spanning 200 ms before to 500 ms after events across four experimental conditions. Connectivity graphs were constructed by calculating correlations between EPs in these structures and visualized using GraphViz 2.38 software.

Each graph additionally reflects amplitude and temporal characteristics of evoked potentials across structures under experimental conditions. This approach reveals similarities and differences in functional connectivity patterns involved in the studied

cognitive process. Connection characteristics included: strength (connectivity correlation coefficient), directionality (unidirectional or bidirectional), and type (excitatory or inhibitory). In this study, connectivity was defined as synchronization of EP temporal and amplitude characteristics. Graph descriptions include correlation coefficients: positive values indicate excitatory connections, negative values indicate inhibitory connections. Strong connections were defined as those with correlation coefficients exceeding 0.70. Connections with coefficients between 0.40-0.60 were considered weak and potentially random, and therefore might be excluded from the studied network.

Results

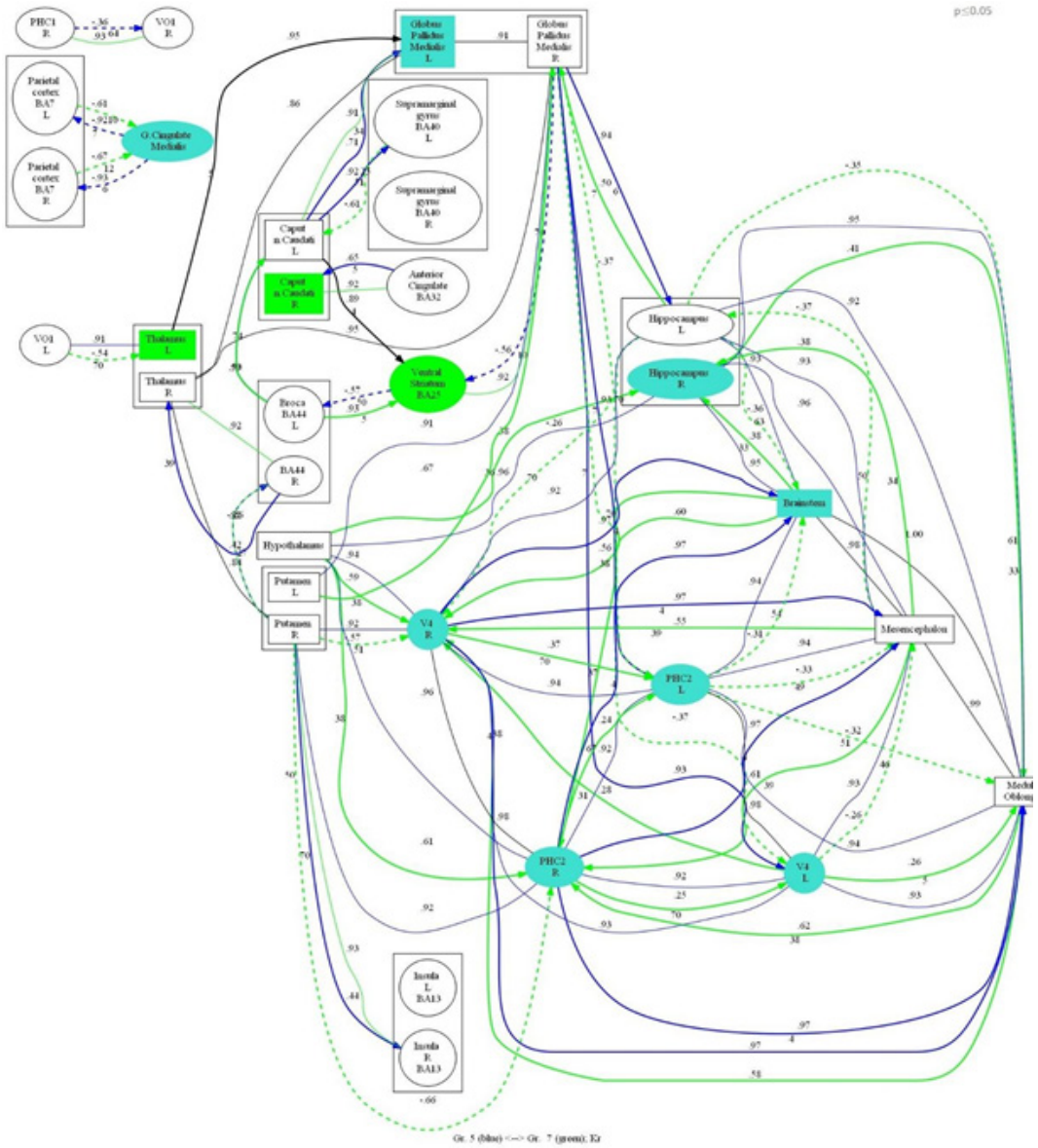
The presented figures illustrate both common and distinct psychophysiological mechanisms underlying different aspects of internal representation for monophonic and polyphonic auditory stimuli. Black connections represent connections identical in strength, direction, and type across both compared groups/conditions. Blue or green connections indicate differences in these parameters, serving as basis for interpreting impairment mechanisms affecting internal representation generation/reproduction (in between-group comparisons). Colored structures denote structures with maximum amplitude values within each condition/group. Yellow structures mark where peak amplitude values were characteristic for both conditions/groups. Blue or green structures: Indicate structures with peak amplitude specific to one condition/group.

The connectome shown in Figure 2 demonstrates that during the perception and extraction of monophonic melodic lines from polyphonic stimuli, no brain structures exhibited equally high amplitudes in both groups. In the clinical group, the most active structures were the left thalamus, right caudate nucleus and ventral striatum, while in the control group - the ventral part of the anterior cingulate gyrus, left globus pallidus, right hippocampus, brainstem, and bilateral visual areas PHC2 and V4.

Common connections in both groups. High correlation coefficients are observed in subcortical structures: between the right thalamus and right putamen (0.84), as well as the right (0.95) and left (0.86) globus pallidus, between which a strong connection was also found (0.91). Common excitatory connections are also observed from the left thalamus to the left globus pallidus (0.95) and from the right caudate nucleus to the ventral striatum (0.89). A still strong connection (0.98-1.00) exists between brainstem structures. In the cortex, equally strong connections in both groups were found between visual regions PHC2 and V4 in the right (0.96) and left (0.97) hemispheres.

Figure 2

Connectome for perception and extraction of monophonic melodic lines from polyphonic musical images



Note. *Blue indicates structures and processes most active in the control group. Green marks structures and processes most active in the clinical group. Yellow designates structures most active in both groups. Connection line styles: Solid lines represent excitatory processes. Dashed lines indicate inhibitory processes. The figures also display correlation coefficients for functional connectivity measures.*

Differences in connections between groups. During interaction with polyphonic musical stimuli, strengthening of some connections is observed in the clinical group. A weak inhibitory connection between right PHC1 and VO1 in controls (-0.36) becomes strengthened (0.93) in schizophrenia and loses its inhibitory properties. Connections also strengthen between right globus pallidus and ventral striatum (0.92), left globus pallidus and left caudate nucleus (0.93), between dorsal anterior cingulate cortex and right caudate nucleus (0.92), right insula and right putamen (0.93), right thalamus and area 44 (0.92). In the control group, these connections are weaker, with particularly significant differences observed in right insula-putamen connections (0.44 in control group), right thalamus-area 44 connections.

Broca's area connectivity differences show distinct patterns. During monophonic melody perception and extraction, controls demonstrate inhibitory connections from right globus pallidus (-0.56) through ventral striatum (-0.57), though these connections remain relatively weak. In contrast, the clinical group exhibits strong excitatory connections originating from Broca's area to bilateral globus pallidus via left caudate nucleus (0.99) to left (0.91) and through ventral striatum (0.93) to right (0.92) structures. No connection between Broca's area and caudate nucleus was found in controls.

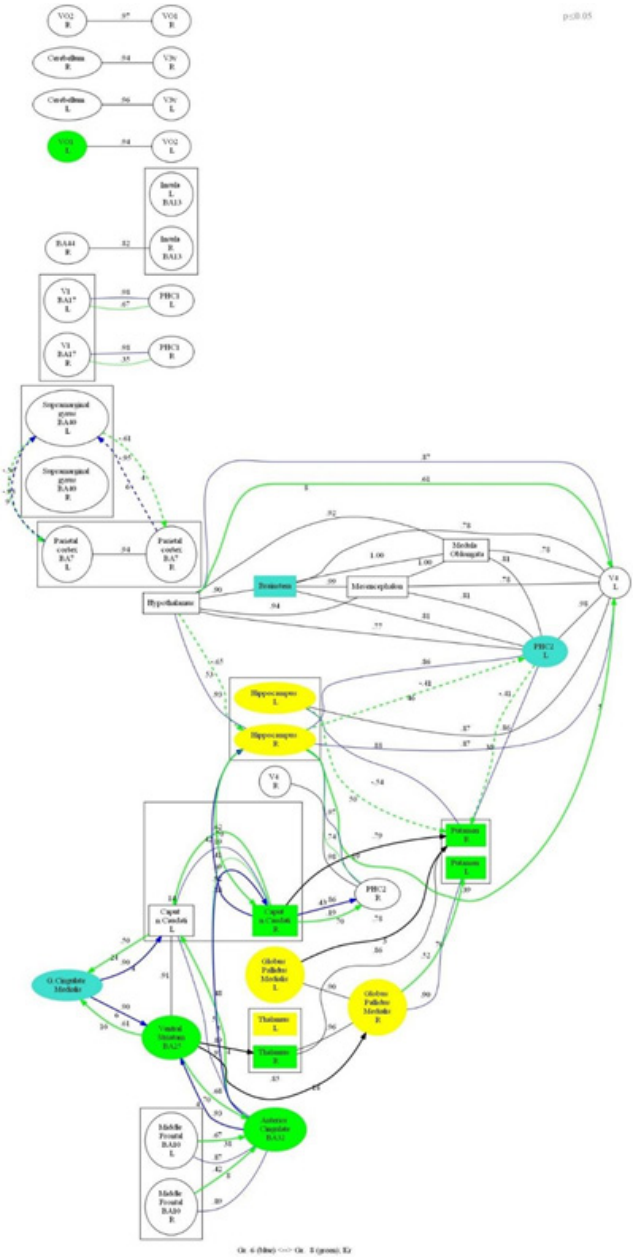
Strongest connections in controls appear between ventral cingulate cortex and parietal regions (R -0.93; L -0.92), left thalamus and left VO1 (0.91), right globus pallidus and V4 (0.93). Interhemispheric connections between visual regions and brainstem structures (0.93-0.99) were observed, along with an excitatory ascending pathway between right putamen and PHC2 (0.92). These connections appear significantly weakened in the clinical group.

While both groups maintain relatively strong connectivity between right hippocampus and hypothalamus (controls: 0.96; clinical: 0.92), the clinical group lacks excitatory hypothalamic projections present in controls, where this process shows bidirectional connectivity.

During the internal representation of a single melodic line from a polyphonic image, the most active structures in both groups are the bilateral globus pallidus and hippocampus, as well as the left thalamus. In the control group, the most active structures are the ventral part of the cingulate gyrus, brainstem, and left PHC2. In the clinical group, the highest amplitude values are observed in the right thalamus and caudate nucleus, ventral striatum, dorsal part of the anterior cingulate cortex, as well as bilateral putamen.

Figure 3

Connectome for internal representation of monophonic melody extracted from polyphonic musical image



Note. *Structures and processes most active in the control group are marked in blue; in the clinical group – in green; structures most active in both groups – in yellow. Solid lines indicate excitatory processes, dashed lines – inhibitory processes. Correlation coefficients for functional connectivity measures are also shown.*

Common connections in both groups. Strong connections were found between visual areas VO1 and VO2 in the right hemisphere (0.97), as well as between the cerebellum and region V3v on the right (0.94) and left (0.96). Strong common connections are also observed between PHC2 and V4 in the left hemisphere (0.98), with V4 in turn connected to the left hippocampus (0.87). Strong connections were also recorded between the insular cortex and area BA44 in the right hemisphere (0.82), between brainstem structures with each other (0.99-1.00), as well as between left and right parietal cortex (0.94). Common connections were also found between brainstem structures and left PHC2 (0.81), as well as with the hypothalamus (0.90). Strong connections are also observed between PHC2 and V4 in the left hemisphere (0.98). Excitatory connections can be noted from the left-hemisphere globus pallidus to the right-hemisphere putamen (0.78). Strong connections are also observed between the ventral striatum and left caudate nucleus (0.91), as well as connections activating the right globus pallidus (0.93) and right thalamus (0.89), which is connected to the right globus pallidus (0.96) and putamen (0.86). The right caudate nucleus activates the right putamen (0.79).

Differences in connections between groups. In the clinical group compared to controls, no strengthening of connections is observed - all connections are significantly weaker, and for some connections their nature and direction change. Only weakening was recorded in connections between area V1 and PHC1 in both hemispheres, with the weakening being stronger in the right hemisphere (0.35/control 0.98) than in the left (0.67/control 0.98), as well as the excitatory connection from the caudate nucleus to region PHC2 in the right hemisphere. Differences in the nature of connections are observed between the hypothalamus and right hippocampus, as well as between the left hippocampus and right putamen. In the control group, a bilateral excitatory connection was noted (0.93), while in the clinical group, inhibition is directed toward the hippocampus (-0.65). The connection between the left hippocampus and right putamen in the control group is represented as bilateral excitatory (0.88), while in the clinical group it is weakened (-0.54) and transmits inhibition to the putamen.

In this task, quite many intergroup differences are observed, characterized by weakening of connections in the clinical group and reversal of their direction of excitation and inhibition transmission. For example, normally there is an inhibitory connection directed toward the left supramarginal gyrus from the left (-0.93) and right (-0.95) parietal cortex, while in the clinical group the inhibitory connections are significantly weaker and directed from the left supramarginal gyrus toward the right (-0.56) and left (-0.61). A similar trend is observed in parts of the cingulate cortex. In the control group, there is an excitatory connection toward the left caudate nucleus (0.90) and ventral striatum (0.90), while in the clinical group these structures transmit excitatory signals toward the cingulate gyrus, also with weakening (0.61 from striatum, 0.50 from caudate nucleus). The dorsal part of the cingulate gyrus also activates excitatory connections toward the ventral striatum (0.93), left (0.87) and right (0.89) middle prefrontal cortex, as well as toward the left caudate nucleus (0.91).

Similar differences are observed in the connectivity between right and left caudate nuclei: in the control group the connection is bilateral (0.89), while in the clinical group excitation is directed to the left hemisphere, with the connection weakened (0.62). The connection between hypothalamus and region V4 in the left hemisphere: bilateral connection in the control group (0.87), in the clinical group a weakened excitatory connection is directed toward the visual region in the left hemisphere (0.61), while the connection between hypothalamus and right hippocampus in the control group shows a bilateral connection (0.93), whereas in the clinical group it acquires an inhibitory character from the hypothalamus toward the hippocampus (-0.65).

Discussion

The polyphonic musical structure has several differences from monophonic verbal stimuli. First, it does not require semantic processing and can trigger affective reactions. At the same time, it allows selecting which line will be dominant at a given moment (Huberth & Fujioka, 2017). In this experiment, the experimenter explicitly instructed participants to choose the dominant line, and the obtained results reflect the process of maintaining attentional focus on the target line.

In this process (Fig. 2), stronger preserved connections are observed in the clinical group, including connections between visual areas (encoding color and general scene), as well as between thalamus and basal ganglia, and between caudate nucleus and striatum. These connections have been repeatedly demonstrated in healthy groups regarding the link between musical perception and color perception (Palmer et al., 2013), while the thalamus-basal ganglia connection is involved in attentional focus (Smith, 2022).

Compared to controls, the clinical group shows strengthened connections between visual areas (form and scene), Broca's area with caudate nucleus and striatum (which excites globus pallidus). These findings may indicate a process shifted toward inner speech rather than internal representation. This interpretation is supported by connections of speech-generating structures, such as motor components with globus pallidus (Bakhtin et al., 2020), as well as sound scene integration through putamen-insula connections. Strong connections between thalamus and right-hemisphere area 44, and between Broca's area, caudate nucleus and striatum may reflect use of subvocalization mechanisms to maintain attention on the target line (Vuong et al., 2023).

In controls, there is a tendency for activation of visual regions and supramarginal gyrus activity supporting stimulus interpretation. Visual areas create associative patterns linked to sound movements, so the image is recoded into polymodal visuo-spatial-auditory (rather than verbal) form, enabling accurate motif reproduction (Kholikov, 2023).

The part of the study shown in Fig. 3 differs in that during mental rehearsal, participants had to not simply reproduce the original stimulus automatically, but transform it - extract an internal representation of its part (associated with a specific instrument's sound)

and reproduce precisely that. Common strong connections remain between right basal ganglia structures, possibly supporting nonverbal inner speech (Riva et al., 2018), consistent with fMRI findings (Krysko, Vartanov, Bronov, 2024). Also aligning with fMRI data are cerebellar-occipital connections and right-hemisphere area 44-insula links supporting musical syntax processing (Maess et al., 2001; Kunert et al., 2015; Chiang et al., 2018).

Key differences include weaker left supramarginal gyrus connectivity and hippocampal inhibitory connections in schizophrenia. This may reflect failure to maintain target figures in working memory while potentially retaining/excluding irrelevant components as a compensatory mechanism in chronic illness (Sass & Parnas, 2007). While thalamic connections with putamen, globus pallidus and striatum remain preserved, subcortical-cortical connections are markedly weakened in schizophrenia. This may indicate unconscious extraction of relevant components by excluding irrelevant ones, whereas healthy processing involves conscious foreground-background separation of task-relevant streams (Uhlig, Fairhurst & Keller, 2013). Schizophrenia patients may have selected perceptually dominant rather than task-relevant components, evidenced by enhanced activation in standard polyphony perception zones but weakened control regions (Dutterer et al., 2023).

Thus, during attentional focus on a polyphonic melody line, healthy individuals activate visual regions and supramarginal gyrus enabling precise internal reproduction of instrument-specific components. In schizophrenia, weakened left supramarginal gyrus connectivity and retention of irrelevant components affects internal reproduction, possibly reflecting compensatory mechanisms. Enhanced activity in polyphony perception zones co-occurs with weakened control regions.

Conclusions

Under normal conditions, when focusing on the dominant line of a polyphonic stimulus, activation occurs in visual areas, the supramarginal gyrus, and regions associated with musical syntax. This ensures accurate internal reproduction of the musical motif associated with a specific instrument. Strong connections exist between the right basal ganglia, thalamus, and other structures, supporting the mechanism of subvocalization and attentive perception of musical elements. In individuals with schizophrenia, weakened connections are observed between the left supramarginal gyrus and other areas, along with enhanced activity in regions associated with polyphony perception. This may indicate difficulties in maintaining and internally reproducing relevant musical components, as well as compensatory mechanisms aimed at managing irrelevant information. Under schizophrenic conditions, weakened connections in control areas and enhanced activity in polyphony perception regions may lead to impaired accuracy of internal reproduction and extraction of the dominant line. This supports the hypothesis that schizophrenia affects cognitive processes related to musical perception and internal reproduction.

Thus, the study reveals differences in neural connections and brain region activation during polyphonic music perception between healthy individuals and patients with schizophrenia. Under normal conditions, the processes of focusing and internal reproduction occur more efficiently, whereas in patients with schizophrenia, impairments in these processes are observed, which may be associated with compensatory mechanisms and alterations in musical information processing.

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Vasilisa D. Abrosimova – participation in the development of the research concept, data collection and analysis, discussion of the results, preparation of the manuscript.

Mariia D. Krysko – participation in the development of the research concept, data collection and analysis, discussion of the results, preparation of the manuscript.

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Propensity to Financial Suggestion: Neuropsychological and Psychophysiological Factors

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Abstract

Introduction. Currently, suggestion is employed as a means of manipulation, influence, and directing human activity toward specific goals. Financial suggestion is characterized by high susceptibility of individuals to manipulative influences when making financial decisions. The relevance of this research is driven by the necessity to understand the mechanisms of financial suggestion and develop effective strategies to counter fraudulent influences. The objective of this work is to demonstrate the psychophysiological aspects of susceptibility to suggestion, including the role of the prefrontal cortex, limbic system, and strategies of information perception and analysis in the process of financial decision-making. **Theoretical justification.** Susceptibility to suggestion is examined from the perspective of P.K. Anokhin's theory of functional systems, the concept of dual-stream information processing in the brain, and the specifics of cortical-subcortical interactions. This work identifies key factors that may increase susceptibility to financial suggestion and proposes algorithms aimed at countering manipulations, particularly those employed by telephone fraudsters. These algorithms ensure the formation of a "cognitive buffer" — a process of activating critical thinking and conscious choice. An individual's awareness of their strengths and weaknesses and associated behavioral patterns allows for the selection of the most effective strategies for each step of the anti-fraud algorithm, thereby enhancing the level of protection. **Discussion.** The study presents an interdisciplinary approach to the problem of financial suggestion, based on the synthesis of psychophysiological and social-psychological data. The algorithms proposed in this work can be effectively utilized

to enhance financial literacy among the population and prevent financial fraud, which represents an important direction for contemporary social and economic development.

Keywords

psychophysiology, financial suggestion, financial risks, counteraction algorithms

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Introduction

The dynamic development of civilization creates favorable conditions for the proliferation of manipulative suggestive phenomena. Contemporary communication processes inevitably contain elements of suggestive influence, the manipulative component of which is based on covert psychological impact on individual consciousness. The capabilities for information transmission and perception, as well as psychological control of physical processes, are so extensive that there arises a necessity not only for deeper scientific understanding of these phenomena, but also for widespread awareness of this phenomenon among the general population.

The absence of societal demand for understanding suggestion as a method of influence has proven to be fraught with the proliferation of its pragmatic use for manipulating human psyche.

The first among the conceptual foundations of suggestion is causality, based on physiological, informational, and psychosocial determinants. This sequence of their arrangement is determined by the fact that the original natural causality of suggestion has physiological foundations, functionally connected with informational processes occurring both within the organism and affecting it from the outside. The synthesis of these processes is realized not only at the level of elementary physiological reactions, but also determines cognitive responses, human social behavior, and social orientation. The degree of proliferation of suggestive phenomena inevitably increases with the growth of society's technological potential.

Despite these conclusions, there remains a lack of understanding of the specific psychophysiological processes that may determine the degree of human susceptibility to financial propositions. This knowledge gap limits the development of effective measures to reduce manipulative influences on financial decision-making.

This study is aimed at analyzing the psychophysiological aspects of susceptibility to financial suggestion and developing algorithms to counteract manipulation by fraudsters.

Theoretical justification

Psychophysiological Foundations of Financial Suggestion

Suggestion (suggestibility) today represents one of the most effective methods of influencing masses. Suggestion, as a guiding factor, regulates individual activity, prompting actions and behaviors or restraining from them. Numerous crisis situations, including those of an economic nature, emotional fluctuations in public mood, and the constant need of human consciousness for miracles and spectacle constitute the primary factors that increase suggestibility and contribute to the reduction of critical thinking across various social strata (Finucane et al., 2000; Kahneman, 2003; Griskevicius et al., 2006; Maner et al., 2005).

Biological predisposition to suggestion is determined by the characteristics of the structural-functional organization of the brain and the patterns of its functioning. Suggestibility is a universal property of higher nervous activity. According to the systems approach based on the principles of functional systems theory, formulated in the previous century by P.K. Anokhin (Anokhin, 1973), suggestibility is mediated by the influence of context on the perception of target stimuli. P.K. Anokhin defined context as situational afferentation, and target stimulus as trigger afferentation (Figure 1). Context or situational afferentation consists of external and internal factors that influence the perception of any stimulus.

The functional state of an individual is mediated by the influence of both external and internal factors. During fatigue, and particularly under stress conditions, susceptibility to suggestion increases.

Individual differences in suggestibility are also associated with specific characteristics of perception and analysis of information necessary for the brain to make decisions and program actions. According to the final common pathway principle — one of the fundamental laws of higher nervous activity — the prefrontal cortex serves as the site of accumulation for all information upon which decisions are made and actions are programmed. In accordance with the two-pathways theory (Goodale & Milner, 1992; Johnson-Frey, 2004; Laycock, Crewther & Chouinard, 2020; Shmuelof & Zohary, 2005), information necessary for decision-making is transmitted from the posterior (caudal) regions of the cerebral cortex to the anterior frontal areas, particularly to the prefrontal cortex, via two streams — the parietal (dorsal) and temporal (ventral) pathways (Figure 2).

Figure 1

A diagram of the structure of a behavioral act according to the theory of functional systems.

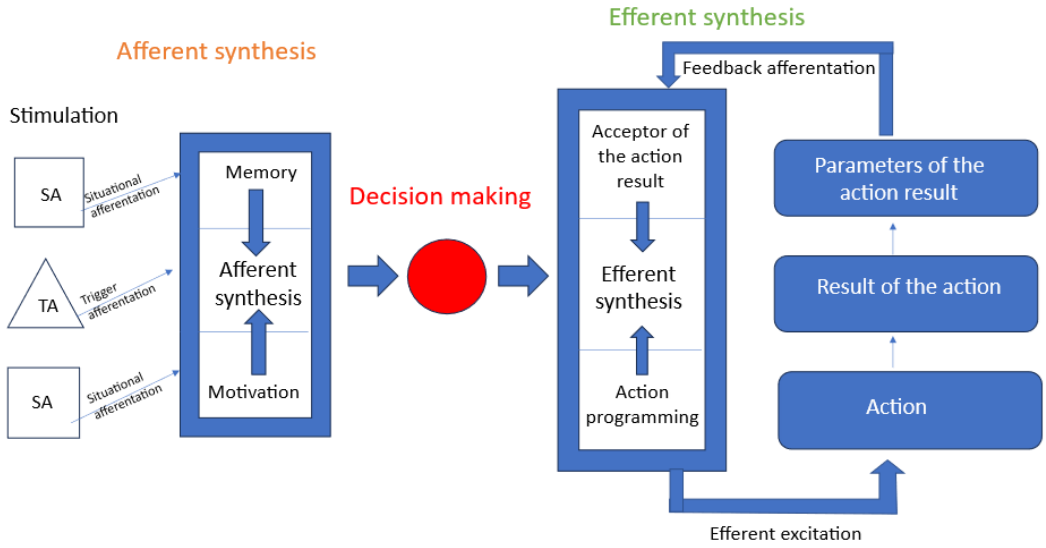
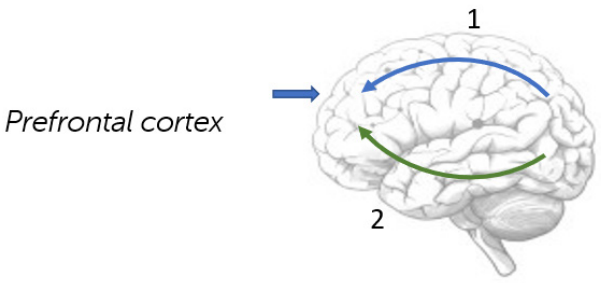


Figure 2

Schematic representation of the parietal (1) and temporal (2) information pathways from the pathways



The existence of two information transmission streams to the prefrontal cortex was initially demonstrated for the visual system (Livingstone & Hubel, 1987; Merigan & Maunsell, 1993), and later for the auditory system and the speech functional system. Perceptual integrity is achieved through the interaction between parietal and temporal streams, which essentially constitute large-scale neural networks. This involves not only the cortical level of information processing, but also the interconnections of these streams with subcortical structures. It has been shown that the inferior nuclei of the pulvinar — the thalamic hub for all information traveling through the brainstem to the cerebral cortex and back to executive structures — connect predominantly with the parietal (dorsal) pathway, while the more lateral nuclei connect with the temporal (ventral) pathway (Tamietto & Morrone, 2015; Troiani & Schultz, 2013; Troiani et al., 2014). The authors report the involvement of the amygdala — a key structure of the limbic system — along with the parietal cortex and frontal eye field, which are components of the parietal (dorsal) cortical pathway, in the process of rapid subconscious evaluation of emotional stimuli (fearful faces).

The nature of interaction between large-scale neural networks of the parietal (dorsal) and temporal (ventral) pathways has individual characteristics that determine strategies for information perception, thinking and decision-making, cognitive responses, and behavior (Shoshina, Shelepin, 2016). In behavioral terms, these characteristics are manifested, among other things, in susceptibility to suggestibility. The activity of the parietal (dorsal) pathway network is associated with the mechanism of global information analysis, while the temporal pathway is associated with the mechanism of local information analysis. The global mechanism of information analysis can alternatively be termed holistic, when information about different stimulus features is processed pathway processing of stimulus details, which requires considerably more time than global analysis. The dominance of the global information analysis mechanism over the local one, as an individual characteristic, manifests in a tendency to make quick decisions, which, in the absence of expertise, threatens a high number of errors. An important point here is that the parietal (dorsal) pathway has more extensive connections with subcortical structures, particularly with the amygdala, which is responsible for emotional reactions, including fear, aggression, anxiety, etc. Therefore, it is logical to assume that individuals with dominance of the global information analysis mechanism will be more prone to suggestibility.

Thus, neurophysiological mechanisms associated with the peculiarities of perception and information processing, as well as with emotional reactions, underlie people's susceptibility to financial suggestion and receptivity to manipulative influences. Based on the above, the following conclusions can be drawn:

1. Susceptibility to financial suggestion (suggestibility) has biological foundations related to the specific features of the structural-functional organization of the brain and the patterns of its functioning.

2. Susceptibility to suggestion is mediated by the influence of context (environmental afferentation) on the perception of the target stimulus. The functional state of an individual, such as fatigue and stress, is characterized by increased susceptibility to suggestibility.

3. Individual differences in susceptibility to suggestibility are associated with peculiarities of perception and information analysis. The dominance of the global (holistic) information analysis mechanism over the local (sequential) analysis is associated with greater susceptibility to suggestibility, as the parietal stream of information transmission to the prefrontal cortical areas has closer connections with central structures regulating emotional reactions, particularly with the amygdala.

4. The activity of emotional brain centers, such as the amygdala, and the suppression of prefrontal cortex functions in stressful situations contribute to reduced critical thinking and increased susceptibility to suggestion.

Factors That Increase the Propensity for Financial Suggestion

Analysis of factors that increase people's susceptibility to financial manipulations can help advance understanding of the mechanisms underlying human vulnerability to financial fraud and develop effective countermeasures. Contributing factors may be associated with emotional state, cognitive characteristics, social conditions, and personal traits. In this regard, we propose to identify five groups of factors: emotional state, lack of knowledge and awareness, social isolation, cognitive and age-related factors, and psychological characteristics.

Emotional state

Fear and Anxiety. Fraudsters frequently employ intimidation communication tactics to induce fear and anxiety, for example, by claiming that an individual has tax problems or that their banking information has been stolen (LeDoux, 2000). States of fear and anxiety are accompanied by activation of the amygdala – a key structure of the limbic system responsible for emotional reactions – and decreased activity in the prefrontal cortex, which is responsible for conscious behavioral control (Drozd et al., 2024). This makes individuals more susceptible to manipulation.

The fight-or-flight response represents one of the fundamental survival strategies activated by the organism in response to stressful or threatening situations. This response is triggered during interactions with financial fraudsters and encompasses the following physiological and behavioral changes:

1. Activation of the sympathetic nervous system: elevation of noradrenaline, adrenaline, and cortisol levels in the blood; increased heart rate and respiratory rate; elevated blood pressure; increased perspiration for body cooling; pupil dilation;
2. Mobilization of energy resources: redistribution of blood flow (e.g., from the digestive system to muscles); release of glucose and fatty acids into the bloodstream to provide energy for muscles;
3. Behavioral responses: "fight" strategy – aggressive resistance and confrontation with the fraudster; "flight" strategy – rapid termination of contact and avoidance of the situation;
4. Cognitive changes: diminished capacity for rational thinking and situational analysis; threat-focused attention; increased impulsivity and reduced self-control.

These physiological and behavioral reactions are adaptive in situations of real danger, but may be maladaptive when interacting with financial fraudsters. It is important to learn to recognize the signs of fight-or-flight response activation and apply regulatory strategies, such as deep (diaphragmatic) breathing, for example. This will help maintain critical thinking and facilitate more balanced decision-making.

The balanced interaction between the prefrontal cortex and limbic system represents a crucial neurophysiological mechanism that ensures adaptive human behavior across various situations (Hanganu-Opatz et al., 2023).

The prefrontal cortex (PFC) is responsible for higher-order cognitive functions, including decision-making, action planning, cognitive flexibility, emotional regulation (such as suppression of aggression or maladaptive behaviors), and critical thinking (Drozd et al., 2024). The PFC conducts "cold," rational situation analysis, risk and consequence assessment, and selection of optimal behavioral strategies.

The limbic system, comprising the amygdala, hippocampus, and other structures, governs emotional responses, motivation, and emotional memory formation. The amygdala plays a pivotal role in rapid assessment of stimulus emotional salience and initiation of corresponding emotional reactions (fear, anger, anxiety) (Polunina, Bryun, 2013; Lockwood et al., 2024). The hippocampus participates in forming new memories and associations related to emotional events.

Under normal conditions, the PFC regulates and controls emotional reactions initiated by the limbic system. The PFC can modulate limbic system activity, suppressing excessive emotional responses and directing behavior in accordance with current goals and situational context. However, during intense emotional arousal or stress, PFC functions may be temporarily suppressed, resulting in emotional reactions predominating over rational control. Thus, alterations in the interaction pattern toward predominant limbic structure activity (particularly the amygdala) leads to diminished conscious behavioral control.

The tendency toward instant financial gratification activates the brain's reward system, which is associated with the dopaminergic system (Volkow & Morales, 2015; Mazhirina et al., 2021). This can lead to impulsive, ill-considered decisions, thereby increasing vulnerability to fraud.

The influence of neurotransmitters on human behavior varies significantly depending on individual characteristics, experience, and current emotional state.

1. Individual characteristics:

• genetic predisposition to certain neurochemical profiles may influence tendency toward risk-taking, impulsivity, anxiety, and other behavioral patterns;

• baseline secretion levels of neurotransmitters such as dopamine, serotonin, and noradrenaline exhibit individual variations and may determine financial behavior;

• receptor sensitivity to neurotransmitters is also an individual characteristic.

2. Experience:

• previous investment experience, successes and failures can influence the development of conditioned reflexes and neurochemical reactions;

• duration of investment activity may alter sensitivity to risks and rewards;

• acquired skills and decision-making strategies, in turn, can modulate the influence of neurotransmitters.

3. Current emotional state:

• stressful situations, anxiety, and fear trigger surges of noradrenaline and cortisol, affecting risk perception;

• euphoria and excitement from successful trades activate the dopaminergic reward system, provoking overconfidence;

• depressive states, associated with reduced serotonin levels, may lead to pessimistic forecasts and risk avoidance.

Thus, neurochemical factors play a pivotal role in human financial behavior, but their influence is modulated by individual characteristics, experience, and current emotional state. Understanding these mechanisms is crucial for developing effective strategies for financial risk management.

Lack of knowledge and awareness

Individuals who lack awareness of existing fraud schemes, such as phishing, fraudulent investment offers, telephone scams, and similar tactics, are more susceptible to victimization as they cannot recognize warning signals (Cialdini, 2007). Without understanding how these schemes operate, it becomes more difficult to identify inconsistencies in the information provided by fraudsters. Ignorance of existing deception methods renders individuals more trusting toward enticing yet dubious propositions. They may be less inclined to verify information and subject it to critical analysis.

A lack of knowledge regarding how modern technologies function and what constitutes internet security can make an individual vulnerable to cybercrime (Furnell, 2005).

Social isolation

Lonely individuals experience a need for social acceptance and belonging, which makes them more susceptible to offers of friendship or romantic relationships, even from strangers (Cacioppo, Hawkley, 2009). Social isolation diminishes self-esteem and self-confidence, thereby increasing trustfulness toward other people.

The experience of loneliness activates brain regions associated with pain and stress, such as the anterior cingulate cortex (part of the limbic system) and the insular cortex. This creates physical discomfort that individuals seek to alleviate. Social isolation leads to decreased activity in cortical areas responsible for social cognition and empathy, such as the medial prefrontal cortex and the temporoparietal junction. The lack of social connections and support weakens the ability to critically evaluate information and make well-informed decisions, as these functions are linked to prefrontal cortex activity (Murugan et al., 2017).

The absence of support from close individuals with whom one can discuss suspicious situations reduces the likelihood of timely fraud detection (Catani, Mesulam, 2008).

Thus, loneliness and social isolation create favorable conditions for successful manipulation by fraudsters. Restoring social connections, enhancing self-esteem, and building self-confidence may serve as important preventive measures against financial fraud.

Cognitive and age-related factors

Age-related cognitive changes and deficits in digital literacy among elderly individuals represent significant factors that render them more vulnerable to financial fraud (Cialdini, 2006).

Age-related cognitive changes:

• The capacity to rapidly perceive, analyze, and respond to new information declines with age, thereby complicating the recognition of fraudulent schemes;

• Deterioration of memory function observed in advanced age impedes the ability to verify provided information, with elderly individuals generally demonstrating poorer recall of conversation details with fraudsters;

• Reduced capacity for abstract thinking may weaken elderly individuals' ability to critically analyze complex financial offers;

• Diminished ability to control impulsive decision-making increases elderly individuals' vulnerability to fraudster manipulation;

• Individuals with cognitive impairments or mental disorders exhibit heightened vulnerability to manipulation (Petersen, 2004).

Digital literacy deficits:

• Insufficient knowledge of modern technologies and lack of skills in using computers, smartphones, and the internet impedes recognition of online fraud;

• Absence of skills for secure use of banking cards, online payments, and other financial instruments also renders elderly individuals more vulnerable to fraudster manipulation.

Thus, age-related cognitive changes and digital literacy deficits among elderly individuals diminish their capacity to recognize fraudulent schemes, critically evaluate information, and make informed financial decisions. This renders them more vulnerable to various forms of financial fraud involving the use of modern technologies.

Psychological features

Gullibility. Individuals prone to trusting others without adequate information verification can easily fall victim to fraudsters (Greenspan, Rogers, 2016). They demonstrate reduced critical thinking, which impedes the recognition of deception indicators. Gullibility is associated with diminished capacity for reflection and analysis of one's own judgments.

Gullibility is often linked to personality traits such as low self-esteem, lack of self-confidence, and heightened need for approval. Certain personality characteristics, including naivety, altruism, and conformity, increase the likelihood of gullible behavior.

The neurobiological foundations of gullibility are related to the functioning of the social cognition system, encompassing the amygdala, medial prefrontal cortex, and other brain structures. Individuals with heightened amygdala activity and reduced prefrontal cortex activity tend to trust unfamiliar people and their claims more readily. Disruptions in these systems, such as those occurring in certain psychiatric disorders, may intensify gullibility.

Among the social factors influencing gullibility are loneliness and social isolation. An increased need for trusting relationships renders individuals more vulnerable. Persons with high affiliation needs (belonging to a group) are more prone to gullibility. Cultural norms that encourage trust in authorities may also contribute to the development of gullible tendencies.

Understanding the neurobiological, cognitive, social, and personality factors underlying gullibility is crucial for developing effective strategies to protect against financial fraud.

Desire to help. Fraudsters frequently exploit people's desire to help others by creating false stories about disasters or needs for assistance (McCrae, Costa, 2004). This manipulation is also accompanied by activation of limbic structures and the medial prefrontal cortex involved in the empathy functional system.

Increasing awareness of contemporary deception methods, training in recognition of fraud indicators, developing critical thinking and decision-making skills under manipulative conditions can help reduce the vulnerability of gullible individuals and decrease the risk of falling victim to fraud.

Decision-making algorithms in the context of financial suggestion

Contemporary research in behavioral economics and cognitive psychology demonstrates that the process of financial decision-making under suggestive influence is characterized by specific neurophysiological mechanisms that can be systematized as sequential algorithmic models (Kahneman, 2011). Understanding these mechanisms is critically important for developing effective strategies to counter financial fraud, as it allows identification of vulnerable points in human decision-making processes (Thaler & Sunstein, 2008).

Research by Daniel Kahneman and Amos Tversky in the field of prospect theory has shown that human decisions under conditions of uncertainty systematically deviate from rational models (Kahneman & Tversky, 1979). These deviations become particularly pronounced in situations involving emotional stress and time constraints, which is actively exploited in fraudulent schemes (Loewenstein & Lerner, 2003). Antonio Damasio, in his work on neuroeconomics, demonstrated that emotional processes play a pivotal role in financial decision-making, often prevailing over rational considerations (Damasio, 1994).

The algorithm of the impact of telephone scammers on the victim

The mechanism employed by telephone scammers represents a complex multi-stage system built upon the exploitation of cognitive biases and neurophysiological characteristics of the human brain. This algorithm can be conceptualized as a sequence of interconnected stages, each designed to suppress critical thinking and stimulate impulsive behavior. The initial contact is characterized by strategic utilization of the principle of authority, as described in the seminal works of Robert Cialdini (Cialdini, 2007). Fraudsters present themselves as representatives of banking institutions, law enforcement agencies, or government services, which triggers activation of the prefrontal cortex, responsible for assessing the social significance of information sources (Klucharev et al., 2009). Research in social neuroscience demonstrates that exposure to authoritative figures induces specific changes in medial prefrontal cortex activity, thereby reducing critical evaluation of incoming information (Berns, 2010). Simultaneously with the establishment of authority, a process of credibility validation occurs through the utilization of the victim's personal data. This mechanism is based on the operational principles of the hippocampus, which performs comparison of new information with existing memories (Squire et al., 2009). When a scammer demonstrates knowledge of the victim's name, address, or partial information about banking transactions, this creates an illusion of contact legitimacy and activates neural networks associated with trust formation (Rilling & Sanfey, 2011).

The next critical phase of the algorithm involves creating artificial time scarcity and emotional tension. Fraudsters report allegedly occurring unauthorized transactions or security threats, which leads to amygdala activation and triggers a stress response (LeDoux, 2000). Neurophysiological studies demonstrate that under conditions of acute stress, there is a significant deterioration in the functioning of executive functions of the prefrontal cortex, making individuals more susceptible to external influence (Arnsten, 2009). Simultaneously, the sympathetic nervous system is activated, leading to the release of noradrenaline and cortisol, further disrupting rational analysis processes (Sapolsky, 2004).

The introduction of threat elements enhances emotional impact and suppresses critical thinking. Scammers employ intimidation communication tactics, threatening arrest, account freezing, or other negative consequences (Petty & Cacioppo, 1986). This leads to further intensification of amygdala activity and suppression of prefrontal cortex functions, creating a state in which the capacity for rational thinking is minimized (Phelps, 2006).

Under conditions of emotional tension and time deficit, there occurs a critical reduction in information processing quality. Research shows that under stress, people tend to use heuristics and cognitive anchors, making them more vulnerable to manipulative influences (Starcke & Brand, 2012). Activation of the dopaminergic system through promises of quick problem resolution or reward acquisition stimulates impulsive behavior and reduces capacity for long-term planning (Berridge & Robinson, 2003).

The final phase of the algorithm involves direct execution of actions according to the scammer's instructions. At this stage, the victim follows the fraudster's directions, providing personal data or making money transfers. Neurophysiologically, this is accompanied by motor cortex activation for performing physical actions (Rizzolatti & Craighero, 2004). Scammers maintain constant contact to prevent doubt from arising and preserve control over the situation, achieved through continuous activation of the brain's emotional centers (Schachter & Singer, 1962).

After completion of the fraudulent operation and termination of contact, gradual restoration of the prefrontal cortex's controlling function over the limbic system occurs. This allows the victim to critically reflect on what transpired and begin situation analysis, which often leads to recognition of the fraud (Metcalfe & Mischel, 1999). This process may be accompanied by pronounced negative emotional reactions, including feelings of shame, anger, and self-blame (Tangney & Dearing, 2002).

An algorithm for countering phone scams from a potential victim

Developing effective strategies to counter phone fraud requires a deep understanding of the neurophysiological mechanisms of decision-making and cognitive processes underlying human behavior under stress conditions (Loewenstein & Cohen, 2008). Contemporary research in neuroeconomics enables the formulation of a scientifically grounded algorithm for protection against fraudulent influences, based on principles of emotional reaction management and critical thinking activation (Camerer, Loewenstein & Prelec, 2005).

The initial stage of counteraction begins from the moment of receiving a suspicious call and involves forming a defensive mindset based on the principle of healthy skepticism. Daniel Gilbert's research in social psychology demonstrates that the human brain is inherently predisposed to trust incoming information, which renders us vulnerable to manipulative influences (Gilbert, 1991). Overcoming this natural tendency requires conscious activation of the prefrontal cortex through the application of critical thinking techniques (Stanovich & West, 2000). An effective approach involves employing the principle of "presumption of distrust" toward unfamiliar callers, particularly when they identify themselves as representatives of financial or governmental institutions (Vrij, 2008).

A key element of the defensive strategy is the management of physiological stress responses. Barbara Fredrickson's work in positive psychology demonstrates that controlled breathing techniques can effectively modulate autonomic nervous system activity and reduce cortisol levels in the blood (Stanovich & West, 2000). Diaphragmatic breathing, in particular, activates the parasympathetic nervous system, leading to decreased amygdala activity and restoration of the prefrontal cortex's regulatory function (Porges, 2011). Research by Andrea Zaccaro and colleagues confirms that slow, deep breathing with emphasis on extended exhalation can rapidly reduce psychological stress levels and improve cognitive functions (Zaccaro et al., 2018).

Information verification represents a critically important component of the defensive algorithm, based on principles of evidence-based assessment. Robert Cialdini, in his work on the psychology of influence, emphasizes the importance of independent information verification as a method of counteracting manipulative techniques (Cialdini & Goldstein, 2004). Neurophysiological studies show that the process of actively searching for and comparing information stimulates hippocampal and dorsolateral prefrontal cortex activity, which contributes to more objective situational assessment (Buckner & Carroll, 2007). The practical implementation of this principle involves mandatory termination of conversation with suspicious callers and independent contact with the relevant organization through official communication channels (Klayman & Ha, 1987).

Managing emotional reactions during decision-making processes requires understanding the interaction mechanisms between the limbic system and prefrontal cortex. Kevin Ochsner's research in cognitive neuroscience demonstrates that conscious application of emotional regulation strategies can effectively modulate amygdala activity and reduce emotional influence on decision-making processes (Ochsner & Gross, 2005). The cognitive reappraisal technique allows for reformulating emotionally

charged stimuli in more neutral terms, facilitating the activation of rational thinking processes (Gross, 2002).

A particular role in the defensive algorithm is played by counteracting artificially created time pressure. Dan Ariely's research in behavioral economics demonstrates that time scarcity is one of the most effective tools for influencing decision-making processes (Ariely & Silva, 2002). The neurophysiological mechanisms of this phenomenon are associated with stress response activation, which disrupts normal executive brain function (Lupien et al., 2009). An effective counteraction strategy involves consciously slowing the pace of interaction and creating pauses for reflection, allowing for the restoration of prefrontal cortex control over emotional reactions (Baumeister & Heatherton, 1996).

Written information recording represents a powerful cognitive defense tool based on principles of distributed attention and external memory. Research by Betsy Sparrow and colleagues demonstrates that the process of recording information activates multiple cognitive systems, including working memory, attention, and executive functions (Sparrow et al., 2011). This leads to deeper information processing and enhanced critical perception (Mueller, P. A., & Oppenheimer, D. M., 2014). Additionally, the physical act of writing can serve as a form of "anchor," helping maintain emotional stability in stressful situations (Clark & Chalmers, 1998).

The recording process also contributes to disrupting the fraudster's communication scenario, forcing them to deviate from their pre-prepared script. Research in social psychology shows that disrupting habitual interaction patterns can significantly reduce the effectiveness of manipulative techniques (Pratkanis & Aronson, 2001). When a potential victim begins asking clarifying questions and requesting information repetition for recording purposes, this creates additional difficulties for the fraudster and may lead to their abandonment of the operation (Levine, 2014).

The final element of the defensive algorithm involves ensuring social support and external validation of decision-making processes. Shelley Taylor's research in social psychology emphasizes the importance of social connections for maintaining psychological well-being and making adequate decisions (Taylor, 2011). Practical implementation of this principle involves mandatory discussion of suspicious situations with trusted individuals or specialists, allowing for independent assessment and avoiding the isolation that fraudsters often create (House et al., 1988).

Personal characteristics and behavioral strategies of a potential victim of telephone fraud.

According to H.J. Eysenck's personality theory, several personality traits (sociability, impulsiveness, activity, etc.) can be identified and grouped into trait continuums of extraversion and neuroticism (Mitchell, Kumari, 2016). Each dimension possesses two poles: extraversion-introversion and neuroticism-emotional stability.

Extraversion is characterized as an orientation toward others, social interaction, and impulsiveness. Extraverts are distinguished by sociability, a desire for social contact, and activity, whereas introverts are characterized by withdrawal and avoidance of large groups. Extraverts establish contact more readily and may recognize manipulation attempts more quickly, but they may be prone to impulsive actions under emotional influence. Introverts are more inclined toward reflection and analysis, which helps them verify and analyze information. However, they may experience significant stress when communicating with strangers.

Neuroticism indicates a tendency to experience frequent and intense negative emotions (Cervone, Pervin, 2015). Individuals with high neuroticism are prone to anxiety, negative emotions, and worry. Low neuroticism—emotional stability—conversely implies balance, calmness, and restraint in emotional expression. High levels of self-control facilitate emotional regulation and resistance to pressure. Individuals who prefer to actively avoid conflicts may terminate suspicious conversations more quickly, but they may consequently miss opportunities to gather important information for subsequent verification. Proponents of active resistance strategies tend toward actively clarifying circumstances and verifying information, but may be more vulnerable to emotional pressure.

Strategies of behavior in the context of possible fraudulent actions

When confronting potential fraud, every individual undergoes several critical stages where their psychological characteristics can either facilitate or impede appropriate responses. Initial contact with fraudsters often catches people off guard, particularly introverts who experience significant stress from unexpected calls. At this moment, it is crucial to activate defensive mechanisms and resist the first impulse. Extraverts, conversely, may engage in conversation too readily, making them vulnerable to manipulation.

The subsequent stage involves verifying the credibility of incoming information. Here, individuals with a skeptical disposition gain an advantage, as they are naturally inclined to

question any assertions. High levels of self-control enable individuals to maintain clarity of thought and methodically request additional information for verification. It is precisely this capacity for self-control that becomes the decisive factor in managing emotions, which fraudsters actively attempt to exploit to achieve their objectives.

Decision-making under fraudulent influence requires a specialized approach. Active resistance helps gather more information about the interlocutor's intentions, though it is essential to avoid emotional decision-making. Sometimes an active avoidance strategy proves more effective, allowing for rapid termination of suspicious contact. The conclusion of interaction also has distinct characteristics: extraverts are more likely to report fraud attempts to appropriate authorities, which is important for preventing future incidents.

This entire process represents the activation of critical thinking—creating a cognitive buffer between stimulus and response. At the neurophysiological level, this means maintaining the controlling function of the prefrontal cortex over limbic structures responsible for emotional and impulsive reactions. The better an individual can preserve this control, the higher their chances of avoiding fraudulent schemes.

Conclusion

Currently, the use of suggestion as a means of manipulation, influence, and directing human activity toward specific objectives is inevitable. It is essential to recognize the biological and social predisposition to suggestion. Telephone fraudsters employ a systematic algorithm of influence on victims, aimed at activating emotional brain centers (amygdala, limbic system) and suppressing rational thinking (prefrontal cortex). This algorithm enables fraudsters to effectively manipulate the victim's consciousness and achieve their objectives.

Countering telephone fraud requires a conscious approach to each step of interaction. It is crucial to maintain composure, employ critical thinking, and verify information accuracy (Medyanik, 2024). These actions help reduce the influence of emotional brain centers (amygdala) and maintain the activity of rational areas (prefrontal cortex), enabling thoughtful and safe decision-making. Recording information provided by the fraudster can serve as a strategic tool that helps activate higher cognitive brain functions, reduce stress levels, and improve decision-making quality.

This article proposes algorithms and strategies for countering financial fraud based on understanding the psychophysiological characteristics of information perception and victim behavior. Awareness of one's strengths and weaknesses regarding personality

traits and associated behavioral strategies will help select the most appropriate strategies for each step of the fraud countermeasure algorithm and enhance overall security.

Increasing awareness of contemporary deception methods, training in fraud recognition, developing critical thinking, and decision-making skills under manipulative conditions can help reduce the risk of becoming a victim of fraud.

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Author's contribution

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Conflict of Interest Information

The authors have no conflicts of interest to declare.