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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.

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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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Hardware-software complex for tensotremometric measurements in psychophysiological research

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Abstract

Introduction. One of the methods of assessing human psychoemotional reactions (PER) is measuring motor system activity. Traditionally, to register involuntary components of PER methods of measuring physiological tremor are used. This paper presents comparative analysis of different methods for tremor registration and also presents a description of a new pen-shaped device outfitted with tensometric sensors to assess severity of stress PER. **Methods**. The device includes tensometric sensors connected to analog-digital conversion device and microcontroller in order to translate the signal to administrator's terminal. The signal contains tensotremorometric data from three fingers, corrected according to maximum voluntary contraction (MVC) of the subject. Said signal is then divided into overlapping segments which are then filtered for the frequency of physiological tremor and analyzed using Epps-Singleton criteria. **Results**. A plan of study that allows to assess severity of stress reaction using presented device is tested. It is shown that if a stressor is introduced, then changes of the background tensotremorogram coincides with the moment of stressor introduction. A prototype for software-hardware complex for assessing PER based on tensotremometry registration and analysis is introduced. **Discussion**. Hypotheses regarding the specifics of connection between tensotremorogram changes and stressor characteristics are formulated. Further developments of technology are discussed.

Keywords

psychoemotional reactions (PER), stress, involuntary movements, vegetative neural system, physiological tremor, tensotremorometry, sliding window, Epps-Singleton criteria, force-sensitive resistor, maximum voluntary contraction

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Introduction

One of the classic criteria of stress-induced psychoemotional reaction (PER) is tremor (Alexandrov, Uplisova, Stepanov, Ivanova, 2017). Physiological normal (muscular) tremor is defined as oscillations of forces, created by coordinated work of different neuromotor units.

The main characteristics studied when assessing tremor are frequency and amplitude. Based on the literature, tremor characteristics allow to diagnose current psychophysiological state of a person in range of 8-16 Hz (Alexandrov, 2018; Dick, Nozdrachev, 2019; Kruchinin, Lebedev, Kholmogorova, 2013; Aleksanyan, Bureneva, & Safyannikov, 2018; Carignan, Daneault, & Duval, 2012; Young, 1933).

Currently the main methods used to measure tremor are electromyography, accelerometry, tensotremometry and video (Govorova, Popova, Tappakhov, 2019). Choice of the method is defined by the goals of the research, experimental procedure, restrictions of the workspace and data analysis technology available.

Main task of accelerometry is measuring tremor amplitude based on data about acceleration and coordinate changes using information from rotational speed sensors (Bobylev, Bolotin, Voronov, Kruchinin, 2012; Ishlinsky, 2018). From biomechanical perspective, accelerometry is a kinematic method. While it is pretty handy, it has some important restrictions: imprecision of the gyroscope, dependence on the ADC precision and quality of the amplifier and difficulties registration when finger amplitude is very small (Elble & McNames, 2016). The fact that accelerometer measures absolute acceleration (combination of accelerations forced upon it) restricts usage of this method when dynamic changes of hand positions are required. Another significant drawback of accelerometry is lack of ability to differentiate between postural, physiological and other kinds of tremor.

Electromyography (EMG) mostly enables gaining important data and has a number of advantages, being cheap, non-invasive and safe, but also having a stable signal due to stable mount (Meygal, Rissanen, Zaripova, Miroshnichenko, Karyalinen, 2015). In most cases EMG uses surface mount. This restricts the data, because pair of surface electrodes

is able to gather data only about activity of close laying motor units tangentially to the muscle. However, in cases where complex mathematical analysis is needed, EMG appears worse than other methods due to unavoidable low-frequency filtration of signal by the skin (Gygi & Moschytz, 1997).

Videoregistration (Pintea et al, 2019; Williams et al, 2020) is a handy contactless method that needs a complex mathematical apparatus to analyze (often including artificial neural networks) and lacks the ability to analyze high-frequency or low-amplitude tremor due to technical limitations of recording camera. IF the need to increase precision arises, high resulting price of a stand makes videoregistration prohibitively expensive to use.

As an alternative to said methods there is tensotremorometry (TTM). It allows to evade unwanted "physiological" filtration, is non-invasive, safe and allows to register tremor of any frequency or amplitude desired. The "gold standard" of TTM is a load cell, which works on the idea of tensoresistors changing their resistance when deformed. A load cell consists of one or more tensoresistors mounted on a metal plate that is elastically deformed under the force. The main drawback of load cells is inability to change the sensitivity, because most of the time precision of a tensoresistor is a fixed value (Ohm/N) and doesn't change based on applied force. This property lays base for a wide use of load cells in scales of varying purpose but it disables the ability to use said cells while researching tremor. This is because change in amplitude of tremor may be tenth, hundredth or even thousandth part of general pressure, and sensors that can reliably gather data that precise are very expensive and largely unavailable.

Sensors based on capacitive (Denner, 1999) or inductive (Pedersen, 2006) schemes have high precision on small and extremely small deltas but are largely unusable when applied forces are high. Those sensors may have limited use when measuring resting tremor, but using those in conditions of movement activity appears hard or even impossible.

In order to find technical (software-hardware) solution that allows to lift those restrictions from the TTM method, an experimental method was created. It is based on registration of tremor data using TTM with active movement of the hand. Past research is mostly limited to measuring "average" forces or is related to pathological tremor (Baur, Fürholzer, Jasper, Marquardt, & Hermsdörfer 2009; Lin et al., 2019).

Analyzing tremorogram during movement activity requires more complex hardware that not only has required resolution to measure small differences, but also filter movement activity, including smallest of the movements. This is unachievable by accelerometry, videoregistration and electromyography and most common method of TTM using load cells doesn't have the required resolution.

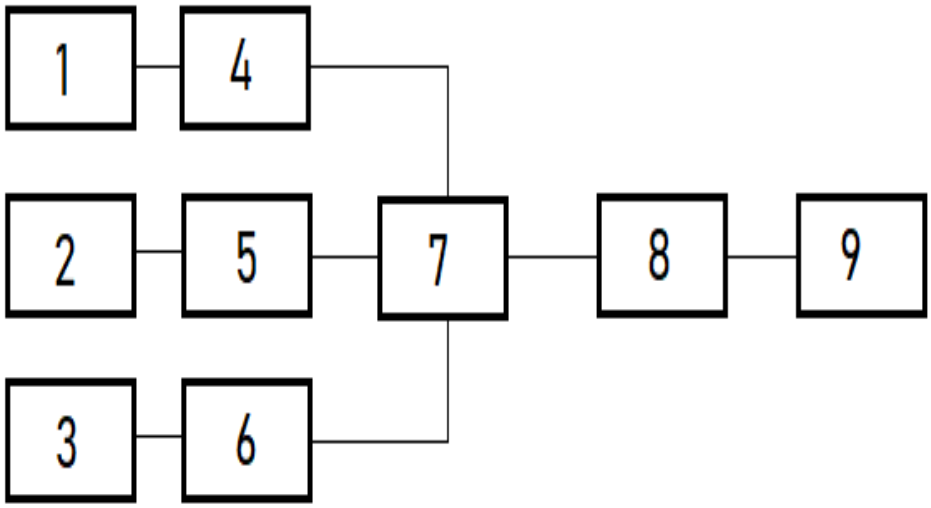
This study presents sample of hardware-software complex (HSC) that contains statistic and hardware improvements that allow to measure finger tremor when holding pen using TTM. Pilot studies are presented that illustrate the potential of improving stress reactions diagnosis using TTM methods with suggested improvements.

Methods

Suggested methodic relies on the new type of force sensors that allows to measure small differences in tremor in wide range of movement forces. The sensors are built upon force-sensitive resistors that have high resolution in certain range of forces and much lower in other ranges (Baker & Sanchez, 2006). Setting the high-resolution range in accordance with individual characteristics of a participant allows to gather measurements of tremor with high sensitivity while negating the influence of other forces.

Schematics for the device are presented on Figure 1.

Figure 1
Schematics for the device



Note. *1, 2, 3 – FSR-based force sensors, 4, 5, 6 – voltage dividers, 7 – ADC module, 8 – microcontroller, 9 – network link to administrator terminal.*

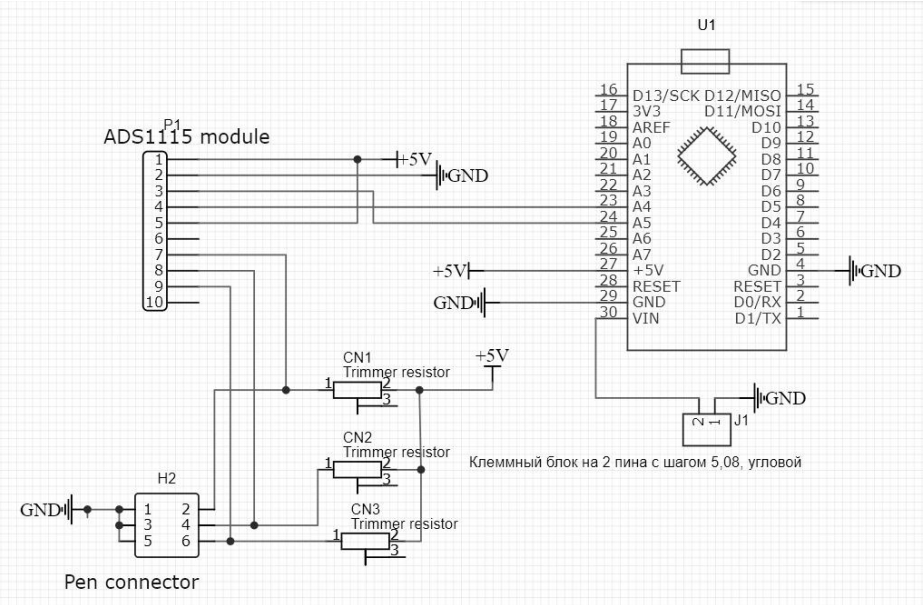
When creating sample device, most common activities involving small hand movements were analyzed. Assuming that using pen and paper is quite common in the everyday life and using pen requires three fingers, pen-shaped form for the device was chosen (Figure 2). An additional description of the device is provided in the article (Belinsky, Devishvili, Chernorizov, Lobin, 2023). Sample device has outer module in the shape of a pen, including digital pen compatible with Wacom tablets. This enables the potential ability to combine TTM data from the pen with handwriting analysis from the

tablet. Module has three tensometric sensors attached under the fingertips while using the tripod grip. Tripod grip is a method of handling pen based on the middle finger with thumb and index finger controlling the pen (Donica, Massengill, & Gooden, 2018).

Figure 2
Device appearance

Measurements, preparation and sending data to the administrator terminal are handled by the main module. Main module contains ADC adapter, ATMega328PB-based microcontroller and network microscheme in the form of USB-UART adapter. Electrical schematics are presented on figure 3.

Figure 3
Electrical schematics for the main module



Note. *U1 – microcontroller, P1 – ADC module, H2 – contacts for the pen module, CN1-3 – trimmer resistor*

Since tremor changes can occur on relatively high frequencies, according to Shannon-Nyquist theorem, sampling frequency was chosen higher than 120Hz in order to fully measure all meaningful ranges of tremor frequency (5-60Hz). Sample device allows to gather data from three force sensors in parallel and independently from each other, however, further development might include more data gathering points.

Changes in pressure force created by tremor were compensated by using sensors based on force-sensitive resistors (Baker & Sanchez, 2006). Connecting said sensors on one leg of voltage divider gives non-linear, but well-approximated as linear changes on voltage on other leg, assuming ranges are relatively small, which is the case with tremor.

In order to compensate for individual differences in pen handling manner for each test subject a 100k Ohm trimmer resistor was used. This allowed for a calibrating session with each participant before main study. Too low (less than half of measurement range) or too high (significantly more than half of measurement range) MVC leads to losing precision. In order to calibrate participant was asked to take the pen with the tripod grip and then hardware was adjusted so MVC of the participant correlated with 2.7 V on the voltage divider leg (~55% of the measuring scale for 0-5V ADC). Empirically this is the best value for getting high precision out of the device, but math required to find out the precise best value is still in development.

Since each of tremor frequencies gives information about a particular source of motor reaction, in order to analyze data, it is needed to get the precise frequency range. To achieve this, 6-th order bidirectional Butterworth filter was used.

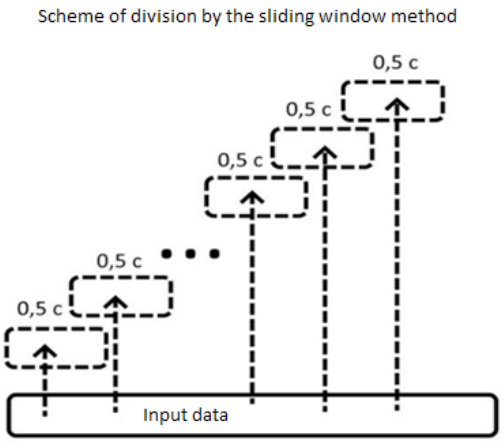
While analyzing the recording, sliding window method was used. This method divides recording into overlapping parts, which are then independently analyzed. Schema of the method is presented on figure 4. This method allows to find reaction time on tensotremorogram and overlapping windows allows to find part that contains the reaction the fullest (Fumarola, Ciampi, Appice, & Malerba, 2009).

For statistical analysis the Epps-Singleton criteria was used. Main advantages of the criteria are ability to be used with discrete data and different size data. This is achieved by using characteristic function instead of distribution function. Furthermore, the statistical power of this criteria is much higher than that of Kolmogorov-Smirnov criteria (Goerg & Kaiser, 2009).

In order to test the methodic an experiment was conducted. Participants were asked to handle the pen module with tripod grip while resting, and then randomly were presented with loud stressing sound (105 dB) lasting 1 second. This schema is largely analogous to experimental research of TTM where electric shock was used (Christou, Jakobi, Critchlow, Fleshner, & Enoka, 2004).

The experiment included 10 participants, 7 men and 3 women (average age 25 +/- 4.2 years). Each participant was given the instruction and then was given test series of one test with stimuli and one control test without stimuli. Then each participant was asked to partake in test series of six random tests – three with stressors and three control tests. Data was controlled for quality of gathering and artifacts. Main goal of the experiment was to determine whether proposed HSC allows to find the moment of the human reaction to stimuli using TTM.

Figure 4
Sliding window method schema



Results

Figures 5 and 6 present the recording with characteristic differences in TTM data with stressor stimuli and without one.

Figure 5
Resting tensotremorogram

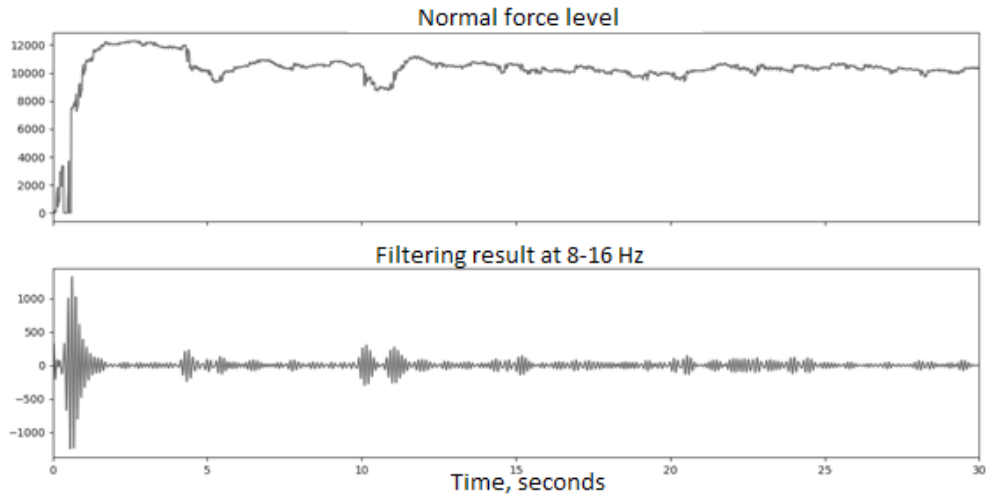


Figure 6
Tremorogram with stimuli, stimulus presented on t = 15s.

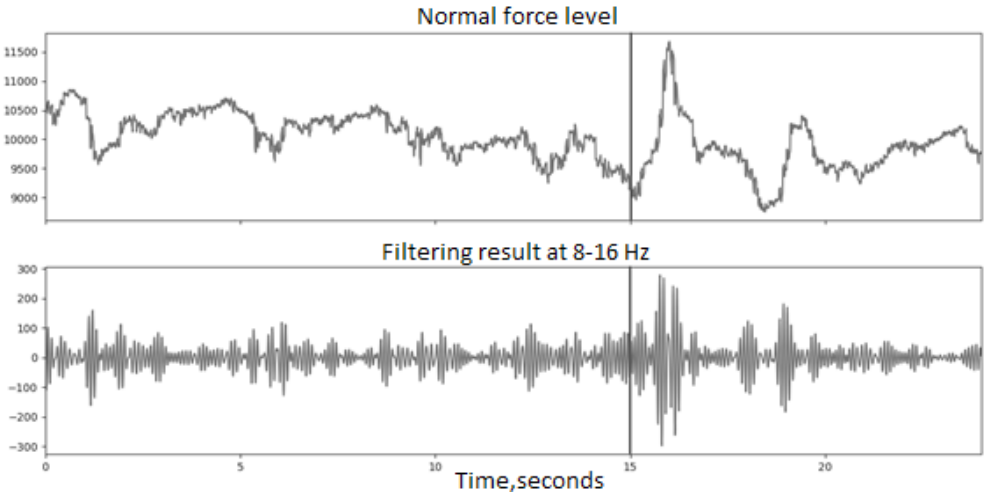


Figure 6 demonstrates the characteristic peak on 16th second, linked to the moment of giving emotionally significant stimulus on 15th second. Big splash on the start of figure 5 is due to participant taking more comfortable grip with the pen while on recording.

Table 1
Statistical analysis of tensotremorogram

Sound stimuli given			No stimuli		
Epps-Singleton criteria	p - value*	Δ, % MVC	Epps-Singleton criteria	p - value*	Δ, % MVC
40,25	0,0043	10,83	26,42	0,003	3,11

***Note**: "*" marks p-value significant on the level of p <0,05.*

Experimental results are presented on table 1. Data analysis shows that stimulus moment was the same as the moment of difference in tensotremorograms for each finger. Presenting sound stimuli gave us value of 40,25 with p=0.0043 on the Epps-Singleton criteria. Resting conditions gave us value of 26.42 with p=0.003 on the Epps-Singleton criteria. This difference marks statistically significant differences in samples, which proves the hypothesis that stimulus has interfered. At the same time, difference between minimal and maximal amplitude of tremor on the "stress" recording is 10.83% MVC which is significantly higher than at "rest" recording (3.11% MVC) which proves the hypothesis of link between tremor and stimulus.

Discussion

Results of present study are proving that the proposed method can find the moment of the stressor on the recording of TTM. Such moment is marked by a characteristic "splash" on the tensotremorogram which signifies the rapid increase in pressure force. On the experiment with the sample size of ten statistically significant differences of TTM data when presenting sound stimuli were found. Our results correspond with the work of Christou

et al (2004) about the increase in tremor amplitude in 1-2 Hz range when researching young healthy participants. In the same time, Blakemore, Shoorangiz & Anderson (2018) found no significant differences in amplitude-frequency data of tensotremorographic measurements while showing emotionally significant images.

Previous studies were based on classic load cell force sensors (Kruchinin et al., 2013; Safyannikov, Bureneva, Zhirnova, 2018; Blakemore et al., 2018; Christou et al., 2004; Ferenčík, Jaščur, Bundzel, & Cavallo, 2020).

Present study proposes the methodic of better precision while measuring tremor under static load using force sensitive resistor type of force sensors in conjunction with mathematical apparatus for preparing data after digitizing. Such information opens the possibility of improving methods of stress diagnostics for cases with high physical stress in circumstances of static or mostly static load. Furthermore, proposed improvement of mathematical apparatus for analyzing tremor under dynamic load allows to measure stress while writing or doing other tasks requiring a lot of small hand and finger movement. This was previously little explored due to complexity of the methods used.

Proposed improvement of data gathering methods based on tensometric sensors with no frequency limitation allows to gather data on frequencies in range of 0.1 to 120 Hz. This paper uses 8-16 Hz range as the most common for the physiological tremor. Proposed method allows to have resolution about 1/100th of a gram in designated force range but lacks the resolution outside designated range. This makes it more applicable for measuring tremor in grip tasks, allowing to calibrate the device for the designated range to be the same as force changes range.

That said, main scenarios for the proposed methodic lay in fields where use of other methods is significantly limited. Mostly this is the case of dynamical activity where high precision for gathering tremor force data is required, but fingers and hand are constantly changing acceleration. At the same time, the methodic lacks the ability to measure tremor of other body parts and limbs, and loses in comparison to others when the hands are free, so its scope of use is rather limited.

Sample experiment results suggest that inducing stress with a stimulus forms a reaction in form of change in tremor characteristics which can then be measured and analyzed. However, kinds and power of stimuli that can be found using TTM and specifics of the device that could find the reaction for the specific type of stimuli still requires further research.

Conclusion

A methodic and software for analysis TTM data is developed. Sample device is pen-shaped with external data analysis module and connects to the researcher's terminal with USB cable. Methodic uses tensotremorometric sensor of the new type, which significantly expand ability to measure tremor characteristics in many ranges of frequencies. Calibration by using trimmer resistors is available, and also the pen module can be swapped for another module should those be developed too.

The methodic allows to analyze individual specifics of tremor automatically using sliding window method and Epps-Singleton criteria. Proposed methodic can be a replacement for the accelerometry method when its applications are limited and expand the instrumental abilities of psychologists in different spheres of theory and practice: research of movement sphere in normal and pathologic situations, diagnosis and monitoring for stress, lie detection.

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Artyom Viktorovich Belinsky – development of the design of the experiment, preparation of the text of the article, conducting the experiment.

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The main results of the mechanisms' study of the of mental self-regulation based on the method of assessing the basal emotions' matrix

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Abstract

Introduction. The article presents an overview of the author's original works devoted to identifying the regulatory mechanisms of the emotional sphere using an innovative approach. The problem of self-organization of mental activity, connected with the determination of the system's state and the assessment of its stability, is discussed. **Methods**. The research program included the author's model of qualitative assessment of mimic response patterns. To quantitatively assess the state of the system by the tension of the facial muscles, an analytical apparatus was developed based on the matrix method, as well as stability criteria and other indicators for assessing the state of the emotional regulation system. **Results**. The main results were obtained on subjects with epilepsy. During diagnostic tests using the myographic measurement of facial muscle tone during the experience and perception of basic emotions, signs of their blocking were revealed. A comparative analysis of individual clinical groups made it possible to determine the significance of various limitations of emotions that manifest themselves at the level of reverse afferentation of the emotional regulation system. **Discussion**. Comparative analysis of the data of qualitative and quantitative analysis made it possible to reveal patterns of regulatory mechanisms associated with distorted afferentation of basic emotions.

Keywords

matrix of basal emotions, psycho-emotional state, mimic patterns, epilepsy, psycho-emotional stability, excessive stability, block, distorted afferentation

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Introduction

The problem of self-organization of mental activity remains relevant in psychology. The structure of the internal mechanisms of both lower and higher mental processes is determined by their ability to reflect and the systemic structure. At the same time, only volitional methods of self-regulation in behavior and activity have been studied in practice. An exception, perhaps, are the discoveries of psychoanalysis, which shed light on unconscious processes. However, they do not reveal regulatory patterns either.

These are descriptive models that reveal a protective adaptation to stress by psychologically limiting painful experiences and memories, with a distortion in the assessment of the event and its perception. The ability of the mental process to self-regulate can only be revealed within the framework of the system.

The consideration of thinking, memory and speech as psychological systems by Russian scientists, which became revolutionary and surpassed the level of scientific thought of contemporaries, made it possible to make a significant breakthrough not only in psychology, but also in the brain sciences. Thus, the application of this methodology to the study of the brain mechanisms of HMF led to an understanding of the principles of the brain, its ability to self-organize in various disorders and injuries, to restore lost functions and, as a result, to create a new science – neuropsychology (Luria, Vygotsky).

As you know, system analysis has become a signature of domestic psychology, the foundations of which were laid even before the advent of cybernetics and synergetics, and even more so similar trends in foreign psychology and humanitarian research, ahead of their time. On its foundation, a new approach to the problem of state and stability is developed in the works of V.A. Ganzen, E.P. Genkovsky, V.N. Ilyina and others. However, so far it offers only a qualitative analysis, without the possibility of calculating dynamic indicators.

Unlike psychology, where the personal approach prevails (Dolgova, Golyeva, 2014), in psychophysiology, a practical solution to the issue of stability research is outlined. So the optimal state of the system is determined by the range of permissible fluctuations of its main parameters without signs of transformation or oppression in order to effectively achieve the desired result. Such a modern approach is offered by Anokhin's theory of functional systems (FS). This can be fully attributed to the HMF and emotional states, reflecting the level and status of the mental organization as a whole.

However, for the time being, the clinical focus prevails, which determines the practical expediency in assessing resistance. There are rare exceptions, for example, the tapping test (Tsukanov, 2000), which determines stable and unstable psycho-emotional states (PES) associated with an increase in neuropsychic stress and fatigue, as well as own time (an individual unit of time). Of interest is the "Vibraimage" method, which makes it possible to remotely diagnose basic emotions and emotional state by microvibrations (Minkin, 2007). On the basis of somatovegetative manifestations in physiology, the emotional state is traditionally assessed at a quantitative level by instrumental diagnostic methods, but only indirectly.

Domestic psychologists were laid the methodological prerequisites for the study of the stability of emotions, primarily A.F. Lazursky. Ideas about the stability of the emotional sphere were proposed by K.K. Platonov and L.M. Schwartz, on sustainability in ensuring activities while overcoming overexcitation – developed by V.A. Plakhtienko, Yu. M. Bludov and others (Dolgova, 2014).

The modern theory of fixed forms of behavior offers a methodology for studying stability in micro-intervals of time (Zalevsky, 2007). At the same time, the principles of self-organization are embedded in the theory of the basal system of emotional self-regulation, identified in the study of autism (Lebedinsky, 2010). The concepts of mental stress and emotional maladjustment were also introduced, but the methods for studying the self-regulation of emotions necessary for a systematic analysis have not yet been created.

Sustainability often comes down to stress resistance (Shevchenko, Makarova, 2013; Yuzhakov, Avdeeva, Nguyen, 2015; Kislyakov, Meyerson, Egorova, 2020). A similar trend can be traced in foreign literature: consideration of stability as an integral property of the emotional sphere – the level of neuroticism, "affective stability" (Guilford, 1959; Cattell, Eber, Tatsuoka, 1970). This approach is observed in foreign works and now (Darvishzadeh, Bozorgi, 2016; Kosonogov, De Zorzi, Honoré, Martínez-Velázquez, Nandrino, Martinez-Selva, Sequeira, 2017; Al-Salkhi, 2019; Mao, Yang, Bonaiuto, Ma, Harmat, 2020). It is also necessary to mention the works of Russian scientists linking the state with emotional stability (Zilberman, 1974; D'chenko, Ponamorenko, 1990; Prokhorov, 2005; Ragozinskaya, Solovieva, Nikolaev, 2009).

In psychology, as well as in psychophysiology, there are no methods for measuring stability, because no methodology has been developed for its study as a dynamic characteristic of the system's state. Methods are limited to tests, questionnaires with scales of subjective assessment, etc. But the main problem is that in the search for identifying mechanisms for achieving sustainability, its carriers are not singled out. So far, no analytical apparatus has been created that makes it possible to identify criteria-based assessments of the state of the system, including stability.

An innovative approach based on the matrix method is devoted to this problem. Below is an overview of the results highlighted in past works and the methodology for studying the emotional regulation system (ERS).

Methods

The methodology for the study of mental self-regulation was based on the theory of functional systems (Anokhin, 1980), the theory of systemogenesis (Barabanshchikov, 2000), the principles of the system-dynamic organization of the HMF (Luria, 2007), and the theory of differential emotions (Izard, 2012).

The rationale for this approach in the works of the classics was based on the connection of basic emotions with the processes of homeostasis, the instinctive sphere, which was noted by Darwin, Kretschmer, Sondi, Deryabin, Obukhovsky, Kempinski (Ilyin, 2013). This is also confirmed by their phylogenetic relationship with brain structures responsible for vital needs, as noted by Luria, Anokhin, Simonov, Plutchik (Ilyin, 2013). That is why the critical deviation in the balance of basic emotions, observed in a wide range of disorders, leads to the development of depression, dysphoria and phobias, inevitably leading to a loss of mental stability.

In turn, according to the principle of reciprocal relationships, bringing PES to balance by the methods of psychotherapy or pharmacology levels these deviations. In this regard, the possibility of assessing the stability of PES opens the way to the study of the mechanisms of mental self-regulation.

Results

Organization of the study

At the preliminary stage, myographic maps for diagnosing patterns of basic emotions were developed, based on the Facial Movement Coding System (FACS) by P. Ekman, expert assessments by G. Schwartz, E.D. Khomskoy, M.N. Rusalova (Volov, 2016). Electromyography was performed on the leads: 1) m. corrugator supercilli, 2) m. epicranius, 3) m. orbicularis oculi, 4) m. zigomaticus major, 5) m. masseter, 6) m. orbicularis oris. After measuring muscle tone in a calm state, tests were carried out when expressing emotions and when it was perceived from a photograph with microexpression (Ekman's test). Registration of contraction of mimic muscles was carried out according to the maximum amplitude in 3 leads. The nature of each reaction (weakening, strengthening of tone or its invariance) determines the type of pattern. The technique was standardized for each emotion (fear, anger, joy, sadness – 1, 4, 5; disgust, surprise – 1, 3, 6 and 2, 4, 6).

According to the plan, the impulse of the resulting afferent and efferent synthesis of the SER is reproduced in the samples. We consider facial expressions as a manifestation of the SER effector (Volov, Zalevsky, 2020). The expression on the face during the experience of emotion reflects a signal for a change in PES (test 1). In the FS theory, this corresponds to the link of efferent excitation. The expression that arises during the perception of an emotion reproduces a signal about the change that has occurred (test 2), which indicates the achievement of the result of the RD action. In Anokhin's theory, this is a link of reverse

afferentation: due to the effect of emotional resonance, the work of this mechanism is displayed. It has been experimentally established that reactions in samples in terms of frequency-amplitude characteristics cause involuntary phenomena.

A technique for decoding mimic patterns

Initially, any reactions that did not correspond to the standard were considered as a failure of the FS: the deployment of basic emotions as the basis for the formation of the state does not occur or is not completed. However, repeated uniform violations of the pattern draw attention to their true meaning. Recurring blood sugar "errors" when there is no response or an uncharacteristic response is observed on delivery or three deviations (tension instead of weakening of the tone, or vice versa), indicate a non-random type of response, an altered mode of functioning of the SER effector. These forms include the b-pattern.

Separately, an antagonistic pattern (c) was identified: there is a paradoxical reaction in all three leads – the opposite to the expected change in tone. It was by this form of reaction that the block of emotion was determined, because. The subjects unambiguously noted difficulties in expression (determined in the first test – c1), experience (c2), and often in determining emotions. As a result, three types of pattern were identified: a – reference, b – disturbed (incomplete), c – antagonistic.

When decoding myographic data, reactions of mirror reproduction of the emotion pattern were revealed in both samples, not only of the reference type, but also with a modified profile. This phenomenon is called the "chiral effect" (CE). With its help, signs of a block were revealed and the non-random nature of the disturbed pattern in a number of cases was confirmed once again. Later it was found that it manifests itself under conditions associated with the limitation of emotions, such as affect, neurosis, affective disorder, paroxysmal states, etc. This occurs due to a distortion in the work of the FS feedback link that determines the balance of PES.

Reproduction of the reference pattern (a) in both samples (k1), regardless of the intensity of the frequency-amplitude characteristics, is a standard manifestation of facial feedback (FRF). Mirror repeating deviations of the pattern indicate a change in the operation of this mechanism, leading to blocking of emotion. First of all, this concerns c-reactions. Accordingly, if such a pattern is determined in both samples, the emotion is completely blocked (k3). The same effect is observed during CE on b-type emotion (k2). Part of the EC with a changed profile is of the asymmetric type (b-type reactions* (k4), in which the disturbed pattern was reproduced in a paired sample inversely). This group includes profiles of the type "a-c", "c-a". The value of each block shape will be determined later, based on the matrix method.

Separately, the effect of imposing a pattern of one emotion on another (cir) should be mentioned. An extreme version of this form of blocking is fixation – a total imposition on several emotions at once.

It turned out that the emotion of fear is more often fixed. With the help of the chiral

principle, the types of reactions and forms of limitation of basic emotions at the level of efferent excitation or reverse afferentation were established, leading to a restructuring of the FS that forms the state (Table 1). Later, this made it possible to identify signs of MBE asymmetry associated with its stability (Volov, 2020).

Table 1
Model of qualitative diagnostics of basic emotions. Reaction types

reference	disturbed	antagonistic	asymmetric	overlay
(a-a) - k1	(a-b), (b-a), (b-b) - k2	(c-b), (b-c), (c-c) - k3	(a-c), (c-a) - k4 (b-b)* - k4	(cir-1) (cir-2)

All reaction profiles of k3, k4, cir-1-2 types are associated with the limitation of basic emotions (Volov, 2021). The direct block (on the efferent link - expression of emotion) is determined in sample 1, the isolation of affect or partial restriction (on the afferent link – experience) is detected on sample 2. Mimic reactions that give signals for change and for a change in PES reflect this process. The above-described typology of RLS restriction became the basis of a model for the qualitative diagnosis of mimic patterns of basic emotions, including the chiral principle, the decoding technique, and the blocking rating scale.

Approbation of the technique was carried out in a study of patients with epilepsy and healthy subjects. Based on the U-criterion, differences in the presence of mimic patterns of different types in the groups were revealed. It was found that the reference patterns for all basic emotions in the control group were more common than in the main group, although there were also violations (but much less frequently). Antagonistic reactions to fear, verifiable as an emotion block (c), were often found in both groups.

In the main group, non-standard reactions are observed more often for all emotions. Similar occurs in the control group, but only for incorrectly defined emotions and less often. It turned out that in the main group, not only more errors, but also false recognition is observed – the perception of one emotion for another. Differences were established for sadness in b- and c-type reactions (p=0.056) and for c-type anger (0.57). Patients better define anger. In a group of healthy anger subjects, an incomplete pattern occurs (b). In patients with a high c-reaction intensity was often elicited by fear. These differences were found in both samples.

With the help of frequency analysis (cr. McNamara), significant differences in EC were established. It turned out that in patients with epilepsy, b-type ECs occur regularly, for all emotions (p=0.405), regardless of recognition (much less often in the control group, p=0.205). And vice versa, a-type EC is more common in the group of healthy individuals for all emotions (in the main group less often, p=0.0258). In terms of anger, the main group of patients had more b-, c-, and k4-type ECs (p=0.0229). Most often, the overlay effect is associated with the emotions of fear, sadness and anger.

At the next stage, deviations in the patterns of basic emotions in the samples, some of which were identified as their blocking, were compared with clinical manifestations. Connections of blocking emotions with equivalents, paroxysmal and post-paroxysmal phenomena were determined. The role of the emotional sphere in the course of epilepsy is difficult to overestimate, because affects can provoke a seizure, be part of a seizure, its equivalent, and even a factor in the antiepileptic system. A special place in terms of the influence on PES and the course of epilepsy is occupied by a special form of distortion of the emotion pattern – superposition.

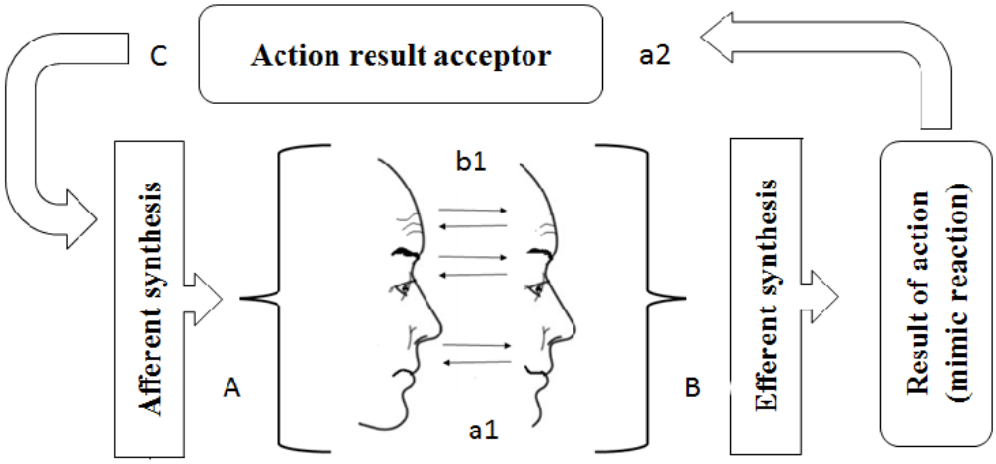
Additional studies have shown that a block to anger, including those with superimposed effects (when a sadness pattern appeared instead of the anger pattern) is of great clinical importance and manifests itself in the symptoms of the disease, such as dysphoria, dysthymia, and depression. Particular regularities were also established. For example, asymmetric block was more often observed in subjects with rare partial paroxysms. In the same group, a block to an emotion of the "isolation" type (a-c) is more often noted. The blocks revealed in the study found the corresponding clinical expression, and were later confirmed by psychodiagnostic data and in self-reports.

Experimental model

The mimic apparatus is considered in the work as a FS effector. The mimic pattern, as a kind of RD code, carries information about the specified changes, simultaneously reporting on the work of the effector, which has its own RD acceptor. The FS that implements mimic movement is included in the SER that determines the state. Both systems share a common feedback mechanism.

Representing it as an information node, we get the opportunity to track the work of the FS by the effector when the RD is reached. It turned out that blocking emotions is possible, both at the level of the flow of impulses for change, and about change. Both signals may not correspond to physiological manifestations and sensations, at the same time being reflected in the FS. As a result, not matching the given result in the form of a reference pattern, the signals lead to a restructuring of the PS or to a change in the RD acceptor. This is a fundamentally new approach to understanding the foundations of SER self-organization, which develops the concepts of Anokhin's theory. This process is modeled in the experiment and recorded using electromyography. The FS blocks are highlighted in the diagram (Fig. 1).

Figure 1
Conditional diagnostic scheme of the SIR information node



***Note**: A – efferent excitation; B – efferent voltage; C – decision-making; b – impulse to change; a1 – signal of change, a2 – reverse afferentation*

The figure shows how mimic movements in the effector, being converted into signals, encode state parameters. Being a subordinate link, the effector, having a common feedback mechanism (a1), reflects the work of the SER. At this level, it is possible to adjust the program for achieving the RD. In case of RD mismatch, in accordance with the FS theory, a decision is made to continue the action or restructuring of the FS, which implements the deployment of the basic emotion, reported through the back afferentation channel (a2). This approach makes it possible to diagnose signs of distorted afferentation. At the next stage, an analytical apparatus was used to quantify TEC.

The analytical method for quantifying the PES, including the static stability of the MBE, was developed on the basis of the matrix method (Gantmacher, 2010). The principle of symmetry and the principle of superposition are applied for the criterion assessment of stability. In the development of the MBE Z_{ij}, a dyadic analysis of paired affects (orthogonal), selected on the basis of psychological polarity, was used. In our previous works, we have described in detail the method of estimating PES, including the mathematical part, which we will present below (Volov, 2015, 2016). In general, the MBE matrix element has the following form:

$$Z_{ij} = Y_j + X_i, where\ i = 1 \div 3, j = 1 \div 3, \quad (1)$$

where the elements of the matrix are determined by the addition of emotions (Table 2).

Table 2
Basic Emotion Matrix

Emotions	X_1 (anger)	X_2 (joy)	X_3 (surprise)
Y_1 (fear)	Z_{11}	Z_{12}	Z_{13}
Y_2 (sadness)	Z_{21}	Z_{22}	Z_{23}
Y_3 (disgust)	Z_{31}	Z_{32}	Z_{33}

The main indicators of the MBE are the norm of the matrix $||M_{ij}||$ and tension (L). The trace of the matrix is determined by summing the readings of paired emotions:

$$L = Z_{11} + Z_2 + Z_3 = (Y_1 + X_1) + (Y_2 + X_2) + (Y_3 + X_3) \quad (2)$$

All MBEs are canonical, and their elements are positively defined. This means that the norm of the matrix has the following form:

$$\text{K-norm} \quad \left\|M_{ij}\right\| = \sqrt{\sum_{i=1}^{3}\sum_{j=1}^{3} z_{ij}^2} \quad \text{(mW)} \quad (3)$$

will be greater than any of the MBE elements

$$\left\|M_{ij}\right\| \geq z_{ij} \quad (4)$$

All matrices are canonical and degenerate (r=2). This fact indicates the connection of paired emotions. The criterion of deviation from MBE symmetry is determined by the average value of deviations of paired non-polar emotions of the matrix (Z_{ij}, Z_{ji}).

This dimensionless criterion determines the stability of the MBE:

$$\bar{\varepsilon} = \sum_{i=1}^{3}\sum_{j=1}^{3}\left|z_{ij} - z_{ji}\right| \Big/ z_{ij(ji)}^{\max} \Big/ 3, \quad i \neq j \quad (5)$$

where is the maximum value of the off-diagonal MBE term.

The criterion is a dimensionless quantity, and the dimensional quantity associated with it, the criterion $\bar{\varepsilon}$ *L, determines the share of the TEC feedback energy that goes to the off-diagonal imbalance of the MBE (Volov, Volov, 2015).

The MBE criterion has also been developed, which determines the degree of deviation of paired polar emotions MBE $\{Z_{ij}\}$ from their average values equal to L/3. This criterion has the following form:

$$\Delta\bar{L} = \Delta L / L, \text{ where } \Delta L = \sum_{i=1}^{3} \left| L/3 - z_{ij} \right| \quad (6)$$

The next criterion is an indicator of the energy efficiency of the PES feedback is defined as follows:

$$I = 1 - \left[\frac{\Delta E + \Delta L}{\|M_{ij}\|} \right] \cdot \varphi, \quad \Delta E = \bar{\varepsilon} \cdot z_{ij(j)} / 3 \quad i \neq j, \quad \phi = \begin{cases} 1, \text{ if } abs(\|M_{ij}\| - L) / \|M_{ij}\| \leq \varepsilon_1; \\ \beta, \text{ if } abs(\|M_{ij}\| - L) / \|M_{ij}\| \rangle \varepsilon_1 \end{cases}; \quad (7)$$

$$\text{where } \beta = 0.7; \ \varepsilon_1 = 0{,}05.$$

The energy of the OLS is only a part of the energy of the PES. When the intensity is close to the value of the norm, the energy of the imbalance is drawn from the energy of the RL (φ=1). Otherwise, part of the energy going to the imbalance is transformed from the total energy (φ=0.7).

Approbation of the method

A comparative analysis according to the criteria of the matrix method revealed significant differences between healthy individuals and patients with epilepsy. Below is a comparison of the MBE characteristics of the two groups (Table 3).

Table 3

Energy indicators of MBE

EMG values(healthy)		EMG values(healthy		Differences (%)
L	ε	*L*	ε	εL
47	0.18	86	0.245	26.5%
EMG values (sick)		EMG values (sick)		Differences %
L	ε	*L*	ε	εL
46	0.18	86	0.31	42%

It follows from the table that the higher the level of tension, the higher the level of imbalance, which is equivalent to an increase in the degree of asymmetry of the MBE. A trend was revealed: subjects with epilepsy are distinguished from healthy individuals by a significant increase in this parameter.

The main results were obtained in studies of the emotional sphere of subjects with different forms and course of epilepsy (Volov, 2016). The data of subjects with rare generalized seizures (1), with frequent generalized seizures (2), with equivalents (3) and in remission (4) were compared. Significant differences were revealed (Table 3).

In past studies, it was determined that MBE indicators differ in patients depending on the frequency and form of paroxysm. When comparing these groups with generalized seizures, the following was determined. Group 2 is characterized by lower energy efficiency (I), high voltage (L), high imbalance costs ($\boldsymbol{\varepsilon}$L), as well as high entropy values (H1=0.613, H2=0.66). This trend shows the best state of the ER group with rare generalized seizures.

Each of the mentioned MBE parameters can be correlated with the state of the emotional sphere and the ability to self-regulate. The intensity of the MBE to a lesser extent requires justification, because physically reflects the quality of the state of the SER. But the imbalance indicators are associated with the stability parameter - the most complex and important object for modern research of the system and assessing the level of its self-organization.

It was a surprise that, according to these indicators, group 1 compares favorably with groups 3 and 4. The revealed trend was justified in the Ivanov-Smolensky theory, in which a convulsive seizure is considered as a factor in discharging paroxysmal tension. The latter contributes to the normalization of the state of the emotional sphere and mental activity. As you know, the reverse mechanism also works: a change in the emotional state, for example, due to antidepressants, normalizes brain activity, leveling paroxysmal activity.

At the same time, the indicators on the energy efficiency index (I) are significantly better in groups without generalized paroxysms (3, 4). So, despite some advantages, the model of self-regulation of the emotional system in the presence of generalized paroxysms, albeit rare ones, is ultimately inferior to these forms. The data of groups 3 and 4 are similar in their indicators.

Noteworthy is only the difference in the stress factor, which is significantly higher in group 4 in subjects in remission. This fact is presumably due to the fact that, unlike group 4, group 3 has epileptic equivalents in its clinic, and, therefore, ways to discharge paroxysmal tension. Thus, the correspondence of the PES profile according to the characteristics of MBE to the clinical forms of the disease was established.

At the next stage of the study, a comparison was made based on the factor of the presence of a block according to the energy indicators of the MBE. A comparative analysis of a group of patients with epilepsy with a sign of block (in sample 1) and with isolation of basic emotions (in sample 2) was carried out. Differences in the level of entropy and imbalance are established. In group 2 they are lower (H_2=0.63, H_1=0.639; $\boldsymbol{\varepsilon}_2$=0.187, $\boldsymbol{\varepsilon}_1$=0.228). In terms of I, group 2 also surpasses group 1, which indicates a greater efficiency of the isolation mechanism. Presumably, the block and isolation solve the problem of achieving stability in different ways. A higher MBE voltage in group 2 is not accompanied

by high imbalance indicators: the formation of a c-block in the second sample occurs under such conditions arises as a factor in leveling the imbalance.

The revealed trend demonstrates the advantages of emotion isolation over the block in some cases. This mechanism is more often observed in the group with rare generalized seizures. In this case, isolation, on the one hand, limits the experience of emotion directly (by blocking the feedback signal), on the other hand, indirectly by eliminating the mechanism of emotional resonance that can trigger the state (Simonov, 1981). Thus, stability of the MBE is achieved. This assumption is confirmed by the fact of large values of imbalance indicators in the specified group in the presence of a block or its absence in both samples.

It was found that the group of the same clinical form with a block favorably differs in MBE characteristics from the group without it. At the same time, the condition and prognosis for the former are more favorable. This was noted in the group with frequent generalized seizures with c-reactions in two tests on the emotion of anger. Also, on the basis of statistical analysis, correlations were established between MBE indicators and signs of emotion limitation. So, in the main group, tension correlates with the factor of blocking emotions of fear (r=-0.47) and disgust (r=0.57), as well as with the index of anger identification (r=-0.48). The last dependence is especially interesting, because it is stated above that it is the emotion of anger that is determined by patients better. Outbursts of anger, attacks of dysphoria are known to be characteristic of patients with epilepsy. The similarity to paroxysm makes this emotion dangerous in terms of provoking a seizure, so its definition becomes an important task of self-regulation. The effect of lowering the MBE tension in the presence of a block on fear is largely determined by the great clinical significance of this emotion and involvement in almost all paroxysmal phenomena and symptoms that occur in epilepsy. The imbalance index correlates with the aversion block (r=0.51). This connection is not accidental: this is largely due to the low ability to displace.

In the group of healthy subjects, MBE tension correlates with the indicator of identification of sadness (r=-0.47) and surprise (r=0.67). Surprise as an emotion related to the orienting reflex triggers cognitive processes. The decrease in the ability to determine sadness, accompanied by an increase in MBE tension, is explained by the mechanism of the displacement of protection from painful experiences accompanied by sadness.

In the next cycle of work, gender differences are identified. In the group of women with epilepsy, a tendency was revealed: a block to fear is observed when its tension (according to the MBE index) is exceeded compared to sadness. Both emotions are observed in the clinic of the disease, but are not orthogonal. Despite this, a dependence was revealed due to the unity of the matrix of basic emotions that determines the energy balance, the expression of which is the balance of PES.

This dependence is not accidental. Fear often provokes an attack, signals about in the structure of precursors. Sadness often manifests itself in the interparoxysmal period in the form of depression. Accordingly, blocking the emotion of fear becomes necessary

to achieve balance in the MBE. When the tension of anger (orthogonal emotion) predominated over fear, the same tendency was noted, reflecting the mechanism of stability of the MBE. In the group of men with epilepsy, with the prevalence of fear, all forms of the block are noted. However, as in the control group, no patterns were found.

It is necessary to separately note the asymmetric block and the overlay effect. Most often, this block was detected in the group with rare partial paroxysms with similar indicators. When the resulting afferent and efferent synthesis are in antiphase, the excess stability of the PES is compensated (Volov, 2016).

A specific distortion of the emotion pattern indicates the presence of the so-called. a stable pathological condition (in the terminology of N.P. Bekhtereva), in which a temporary balance is achieved by limiting the RLS. The variety of forms of the block reflects the variability of the mechanisms of mental self-organization in the conditions of the paroxysmal brain, associated with the solution of the problem of achieving stability. But the question of the role of each block shape is yet to be clarified.

It is known that basic emotions can mix and inhibit each other. According to Izard, the energy of one affect can be transferred to another. As it turned out, this happens when imposing. An important assumption is the idea that overlaps gradually lead to the formation of corresponding emotional traits. Thus, the old scientific problem of an "epileptic nature" sounds in a new context (Boldyrev, 2000).

It is necessary to take into account other factors, for example, fixation, which consists in fixing a typical reaction in the form of a distorted pattern (b-type), or a chiral reaction of orthogonal emotions (type a-c, c-a). More often these are persistent stereotypes of aggressive-angry behavior and an angry-dreary mood.

Entropy method

In addition to matrix criteria, static and dynamic sustainability criteria were developed based on the entropy approach (Volov, Volov 2015). The generalized measure of stability developed in 2015-2016 was the deterministic entropy, which has the following form:

$$H = \alpha\left[1\text{-}\delta\left(M_{ij}{}^{(sym)}\text{-}M_{ij}\right)\right] + \frac{H_0 - \alpha}{\ln\left(a^{r-1}\right)}\ln\left[a^{r-1} + b\left(\frac{\bar{\varepsilon}L}{<\bar{\varepsilon}L>_{healthy}} + \frac{JL}{<JL>_{healthy}} + \frac{J\bar{\varepsilon}}{<J\bar{\varepsilon}>_{healthy}} - 3\right)\right][1\text{-}\delta(r\text{-}1 \quad (8)$$

$$\alpha = 0.3, \quad a = 1.2, \quad b = 1\cdot 10^{-3}, \quad \delta\left(M_{ij}^{sim} - M_{ij}\right) = \begin{cases} 1, & M_{ij}^{(sim)} = M_{ij} \\ 0, & M_{ij}^{(sim)} \neq M_{ij} \end{cases}, \quad \delta(r-1) = \begin{cases} 1, & r = 1 \\ 0, & r \neq 1 \end{cases}$$

where $\overline{\Delta}E = \Delta E / L$ $i \neq j$ $\Delta\overline{L} = \langle \Delta L / L \rangle_{healthy} = 0.1023;\ \langle \Delta\overline{E} \rangle_{healthy} = \langle \Delta E / L \rangle_{healthy} = 0.2047.$

In forumule (8) M_{ij}^{sim} – a symmetric matrix having the same norm as the MBE obtained as a result of the study, M_{ij}, r – matrix rank $\overline{\varepsilon} \cdot L$ – the value of the average energy imbalance of the MBE, H=0.618, the value of the "golden section" entropy , $\varepsilon L_{healthy}$, $\langle \Delta\overline{E} \rangle_{healthy}$, $\langle \Delta\overline{L} \rangle_{healthy}$ – are the averaged values of the off-diagonal imbalance, relative imbalance of off-diagonal terms and relative inhomogeneity of tension for healthy people.

There is a difference in the dependence of entropy on the MBE tension parameter in epilepsy (Volov, 2016). It was found that for healthy individuals, the increase in entropy is linear, and for sick subjects, a parabolic dependence is noted. At the same time, the level of entropy (H) in healthy people with an increase in the parameter L is significantly higher than in patients, where is the standard deviation (Fig. 2, 3).

Figure 2

Dependence of entropy on the intensity of the MBE in a group of healthy individuals

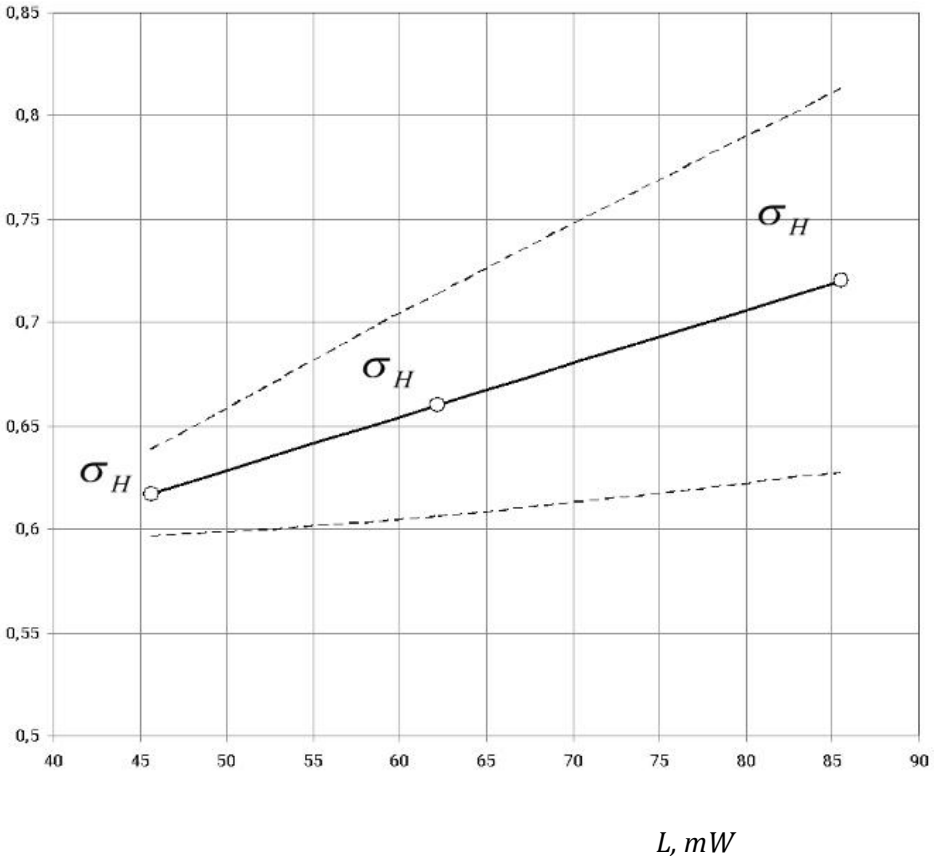
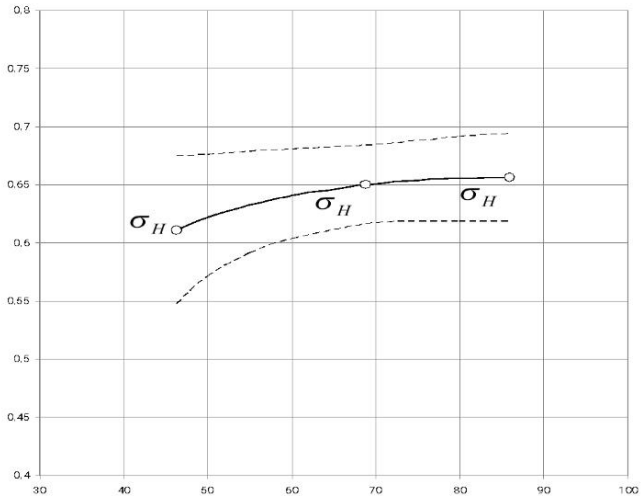


Figure 3

Dependence of entropy on MBE intensity in the group of patients with epileps



Previously, the dependence of entropy on the MBE voltage level was established (Volov, 2015). In the first sample (at L ≤60), with the same MBE parameters, the level of entropy volatility in patients with epilepsy is significantly higher (Fig. 4, 5).

Figure 4

The level of entropy volatility in the group of patients with epilepsy

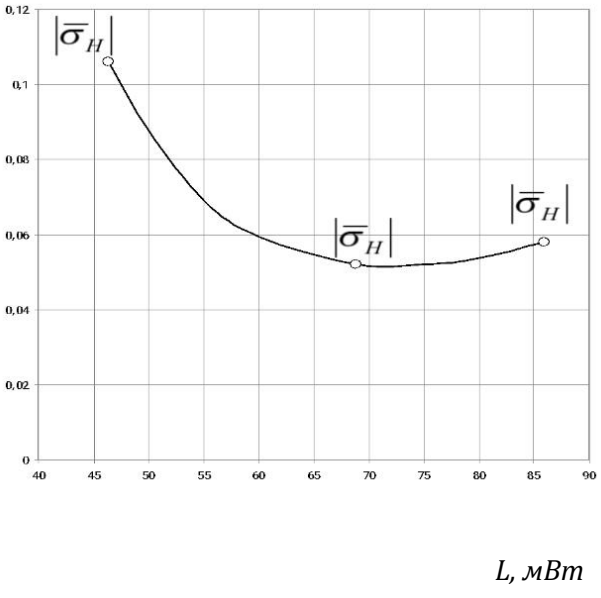
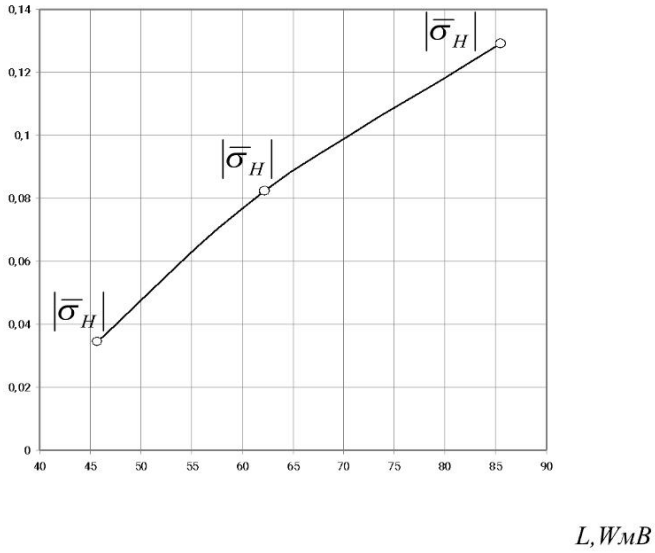


Figure 5
The level of entropy volatility in the healthy group



In the second group (L≥60), with the same values of the parameter L, the level of entropy fluctuations in healthy people is significantly higher (Volov & Volov, 2015). With an increase in stress, the level of entropy fluctuations in patients decreases, which corresponds to the effect of excessive stability (Zalevsky, 1993).

With the help of the method, a fundamental pattern was revealed: in epilepsy, with an increase in the power of the MBE, its energy imbalance increases, which means that the stability of the PES is lost. Higher voltage is combined with higher unbalance energy ratings. The figure shows that the trend depending on the tension has a convex character, which, in accordance with I. Prigogine's theorem on the minimum entropy production, can be interpreted as a stable MBE character (the L parameter here plays the role of time).

An analysis of the average values of the standard deviations of entropy shows a decrease in their values with an increase in the tension L, which additionally confirms the stability of the functioning of the ER in epilepsy.

This is a manifestation of self-organization associated with the blocking of basic emotions: the system gets rid of unnecessary degrees of freedom.

Discussion

The paper presents an innovative method by which the criteria for assessing PES are determined. The basis of the method, which opens up new perspectives in the study of the regulatory mechanisms of the functional systems of the psyche, is the matrix of basic emotions.

Established on the basis of the model of qualitative analysis, the block of emotion, identified at the level of the OLS, under such conditions arises as a factor in leveling the imbalance of the MBE. Comparative analysis made it possible to determine the effectiveness of various forms of emotional block in epilepsy as a mechanism for achieving PES stability, determined by the balance of basic emotions. For the first time, the phenomenon of distorted afferentation was experimentally established, which does not arise as a result of a perception error or pathology of sensations, but as a phenomenon of internal self-regulation of the SER, which manifests itself in the feedback link.

Based on the MBE, a formula for its entropy has been developed, which allows revealing additional information about the dynamics and statics of the psycho-emotional state. The revealed effect of volatility shows the fundamental difference between the SER between a healthy and paroxysmal brain. Thus, the study reveals individual mechanisms of self-regulation associated with limiting the feedback of the emotional response system.

Conclusion

- Mimicry is considered as an effector of the functional system of emotions, according to the manifestations of which the work of the information node is diagnosed, reflecting in the facial muscles impulses to change the state and signals about its implementation.
- In the experiment, the operation of the information node of the emotional regulation system was modeled, which was recorded using electromyography and made it possible to assess the state, as well as determine the quality of the reaction, and establish signs of distortion of the basic emotion pattern.
- The proposed approach for the study of the psycho-emotional state based on monitoring the matrix of basic emotions by facial feedback includes an analytical apparatus that allows us to make quantitative assessments of stability, tension, the level of imbalance, as well as a model for the qualitative diagnosis of mimic patterns of basic emotions.
- Based on the developed approach and innovative methods, signs of distorted afferentation at the level of the resulting afferent and efferent synthesis were revealed. These phenomena are identified as various forms of limitation of emotional response in the form of a block, isolation or overlap, some of which relate to the mechanisms of self-organization, and some to pathological signs.

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Attitudes Towards the Speed of Social Processes: Development of a New Inventory and Assessment of Its Validity

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Abstract

Introduction. The article is devoted to the current but understudied problem in psychology: the speed of social processes. The interdisciplinary approach (theories of P. Virilio, H. Rosa) is used when discussing the issue, substantiating the purpose and hypotheses of the study. The article is aimed to propose the author's Attitudes towards the Speed of Social Processes inventory, determine its psychometric properties and test its validity. The attitude towards speed is considered as an aspect of subjective time. **Methods.** The sample size was 521 people. The average age was 31.5 years (min – 21, max – 45), 48.8% of them were men, and 65.6% with higher education; the sample included advanced workers and graduates of vocational educational institutions (work experience 2-3 years). To assess convergent validity, the following were used: Questionnaire of Attitudes towards Technology by G. U. Soldatova, T. A. Nestik, E. I. Rasskazova, E. A. Dorokhova; Personal Flexibility at the Labour Sphere Scale by A. N. Diomin, O. V. Kireeva; scales measuring attitudes towards remote technologies. To assess the criterion validity, the graduates of vocational educational institutions and advancing-age workers were compared (age criterion). Exploratory and confirmatory factor analysis, Spearman's ρ correlation coefficient and the Mann-Whitney U-test were used. **Results.** The structure of the inventory is set apart and confirmed. It includes two scales: awareness of the social acceleration (the cognitive component) and rejection of the social acceleration (the affective component); their internal and retest reliability is acceptable. The scales correlate with technophilia, technophobia, technopessimism, attitude to remote technologies, and

flexibility of the individual at the labour sphere. It has been established that graduates of vocational educational institutions demonstrate a significantly higher level of awareness and emotional acceptance of social acceleration compared to advanced-age workers. **Discussion**. The correlations and differences expected in theoretical terms are empirically confirmed. The conclusion is made: the Attitudes Towards the Speed of Social Processes inventory is a new compact psychodiagnostic tool that can be used in psychological and interdisciplinary research. Ideas are formulated that aim to expand the list of criteria for the validity of the new inventory.

Keywords

speed of social processes, acceleration society, attitudes towards the speed, inventory, awareness of social acceleration, rejection of social acceleration

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Introduction

The problem of the speed of social processes is actively discussed by representatives of various sciences due to the rapid, multifaceted, and large-scale changes in the economy, social relations, and culture. In the article, we will first make a brief overview of interdisciplinary approaches to this problem and then, based on them, move into the plane of psychological analysis and relevant methodological developments.

To date, original sociophilosophical and culturological approaches to the study of speed and acceleration have taken shape, among which are the theory of kinematic society by P. Virilio and the theory of social acceleration by H. Rosa.

Paul Virilio is a French thinker, the developer of 'dromology' (from the Greek dromos – running, path), in which speed is understood based on ideas of phenomenology, physics, history, politics, psychology, and other sciences. According to P. Virilio (2004), we live in a world that completes a system that for several centuries has given a key role to

the speed of visual and speech communication techniques. In an interview, he noted that acceleration is a phenomenon without which it is impossible to understand history, especially the history of the West, since the XVIII century (Armitage, 1999).

Speed is provided by a set of technologies that P. Virilio calls a 'time-reducing machine' (Virilio, 1999, p. 69). These include audiovisual, telecommunication, and computer technologies that make objects accessible for perception regardless of spatial distance. The speed of light has become the dominant speed in the modern world, but the question arises: What forms does the speed that has reached its physical limits take? P. Virilio expresses the heuristic idea that technologies become something physically assimilable, a kind of nutrition for the human race through dynamic inserts and implants, which can include additional memory storage, etc. (Armitage, 1999, p. 49). Thus, the human body turns into a carrier of speed and acceleration, it is not something external to speed.

Another key figure is the modern German theorist Hartmut Rosa. From his point of view, acceleration is a non-reducible essential characteristic of modernity, which helps to understand fundamental transformations in society. To a certain extent, social acceleration is a self-moving process due to the interaction of three forms of acceleration: technological, leading to a time reduction in the fields of transport, communications, and production; acceleration of social changes, as a result of which the rate of disintegration of experience increases (for example, in the late modern, professions change faster than generations); acceleration of the pace of life (increased lack of free time and an increase in the number of actions per unit of time) (Rosa, 2003).

H. Rosa argues that the term 'acceleration society' is applicable only if technological acceleration and acceleration of the pace of life act simultaneously (Rosa, 2003, p. 10). At the same time, the second form of acceleration is most closely related to personality (identity and other psychological phenomena).

P. Virilio and H. Rosa work in the same problem area but with different tools. The first one applies the concepts-images revealed in the creative stream of consciousness. The second one has a more rigorous analytical approach, consistent distinction, correlation, and subordination of concepts. Both authors make a new social temporality explicit, accessible to analysis, hinting somewhere, somewhere directly pointing to the combinations and interdependencies of rapidity, technology, social structures, and everyday actions. This is a theoretical basis that can and should be used when studying the psychology of speed.

Comprehending and developing H. Rosa's theory, E. Xiu and E. Elliott consider the acceleration of social life through the perspective of the Self. They believe that there are at least five images of the Self that can be associated with the phenomenon of social acceleration: the detached Self, the reflexive Self, the reinventive Self, and the stationary and decelerating Self (Hsu & Elliott, 2014).

In addition to the image of the Self, various temporal characteristics of the personality can play a significant role in the study of speed and acceleration, for example, time urgency

(orientation to quick execution, achievement). This quality correlates with achievement drive and impatience (a sort of obsession with time). It includes orientation at the time of day, regardless of the environment or circumstances, the creation of work schedules and to-do lists, the peculiarities of eating behaviour, and the setting of deadlines. People who are prone to immediate action experience excitement and anxiety even during short periods of inactivity (Conte, Mathieu & Landy, 1998). If we consider this quality in a broad sociocultural and historical context, then it can be identified with the 'moral of the hour hands' that accompanied the formation of capitalism and, according to the German philosopher K. Geissler, is considered as an acceleration tool (Kustarev, 2002, pp. 15-16).

Another important temporal characteristic of a person is timeliness. This quality determines the measure of correspondence of the person's activity to life situations and affects the continuity of the lifeline (Abulkhanova, 2003), but it has not received further development. Yu.K. Strelkov (2011), analyzing the temporary structure of activity, identifies temporary tasks ("to wait for the right moment", "to be on time"), which are likely, may be related to the speed of social actions. It is obvious that professional careers also have a temporary structure. The opinion is expressed that for specific categories of workers, for example, men and residents of large cities, career cycles occur faster (Tolochek, 2017). That is, there is an acceleration of employment processes. These significant considerations need methodological reinforcement.

H. Ulferts, K. Korunka, and B. Kubicek (Ulferts, Korunka & Kubicek, 2013) turned to the ideas of H. Rosa for testing his theoretical provisions about the three forms of acceleration on the material of labour processes. The authors draw attention to the fact that the requirements associated with acceleration are constantly increasing. For example, the intensity of work increases and the temporary pressure on employees becomes chronic. The study contains useful information on specific manifestations of acceleration in the labour sphere according to the three forms of social acceleration and how employees perceive them. In another study by this team of authors, performed in a longitudinal format on a sample of elderly care workers, it was shown that the intensification of work leads to further emotional exhaustion and decreased job satisfaction (Korunka, Kubicek, Paškvan & Ulferts, 2015).

In general, the literature notes a shortage of specific empirical studies and data concerning the speed of social actions and processes (Bergener & Santarius, 2021; Hsu, 2014; Ulferts et al., 2013), which is quite paradoxical, since in everyday life, we record the prevalence of these phenomena. J. Bergener and T. Santarius argue that currently there is no reliable tool for empirically measuring the actual pace of life simply and understandably. They proposed the General Acceleration Scale (GAS), having carried out the operationalisation of four strategies for accelerating the pace of life by H. Rosa for leisure (Bergener & Santarius, 2021). In the Russian psychological literature, we do not know the tools that directly measure specific aspects of the speed of social processes. Conditionally, they can include methods that diagnose attitudes to uncertainty and social and organisational changes (for example, Bazarov, Sycheva, 2012; Belinskaya,

Dubovskaya, 2009; Shamionov, 2017), but do not directly affect speed. Another battery of techniques is aimed at identifying the relationship between time and time itself. In these terms, the most well-known and actively applied is the concept of psychological time by E. I. Golovakha and A. A. Kronik (1984), but the problem of social speed is also not considered in this one.

The purpose of this article is to develop the author's inventory of attitudes towards the speed of social processes and to evaluate its psychometric properties and validity.

The attitude toward speed is an aspect of subjective time, by which we, following T. A. Nestik, understand the totality of psychological attitudes towards objective temporal attitudes; psychological attitudes include "peculiarities of perception, experience, comprehension, and organisation of time" (Nestik, 2014, p. 10). The study of speed through the attitude of people towards this phenomenon allows us to go beyond the boundaries of specific behavioural acts.-

Research methods

The stages of inventory development

In the first stage, a list of 24 judgments (inventory items) was compiled, revealing a person's attitude toward the speed of social processes. The points describe the speed of communication processes, financial decisions, employment processes, consumption, record a positive or negative attitude towards speed, and the ability or difficulty of managing it. The content of the points fits into the general theoretical structure of relations (cognitive, affective, and regulatory components). The selection of items took into account previously expressed conceptual considerations, generalisations, and published methods (Demin, Demina, 2020; Nestik, 2014; Urri, 2019; Bergener & Santarius, 2021; Rosa, 2003; Ulferts et al., 2013). Each statement is proposed to be evaluated using five answer options from 'completely agree' (5) to 'completely disagree' (1) (Likert scale). To identify the points with the best measuring properties, compliance with the normal distribution was verified. Based on the values of asymmetry and kurtosis, 12 points were selected for which the distribution of points has a weak or moderate degree of deviation from the normal distribution.

In the second stage, the remaining items were subjected to factor analysis, an analysis of its results was carried out, and the psychometric qualities of the inventory (internal and retest reliability) were determined. In the third stage, the convergent validity and criterion validity of the methodology were evaluated.

Sample Group

The study involved 521 people the average age was 31.5 years (min – 21, max – 45), 48.8% of them were men, 65.6% had higher education; the sample included advanced

workers (60.8%) and graduates of vocational educational institutions (2-3 years of work experience) (39.2%).

Hypotheses

Two hypotheses have been formulated as part of the convergent validity test.

Hypothesis 1: It is assumed that the attitude towards the speed of social processes can be related to a person's attitude towards technology in general; in particular, positive correlations can be expected with technophilia, technorationalism, acceptance of remote technologies; negative correlations – with technophobia and technopessimism. We proceed from the fact that modern technologies are one of the sources, and at the same time one of the forms of social acceleration (Armitage, 1999; Rosa, 2003; Virilio, 1999). When testing Hypothesis 1, we used: a Questionnaire of Attitudes towards Technology (Soldatova, Nestik, Rasskazova, Dorokhov, 2021); two scales measuring attitudes towards remote technologies ("How do you assess the use of remote technologies?" (1 – negative, 2 – rather negative than positive, 3 – something between 'negative' and 'positive', 4 – more positive than negative, 5 – positive); 'Taking it for what it is, will remote technologies help achieve your goals in life?' (1 – will not, 2 – rather, will not, 3 – it is difficult to say whether they will or will not, 4 – rather will, 5 – definitely will)).

Hypothesis 2: the attitude towards the speed of social processes may be related to the flexibility of the individual in the labour sphere. On the one hand, this assumption is due to the fact that readiness for changes in the labour sphere refers to the pace of life as a form of social acceleration (Rosa, 2003). On the other hand, personal flexibility correlates with susceptibility to new technologies (Fugate & Kinicki, 2008; McCartt & Rohrbaugh, 1995), which, as mentioned above, can be a source of social acceleration. When testing Hypothesis 2, a Personal Flexibility on the Labour Sphere Scale was used, including six points (Diomin, Kireeva, 2022).

Both hypotheses were tested on a subsample of 175 people (part of the total sample, similar in structure: average age 36 years, 45% men, 70% with higher education).

Under the criteria validity test, we assumed (**Hypothesis 3**): indicators of attitude toward the speed of social processes will differ significantly among young and advanced workers. Hypothesis 3 is based on the provisions of the Unified Theory of Acceptance and Use of Technology, in which age is considered as an important moderating variable (Venkatesh et al., 2003).

Statistical methods

Exploratory and confirmatory factor analysis, descriptive statistics methods and nonparametric statistics methods were used when performing correlation (Spearman ρ coefficient) and comparative data analysis (Mann-Whitney U-test) data analysis.

Results

First, let us turn to the results of the exploratory factor analysis. The principal component analysis with Varimax rotation and Kaiser normalisation was applied to extract the factors. The significance level of Bartlett's sphericity test does not exceed 0.05 (p = 0.000). The Kaiser-Meyer-Olkin sampling adequacy measure is 0.754. It means that the available data are acceptable for factor analysis. In total, there are three factors with an eigenvalue greater than 1.

Focussing on making our tool compact, we adhered to the following standards for the composition of scales. Relevant elements must have a sufficiently high factor load (> 0.5) and a low load on other factors and be accessible to an understandable theoretical explanation. With a unifactor solution, the scale includes 7 points with an explicable variance of 39.9%. Its operating name is Rejection of Social Acceleration. With a two-factor solution, a Rejection of the Social Acceleration scale (6 points) and an Awareness of the Social Acceleration scale (3 points) are formed with a combined cumulative explained variance of 49%. We rejected the three-factor solution because it was not possible to give a compatible explanation for the third scale. The distribution of points for one- and two-factor solutions is presented in Table 1. The significant factor loads are highlighted in bold.

Table 1
Factor loads of items in the inventory

Content in items of the inventory	Unifactor model	Two-factor model	
	F1	F1	F2
Speed is an attractive phenomenon	-0,346	-0,253	0,377
It scares me how fast decisions are made in different spheres of life	0,661	0,679	-0,025
I do not have time to keep up with updates on social media	0,576	0,558	-0,143
At work, everything happens faster than before	0,232	0,358	0,418
I would like to communicate with other people in a calmer, slower mode	0,647	0,646	-0,094
In communication between people, everything happens faster than before	0,004	0,168	0,585
I am of the opinion that it used to be more convenient to manage information	0,560	0,603	0,074

Content in items of the inventory	Unifactor model	Two-factor model	
	F1	F1	F2
Today, it is possible to achieve something much faster than before	-0,312	-0,106	0,777
I am stumped by the rapid change in events	0,669	0,692	-0,008
Now you can make a good career faster than before	-0,256	-,059	0,738
I would like to slow down the pace of events in the life around me	0,676	0,704	0,006
I know how to adapt to the speed of events	-0,511	-0,406	0,447

Confirmatory factor analysis was used to select a model corresponding to empirical data (implemented in the LISREL 8.8 statistical package). Indices and their recommended thresholds were taken into account: CMIN (chi-square); RMSEA (RMS error of approximation) ≤ 0.08; SRMR (standardized RMS residuals) ≤ 0.08; CFI (comparative fit index) ≥ 0.90 (Table 2). Since the chi-square is affected by several factors that worsen its values, we additionally turned to the NFI index (≥ 0.90), which evaluates the discrepancy between the CMIN values of the hypothetical and null models.

Table 2
Fit indices' levels

Fit indices	Unifactor model	Two-factor model
CMIN	52,27 (p = 0,00)	81,16 (p = 0,00)
RMSEA (90% CI)	0,072 (0,050; 0,092)	0,064 (0,048; 0,080)
SRMR	0,041	0,050
CFI	0,96	0,95
NFI	0,95	0,93

The unifactor and two-factor models have similar and acceptable indicators. For further work, a two-factor inventory model (9 items) was chosen, which implements a more complete structure of the attitude to speed: awareness of the phenomenon (the cognitive component); its emotional assessment (the affective component).

The internal reliability of the scales was tested using Cronbach's alpha and the test-retest reliability (n = 44, the survey was conducted at intervals of 3 weeks) (Table 3).

Table 3
The levels of internal and test-retest reliability of questionary scales

Scale name	Cronbach's α	Test-retest (Spearman's ρ)
Awareness of the social acceleration	0,603	0,47*
Rejection of the social acceleration	0,746	0,59**

Note: * – 0,01; ** – 0,001.

The internal and test-retest reliability indicators of the scales have acceptable values, including Cronbach's alpha for the scale Awareness of the Social Acceleration (recommended threshold value ≥ 0.60, see Burlachuk and Morozov, 1989). The Spearman correlation coefficient between the scales is ρ = -0.077, indicating their relative independence from each other. In the analysis, it is recommended to manipulate the average values for each scale and the ratio of scales in the resulting profile.

The inventory text is presented in the Appendix. The descriptive statistics of the scales are in Table 4.

Table 4
Descriptive statistics of the scales of the Attitudes towards the Speed of Social Processes inventory

Scale name	M	Med	SD	Ske	Kurt
Awareness of the social acceleration	3,84	4,0	0,81	-0,41	-0,51
Rejection of the social acceleration	3,03	3,0	0,84	0,11	-0,49

Note: M – mean value; Med – median; SD – standard deviation; Ske – skewness; Kurt – kurtosis.

The results of the tests of Hypotheses 1 and 2 are presented in Table 5.

Table 5

Correlation coefficients between attitudes indicators towards the speed of social processes and scores of methods selected to test the convergent validity (n= 175)

Scale name	Awareness of the Social Acceleration Scale	Rejection of the Social Acceleration Scale
Technophilia	0,339***	-0,431***
Technophobia	-0,141	0,447***
Technorationalism	0,147	-0,091
Technopessimism	-0,284***	0,334***
How do you assess the use of remote technologies? (1 – negative, 2 – rather negative than positive, 3 – something between 'negative' and 'positive', 4 – more positive than negative, 5 – positive)	0,167*	-0,203**
Will remote technologies help you achieve your life goals? (1 – will not, 2 – rather, will not, 3 – it is difficult to say whether they will or will not, 4 – rather will, 5 – definitely will)	0,104	-0,190*
The flexibility of the individual in the labour sphere	0,176*	-0,178*

Note: * – 0,05; ** – 0,01; *** – 0,001

To test Hypothesis 3, on the one hand, graduates from universities and colleges with 2-3 years of work experience (n = 204) and, on the other hand, workers of advanced age 30-45 years (n = 317) were compared. It was found that young and mature workers differ from each other in awareness of social acceleration (in young people, the indicator is higher: U = 28032.0, p = 0.01) and in the emotional assessment of speed (in advanced workers, the level of rejection of social acceleration is significantly higher: U = 26502.5, p = 0.0001).

Discussion

The close correlations of the questionnaire scales with indicators of attitude to technology, in general, confirm the theoretical considerations of P. Virillo and H. Rosa on the relationship between social speed and technology (Rosa, 2003; Virilio, 1999). Apparently, awareness of social acceleration is supported by technophilia and blocked by technopessimism. Naturally, technophilia reduces the rejection of social acceleration, while technophobia and technopessimism, on the contrary, increase the rejection. Technorationalism has no statistically significant links with the scales of the inventory developed. Judging by the content of the items included in the corresponding scale of G. Based on the methodology of U. Soldatova and co-authors (2021), we are talking about the utilitarian use of technological innovations plus their affordability. If we correlate this content with the scales of our inventory, then they really lie in different planes.

The relationship between inventory scales and attitudes towards remote technologies can be explained by the fact that remote technologies overcome space. They are included in what P. Virilio called a 'time-reducing machine'. Therefore, it is naturally determined that the higher the rejection of social acceleration, the lower the assessment of remote technologies in terms of their impact on the achievement of life goals.

Correlations of the inventory scales with the flexibility of the individual in the labour sphere indicate that awareness and acceptance of accelerating technologies contribute to the acceptance of updated working conditions and organizational changes, as well as the opposite. Such interdependencies can be considered as a manifestation of more general patterns in the relationship between the flexibility of personality and technology (McCartt & Rohrbaugh, 1995; Torrent-Sellens, Ficapal-Cusí & Boada-Grau, 2016).

The results obtained confirm Hypothesis 1 and Hypothesis 2 and indicate the convergent validity of the Attitudes towards the Speed of Social Processes inventory.

The result of the test for Hypothesis 3 is consistent with the results of studies of intergenerational differences in interaction with technology. For example, parents and children have different structures of attitudes towards technology in terms of technophilia and technopessimism (Soldatova et al., 2021, p. 178); age is a factor of inequality when looking for work through the Internet (Karaoglu et al., 2021), and, in general, it affects the digital gap between social groups and individuals (Riggins & Dewan, 2005). Thus, Hypothesis 3 has been confirmed. The Attitudes towards the Speed of Social Processes inventory has validity according to the age criterion.

In the future, it is advisable to expand the list of criteria by adding them, for example, employment status. When developing the model of J. Ronen (Wärneryd, 1988), it can be assumed that entrepreneurs will differ from employees in their attitude toward speed since they are more often faced with the novelty of social and labour circumstances. Another criterion is taking into account the professional affiliation of people. Its importance is due, in particular, to the spread of information-type professions that not

only have psychological specifics (Karpov, Lenkov, Rubtsova, 2021), but also contribute to the acceleration of social processes. Representatives of this type of profession can be compared with representatives of those that are not directly related to social acceleration (for example, information and communication technologies are rarely used in work).

Expanding the validity criteria of the proposed inventory will allow us to study the emerging speed gaps between social groups in more detail. It is significant in psychological and socio-political aspects, which the followers of P. Virilio paid attention to (McQuire, 1999). Speed gaps and speed inequality seem to be an inevitable consequence of the implementation of modern accelerating technologies.

Conclusion

1. The article contributes to the development of a psychological approach to the interdisciplinary problem of social speed and acceleration. The authors rely on the theory of the kinematic society of P. Virilio and the social theory of H. Rosa, developing them with the help of psychological conceptual and methodological instruments.

2. A compact inventory has been created with acceptable psychometric properties and convergent and criterion validity. It allows an instant diagnosis of a person's attitude towards the speed of social processes and thus studies a significant aspect of human adaptation to social and technological changes. Considering the selected scales, the attitude toward speed has a two-component composition: awareness of social acceleration (the cognitive component) and rejection of social acceleration (the affective component).

3. Awareness of social acceleration is positively correlated with technophilia, attitude towards remote technologies, and individual flexibility in the labour sphere and negatively correlates with technopessimism. The rejection of social acceleration is closely related to technophobia and technopessimism and negatively correlates with technophilia, attitude to remote technologies, and flexibility in the labour sphere.

4. Graduates of vocational educational institutions demonstrate a significantly higher level of awareness and emotional acceptance of social acceleration compared to advanced-age workers.

5. The study conducted can stimulate the psychological examination of phenomena related to social speed, including the creation of new methodological tools in this area.

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Appendix 1

Attitudes towards the Speed of Social Processes inventory

Directions

To what extent do you agree with the statements below? Answer each line, circling the corresponding number.

Statements	Completely agree	Rather agree than disagree	It is hard to say agree or not	Rather disagree than agree	Completely disagree
1. It scares me how fast decisions are made in different spheres of life	5	4	3	2	1
2. I do not have time to keep up with updates on social media	5	4	3	2	1
3. I would like to communicate with other people in a calmer, slower mode	5	4	3	2	1
4. In communication between people, everything happens faster than before	5	4	3	2	1
5. I am of the opinion that it used to be more convenient to manage information	5	4	3	2	1
6. Nowadays, it is possible to achieve something much faster than before	5	4	3	2	1

7. I am stumped because of the rapid change of events	5	4	3	2	1
8. I would like to slow down the pace of events in the life around me	5	4	3	2	1
9. It scares me how fast decisions are made in different spheres of life	5	4	3	2	1

Answer key

Awareness of the social acceleration: 4, 6, 8.
Rejection of the social acceleration: 1, 2, 3, 5, 7, 9.

Processing of results

The average score on each scale is calculating to analyze the profile and severity of the ratio r components of the speed of social processes.

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Author Contributions

Andrey Nikolaevich Diomin– development of the idea and purpose of the article, conducting a literature review, planning and organization of study, participation in data collection, analysis and interpretation of results, writing the text of the article.

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Features of Digital Leisure for Students of Schools with Different Learning and Upbringing Conditions During the Covid-19 Pandemic

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Abstract

Introduction. There are a large number of facts in the scientific literature demonstrating the increasing influence of digital technologies on the involvement of adolescents in Internet activity. However, contradictions in the experimental material and the heterogeneity of research methods make it difficult to formulate certain conclusions about the nature of the impact of the Internet on adolescents. The peculiarity of our study is to study the behavior on the Internet of school students who are characterized by different learning and upbringing conditions using the same methodology in similar conditions of social restrictions due to the Covid-19 pandemic. We relied on the fact that every teenager has certain preferences for virtual leisure, and the choice of online activities is characterized by certain similarities in different educational institutions, but at the same time it may be related to the quality of physical and social activity in a real environment. **Methods**. The approved author's questionnaire "Digital preferences of modern teenagers" was used, which allows quantifying the features of different types of students' activities in a virtual environment. 96 students from three schools in Lipetsk took part in the survey, differing in learning conditions, different contributions of additional education (sports classes in sections) and active participation in public life of the city. **Results**. The activity of students in social networks is characterized by differences in preferred leisure activities and time spent on communication on the Internet. For the first time, it was established that overly enthusiastic visiting of social networks, which means using the Internet for 4 or more hours a day, is due to both the humanitarian specifics of the school's educational program and the neglect of students outside of school life. **Discussion**. The article establishes the fundamental features of the activity of Russian teenagers on the Internet during the Covid-19 pandemic in comparison with their peers from other countries: Russians prefer communication in social networks to all other types of leisure in the virtual space. The practical and significant

role of teenagers' activity in real social life, passion for sports and physical culture as ways to prevent the formation of Internet addiction is discussed.

Keywords

teenagers, learning conditions, digital preferences, social networks, online games, questionnaires, Covid-19 pandemic

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Introduction

Problem statement

Digital technologies are rapidly gaining not only the educational and professional sphere of activity in all developed countries, but also the everyday life of people, especially the younger generation. If the inclusion of information technologies in education is seen as a positive trend in the development of society, then the use of gadgets and the Internet in everyday life has mixed assessments. Initially, the Internet acted as a system of fast communications and communications in the form of e-mail, which greatly facilitated the communication of people over long distances. It is generally believed that social networks are a natural result of the development of the Internet and currently "life" in social networks has become common among teenagers and young people (Veraxa, Kornienko & Chursina, 2021; Kamenskaya & Tomanov, 2022; Gareht, 2018; Kamenskaya & Tomanov, 2019, Sobkin & Fedotova, 2021). Statistical reports from 2019-2021 prove an increase in the use of social networks in all countries. Statistical surveys show that 60% of the world's population in 2020 used social networks at least once a day, on average Internet users spent 144 minutes a day on social media applications and messaging, which is more than half an hour more than in 2015 (Statista, 2021).

The growth of the audience of social networks continued in 2021, and the time spent on the Internet also increased: the average user spent almost seven hours a day on the Internet, that is, more than 40% of his daily activity (Global Digital, 2022). The process of immersion in virtual reality is accompanied by increased involvement in Internet communication of adolescents and young people, which cannot but worry the pedagogical community and many parents (Kamenskaya & Tomanov, 2022; Soldatova, Rasskazova & Chigarkova, 2020, Sobkin & Fedotova, 2021). If we follow the cultural and historical concept of L. S. Vygotsky, it is obvious that fundamental changes in the development environment of children and

adolescents due to the intensive introduction of digital technologies into public life cannot but affect the formation of the mental functions of the younger generation. It is shown that the introduction of computer games into the education and leisure system of children changes their cognitive functions (Center on Media and Child Health, 2020, Cheng, Cheung & Wang, 2018; Statista, 2018, Zhu, Zhuang & Lee, 2020).

The positive impact of the technological gaming environment on the development of the intelligence of preschoolers of the 2011-2012 testing years compared to their peers of the "pre-Internet" era is described (Kamenskaya & Tomanov, 2019).

As digital products and technologies are introduced into the social environment, the negative aspects of the Internet and various digital devices are increasingly being recorded: smartphones, tablets, personal computers (Baeva, 2019, Kamenskaya & Tomanov, 2022, Kamenskaya, Tomanov & Tatiana, 2020; Tereshchenko & Smolnikova, 2020; Cheng et al., 2018). The creation of numerous blogs and accounts in social networks that have formed the main means of leisure and entertainment for children and adolescents is reflected in the psychological characteristics of fans of social networks (Tereshchenko & Smolnikova, 2020, Cherenkov, 2015; Groarke, Berry & Graham-Wisener, 2020; Kuss & Lopez-Fernandez, 2016). In addition, digital forms of entertainment are increasingly replacing the usual and previously encouraged leisure activities: physical activity, sports, interest classes in clubs and sections (Baeva, 2019, Von Der Heiden, Braun, Müller & Egloff, 2019).

The impact of technologically innovative leisure on the physical and neuropsychic development of children and adolescents turned out to be ambiguous during the Covid-19 pandemic (Tereshchenko & Smolnikova, 2020, Groarke et al., 2020, Luchetti et al., 2020, Mental Health Foundation, 2020). According to the researchers, the pandemic turned out to be an additional stressful factor for children and adolescents (Keya, Rahman, Mur & Kamal, 2020; Mental Health Foundation, 2020, Zhu et al., 2020), which pushed many users to use social media and video games more intensively.

It is possible to assume a different reaction of adolescents to the pandemic, which may correlate with the peculiarities of the educational environment at school, but international experience does not allow us to unambiguously highlight the correlations of learning and living conditions with the degree of enthusiasm for virtual leisure (Baeva, 2019, Cheng et al., 2018, Park, Kim & Cho, 2008). Occasional references to the relationship between the behavior of adolescents in a virtual environment and academic success, socio-cultural living conditions and education have very contradictory interpretations (see the review Kamenskaya, Tomanov, 2022). These problems are of significant relevance due to the global impact on the younger generation of a new and socially significant technological factor, therefore, the **subject** of our study is related to the study of behavior in the virtual environment of students of the eighth grades of schools in the city of Lipetsk, having different learning conditions during the Covid-19 pandemic.

The aim of the work is to statistically assess digital preferences and leisure time using different types of leisure, the degree of Internet involvement of students from three

schools in the same city, which are characterized by different learning and upbringing conditions and are influenced by the general factor of social isolation due to the Covid-19 pandemic. It is assumed that, firstly, every teenager has certain preferences for virtual leisure, and, secondly, the choice of a strategy for behavior on the Internet. It is also assumed that the time spent on digital leisure has a high degree of similarity in different educational institutions, but at the same time may be associated with the quality of physical and social activity in a real environment.

Methods

Experimental methodology and sample description

The study used the author's questionnaire "Digital Preferences of modern teenagers", previously tested on schoolchildren in Moscow (Kamenskaya et al., 2020, Kamenskaya, Tomanov & Tatianina, 2021), which allows quantifying the preferences of different types of student activities in a virtual environment. The formulation of the four main questions of this questionnaire assumes the choice of one answer from three to four options, which allows students to get a differentiated assessment of the main characteristics of Internet use in the field of leisure. The time of interaction with digital products and the method of their application were evaluated.

These features of the questionnaire proved useful in studying the specifics of information leisure of students of the same age living in different cities of Russia and who took part in similar testing during the first wave of the Covid-19 pandemic (Kamenskaya et al., 2021). In this paper, the questionnaire served as a way to study the relationship of students' behavior with the peculiarities of the educational environment of three different schools in Lipetsk.

The study was conducted in the period from December 2020 to January 2021 in the format of online testing on the Google Forms platform using four main questionnaire questions assessing the choice and specifics of various activities on the Internet and the time spent on leisure in cyberspace. The percentage of responses for the sample as a whole to each question under the correct conditions of testing and statistical processing should be 100% for each question. The process of statistical evaluation of the results of the study consisted of calculating the percentage of participants who chose specific answers in the questionnaire. All the respondents' answers were formed into a single table and processed in Microsoft Excel 2013. The SPSS Statistics 22.0 software package was used to assess the statistical reliability of the differences in the results of the survey of schoolchildren from different schools. 96 students from three Lipetsk schools took part in the survey, which are characterized by different learning conditions, different contributions of additional education in the form of sports classes in sections, as well as different degrees of participation in social activities.

In the first municipal educational institution secondary educational school (MEI SES) No. 14 in Lipetsk, a cadet corpus was examined, in which only teenage boys (28 people,

average age – 15 years) are trained. The training program involves an in-depth study of the history of Russia and the mandatory inclusion of additional educational programs (physical and military drill). Extracurricular activities are also provided: volunteer movement, museum pedagogy, search teams, unarmy, sports tourism. The priority direction for cadets is the principle: "To be the best in studies and in sports!" Students with excellent academic performance are encouraged by officers-teachers with certificates of honor, medals, badges of distinction, vouchers to summer camps, the opportunity to engage in parachuting. Cadets regularly take part in all city, municipal and all-Russian events of military, sports, and creative subjects. All teenagers additionally play sports in different sections in accordance with their interests.

In the second MEI SES No. 22 of Lipetsk, from which 23 teenagers (12 girls, 11 boys, average age – 15 years) took part in the testing, she was in a socially and economically disadvantaged area of the city, characterized by an antisocial climate, high turnover of the population. According to the plans of the city authorities, the school is subject to disbandment. The school has a poorly developed field of additional education, most students rarely participate in the social life of the city.

The study also involved students of the eighth grades of the third MEI SES No. 24 named after M. B. Rakovsky (n = 45 people: girls – 32 people, boys – 13 people, average age – 15 years). The school gained its unique image during the creation of pedagogical classes; the teaching staff of the school for many years was distinguished by the modern formulation of educational work and such an organization of relationships with students, in which the choice of a teaching profession by students became natural for many of them. The creators of the school S. A. Shmakov and M. B. Rakovsky developed an educational program that includes psychological and pedagogical theoretical and practical training. At the moment, the practical training of high school students is carried out in the process of working with younger students during the school year and during the summer holidays in health camps. The school has various sports sections, museums and creative workshops that teenagers attend outside of school hours. Students of the school are participants and prize-winners of numerous competitions at the city and regional level.

Thus, the study involved adolescents from two prosperous schools (the first and third) and one with less favorable conditions for the development of adolescents. In prosperous schools, intensive work is carried out on pre-professional training: military in the first and pedagogical in the third; no such events were noted in the second school.

Results

An important part of the information about the behavior of modern students in cyberspace concerns their preferred activities on the Internet. Table 1 shows the number of teenagers who have chosen one or another leisure option in general for all schools.

Table 1

Priority interests on the Internet of students of all Lipetsk schools

		Number of selections	Percentage of the total, %	Valid percentage, %
Types of behavior on the Internet	Games	9	9,4	9,4
	Search engines	22	22,9	22,9
	Internet-Shopping	10	10,4	10,4
	Social Media	55	57,3	57,3
	Total	96	100,0	100,0

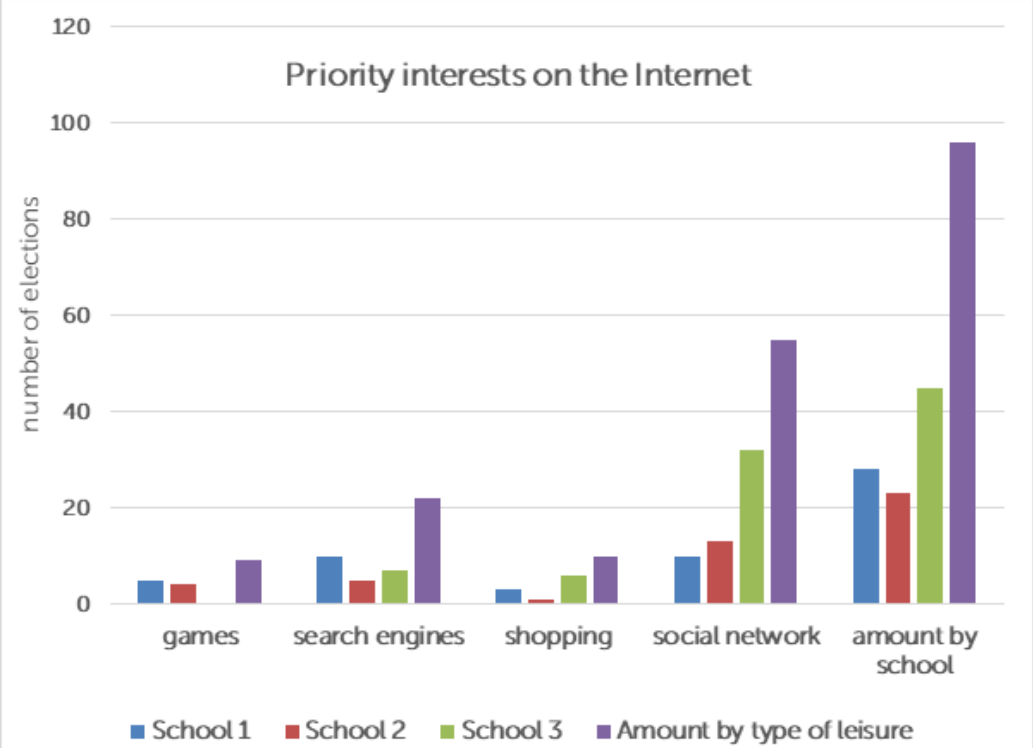
The materials in Table 1 show that the maximum number of teenagers choose social networks as their preferred leisure (57.3%), online games are the least popular among teenagers, and only 9.4% chose this type of leisure.

At the same time, a statistical assessment of the distribution of priority interests of adolescents on the Internet of three Lipetsk schools showed heterogeneity of results. In two schools (No. 22 and No. 24), teenagers prefer social media communication to all other types of digital leisure. Equal groups of teenage cadets (School No. 14) use social networks and Internet messengers. These features are reflected in Figure 1, which shows the number of schoolchildren from three schools who choose certain types of leisure activities on the Internet.

A qualitative visual analysis of Figure 1 gives reason to believe that the distribution of schoolchildren by priority forms of leisure in the three schools differs. It is obvious that the students of the cadet class of school No. 14 do not have a certain priority in choosing their favorite vacation compared to the students of the other two schools, at the same time, a small part of the teenage cadets play online computer games. Students of the humanitarian school No. 24 are not fond of online games at all. Students of schools No. 22 and No. 24 most often choose social networks as the main type of digital leisure. The statistical assessment of the reliability of the differences in these distributions was carried out using the nonparametric criterion χ2-Pearson, which confirmed that the use of digital leisure activities on the Internet of three schools is highly reliable (the calculated value of the criterion is 15.984 with a significance level of 0.014).

Figure 1

Distribution of the number of digital leisure choices by students of the surveyed schools



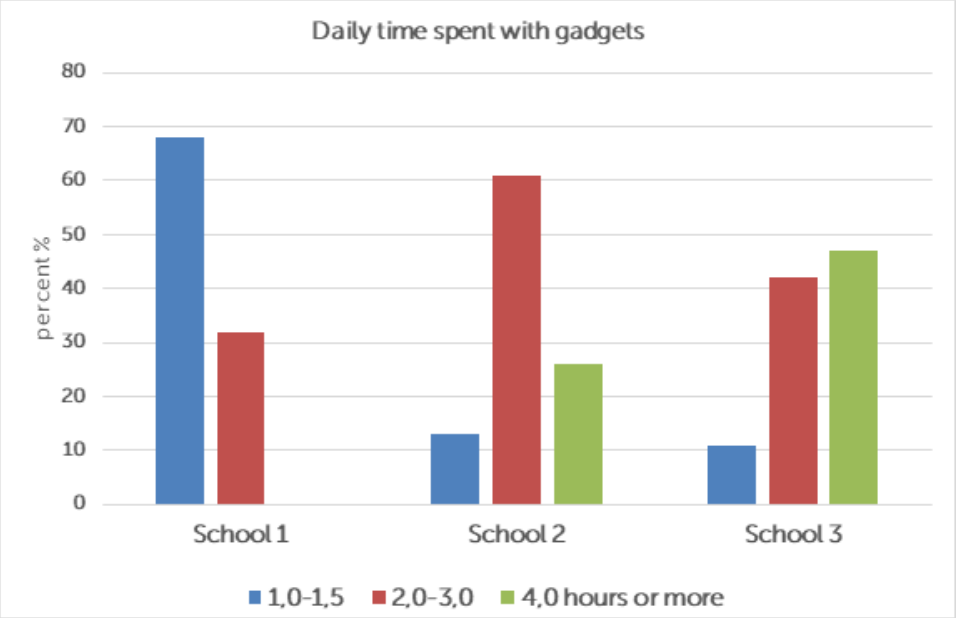
Note. *School 1 – cadet corpus of school No. 14, school 2 – school No. 22, school 3 – pedagogical class of school No. 24.*

Processing of the results of the evaluation of the time spent on leisure on the Internet showed that the majority of schoolchildren (37%) spend 1-1.5 hours with gadgets, while the maximum time (4 hours or more) is spent on leisure in virtual space by only 27%. At the same time, it is shown that these distributions are also different in different educational institutions (see Figure 2).

It is obvious that in the cadet class (first school No. 14) there are practically no teenagers who can be conditionally classified as overly enthusiastic, that is, aboutspending 4 hours or more on the Internet. Almost all cadet boys spend acceptable time with gadgets (68% – from an hour to an hour and a half and 32% – from two to three hours a day). Students of the pedagogical classes of the third school (No. 24), on the contrary, are characterized by active use of the Internet, since 89% of students of this school spend on the Internet from two hours to four hours or more. Teenagers from the socially disadvantaged district of Lipetsk also spend a significant percentage of their time on the Internet (87%). Calculations show that a high level of significance of the χ2-Pearson criterion was recorded (59,180, p = 0.000), which allows us to draw a reliable conclusion about the reliability of the differences in the three distributions. Students of the three schools have different attachment to the Internet: the maximum number of cadets in the first school (No. 14) spends the least time on gadgets, the largest number of teenagers of the humanitarian school No. 24 and school No. 22 spend significantly more leisure time with gadgets.

Figure 2

Distribution of percentages of students in three schools by time spent interacting with gadgets



Due to the fact that, according to our data, social networks have priority in the form of a favorite activity during the Covid-19 pandemic for many teenagers, a study was conducted on the competence of students in communicating with a teenage audience through social media accounts and various blogs. The percentage of teenagers from three surveyed schools who have accounts in one or more social networks has been calculated. The results of processing the questionnaire are shown in Fig. 3.

Histograms illustrate a monotonous pattern in all three schools: almost all students have accounts in several social networks, a significantly smaller part of teenagers own one account. The absence of differences in the distribution of responses of students from the three schools was also confirmed by Pearson's criterion $\chi 2$, which is equal to 1.251 at $p = 0.535$. Teenagers' social media activity is carried out through personal pages created by them, the content of which includes discussion of friends, social, sports events, photos, videos, music that fully correspond to age interests.

At the same time, a significantly smaller number of teenagers have their own blogs, which are usually dedicated to a certain audience and have their own topics. This type of activity requires more time compared to other leisure activities, as well as a certain competence in the digital environment. Obviously, such leisure should not be too popular, which is confirmed in Figure 4, where it is shown that from 35% to 75% of schoolchildren do not have their own blog.

Figure 3

Distribution of students (in percentages) of different schools by creating accounts in social networks

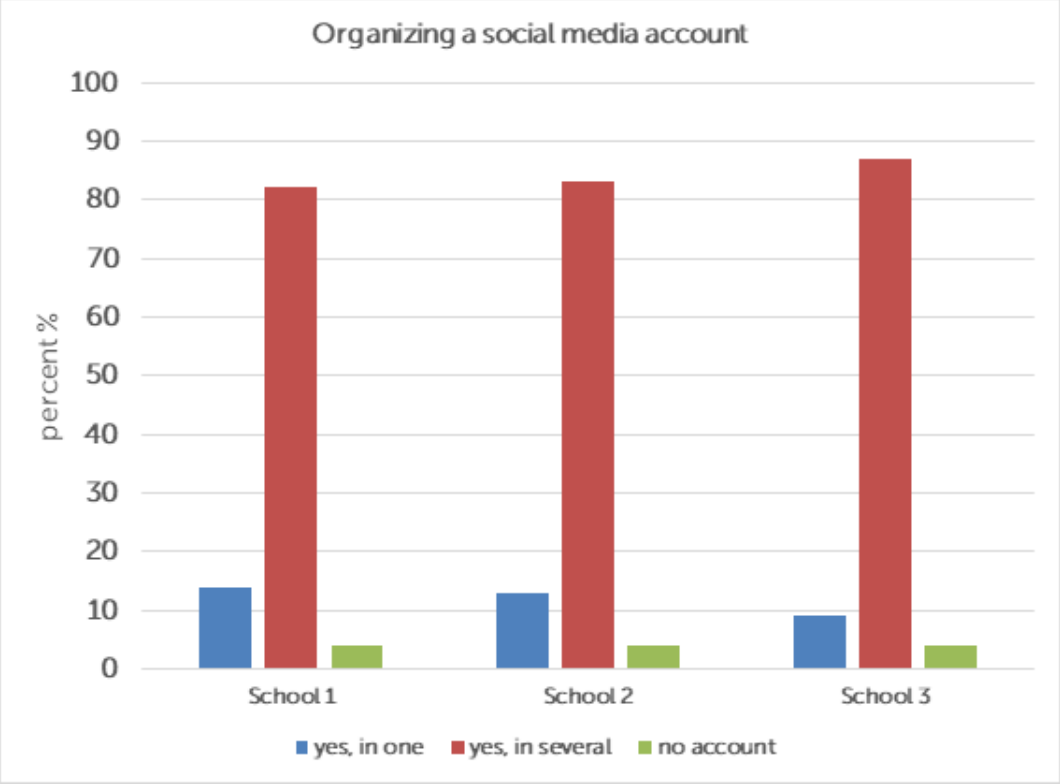
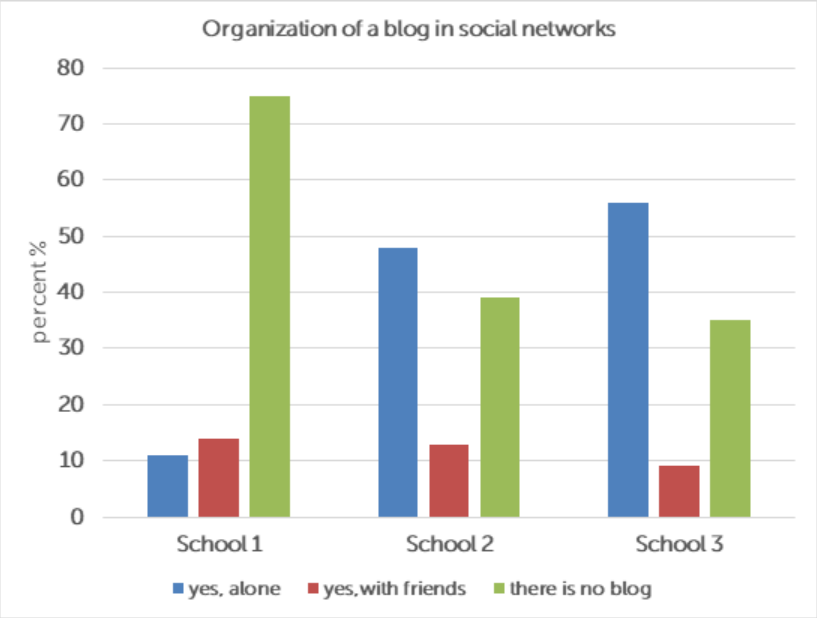


Figure 4
Percentage distribution of students in different schools by the presence of permanent blogs on the Internet



With friends or alone, different numbers of students in three schools answered the question about their ability to create content that attracts other teenagers. Moreover, it can be noted that the maximum percentage of such competent students is recorded in a humanitarian school with pedagogical specialization. The minimum percentage of students who have their own blog is noted in the cadet class of school No. 14. These differences were also checked for validity by Pearson's criterion $\chi 2$, which confirmed the validity of these differences (the calculated value of the criterion is 11.11 at $p = 0.004$).

Discussion

The article establishes the principal features of the activity of adolescents of the Russian sample of Lipetsk studied by us on the Internet during the Covid-19 pandemic in comparison with their peers in other countries. Russians prefer communication in social networks to all other types of leisure in the virtual space, which is probably due to the high importance of social communications for Russian teenagers. This fact is consistent with the scientific ideas known in the literature about a certain influence of the living conditions and learning of students on their inclusion in the virtual environment and the choice of digital leisure (Veraxa et al., 2021; Kamenskaya, Tomanov, 2022; Cherenkov, 2015, Gao et al., 2020; Keya et al., 2020; park with et al., 2008; Soldatova et al., 2020). In this paper and our previous studies (In Kamenskaya.G, Dr. I., 2020, Kamenskaya V. G. et al., 2021)

it was found that online games are the least popular among teenagers, which is the difference from peers in China, Korea and the USA (Mihara, and higuchi, 2017), who spend more time playing games than other forms of digital leisure. In addition, the authors indicate a significantly higher percentage of students who prefer online games to virtual communication in social networks during the Covid-19 pandemic (Kamenskaya, Tomanov, 2022; Center for Media and Children's Health, 2020; Statistics, 2021; Mental Health Foundation, 2020; Zhu et al., 2020).

At the same time, the activity of students in social networks of the three surveyed schools has its own specifics. Students of the pedagogical class of the humanitarian school No. 24 communicate on social networks for as maximum long time. At the same time, a significantly larger number of teenagers of this school prefer social networks to all other types of leisure in the virtual space. The same students are characterized by sufficient competence to form interesting content for their peers in social networks. Cadet boys are fundamentally different from teenagers of the pedagogical class, who, in general, are less likely to resort to social networking and, moreover, from time to time play online computer games. It is impossible to exclude the contribution of the gender factor to these differences (Statista, 2021), since girls make up the majority of the sample in the teaching class. However, the minimal enthusiasm for virtual leisure by cadet boys has another possible reason associated with intensive sports and encouragement of academic performance by teachers-educators. This is confirmed by the high time spent on leisure time on the Internet by school students from the disadvantaged district of Lipetsk in comparison with cadet boys, who are significantly less covered by additional classes and participation in the collective affairs of the school.

The problem of motivation that forces teenagers to spend time on social networks or in an online game is complex and has no definite solution. The idea is expressed that this motivational complex is quite complex and includes various motives, including entertainment (Veraxa et al., 2021; Gareht, 2018; Marín-López et al., 2020; Stockdale & Coyne, 2020; Von Der Heiden et al., 2019). These circumstances encourage researchers to continue studying the behavior of adolescents in the digital environment and its dynamics in various social and environmental circumstances.

The pandemic as an additional stressful factor for the younger generation has led to the increased use of digital leisure facilities that act as psychological mechanisms protecting young people from forced loneliness (Groarke et al., 2020; Mental Health Foundation, 2020; Luchetti et al., 2020, Zhu et al., 2020). At the same time, it turned out that during this difficult period, the degree of immersion in the virtual world is determined by both the specifics of the educational environment of students and the personal preferences of adolescents. The degree of risk of developing Internet addiction can be determined by the personal preferences and time of digital leisure of adolescents, and is also associated with socio-cultural learning conditions, which is fully consistent with the concept of cultural and historical determination of the social and mental development of children and adolescents adopted in Russian psychology.

Conclusion

The development and education of modern children and adolescents takes place in a changed socio-cultural environment due to the introduction of digital products into public life as a result of technological evolution. The changed socio-cultural environment determines new forms of behavior, including in leisure activities that displace the previously dominant forms of recreation and entertainment for children and adolescents. The Covid-19 pandemic turned out to be an additional environmental factor that could have an impact on the enthusiasm for Internet resources in 2020, which led to a reduction in social contacts between teenagers with each other.

The forms and duration of leisure activities of adolescents in these conditions are determined by the peculiarities of the educational environment, at the same time, individual and personal characteristics associated with pre-professional training at school are also important. A common feature of the digital leisure of teenagers in an industrial city of Russia turned out to be a preference for communication in social networks to online games. At the same time, the time spent on the Internet for most teenagers ranged from an hour to three, which indicates a moderate enthusiasm for digital leisure in conditions of increased stress by the Covid-19 pandemic. However, in the humanities gymnasium, 47% of students show an over-enthusiasm for virtual leisure, defined as the time spent on the Internet for more than 4 hours a day, which can be considered as certain risks of Internet addiction (Kamenskaya, Tomanov, 2022).

The distribution of individual preferences for digital leisure significantly differs in schools with different educational programs: communication in social networks dominates as a favorite form of leisure for students of a humanitarian school with pedagogical specialization. In the cadet corps, teenage boys could not find a certain dominance of their favorite form of leisure, while the choice of search browsers and online games is equally represented. Students of the school from a socially disadvantaged area demonstrate the similarity of forms of digital leisure with students of the humanities gymnasium. Teenagers of different schools show different degrees of competence in mastering social networks, which are associated with the creation of content in them through the organization of blogs for a certain audience. The most successful in this regard were students of pedagogical specialization in the humanities gymnasium. The minimum number of teenagers organizing their blog was found in the cadet class, which indicates a reduced motivation for the implementation of this form of activity and the lack of the necessary Internet competence for the formation of adequate age-related content.

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Features of The Managing Style of Cadets Depending On the Role Model of the Commander Chosen by Them

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Abstract

Introduction. Purpose of the article involves determining effective role models in solving military-professional tasks and identifying the features of the management style with the expression of various role models of the commander. **Methods**. Research design included solving by cadets (N = 150, at age 21 to 27 years) 9 service and combat tasks, distributed in three blocks. In the process of solving the introductory task, the cadet had to choose a role model out of 10 possible ones, with which he identifies himself as a commander. For each block, the most frequently encountered roles of the cadet commander were identified, which were presented as dominant. All cadets were tested on the questionnaire "Management style" using the program "Psychologist-BB", on the basis of which the cadet was awarded points in three management styles. To determine the dependence of the management style on the leading role model, a one-factor analysis of variance (ANOVA) was performed. **Results**. Analysis showed a statistically significant influence of the chosen role model of the commander of the authoritarian and liberal management style when performing tasks aimed at stabilizing interpersonal relations during the organization of service and combat activities and making decisions in an unusual situation. **Discussion**. The results obtained indicate that cadets, when solving military-professional tasks related to the normalization of interpersonal relations during the organization of service and combat activities, personnel injuries and non-standard situations, choose mainly three role models of the commander as the role of

the commander, which correspond to: role model 1 with a democratic management style, role model 2 with an authoritarian management style and role model 3, with two management styles – active and passive.

Keywords

role model, role, management style, destructive management, cadets, military professional activity, unit commander, democratic style, authoritarian style, liberal style

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Introduction

Due to the rapid socio-cultural, economic, political and moral development of modern society, as well as increasing geopolitical risks, enforcement forces need to perform tasks that were previously unknown to their personnel. This contributed to the reform of the troops of the National Guard of the Russian Federation (hereinafter TNG RF). In turn, the change in the organizational and staff structure of the TNG RF has generated a number of new service and combat tasks, such as the use of forces and means on the territory of foreign states, in order to combat global terrorism and extremism, ensure public security in the face of increased external and internal threats, etc. This led to an increase in the qualification requirements for the military professional level unit commanders, as well as changes in both the individual and collective management style of the military team.

In addition, the importance of effective command and control, discipline and clear responsibility is crucial in the performance of assigned service and combat tasks. This is closely related to the definition of the commander's role model. The term "role model" is attributed to sociologist R. Merton (Merton, 1949), who suggested that people compare themselves with reference subjects who demonstrate the social role that the individual aspires to. According to the author, a role model – is a person whose behavior, example or success is imitated or can be emulated by other people. In turn, M. Weber (Weber, 1990) understands a role as a pattern, an ideal model of behavior that represents a logical construct. Consequently, a role model is a certain pattern of behavior set by society, which has specific characteristics and includes public expectations (Perevozkina, 2019). A study of the role behavior of a junior commander, carried out by M. M. Tryagin (2011), showed that it is associated with a certain conflict. So, on the part of the officers, the junior commander's performance of role functions must meet the requirements of

the Statute, which makes possible to solve official tasks effectively, which does not always meet the expectations of subordinates. As a result, the success of the junior commander's professional activity is largely achieved by matching the role behavior of the position held and the expectations of the subjects of interaction.

Existing special conditions in military organizations can either reduce or exaggerate the prevalence and impact of destructive management. Therefore, it is appropriate to investigate the prerequisites for the development of destructive management in the military team. There is reason to believe that destructive forms of management are particularly characteristic of the armed forces. The high risks associated with failure in both military training and operations, including the risk of loss of life, can lead a commander to engage in more assertive and aggressive performance behaviors that sometimes cross the line. However, high risks and costs can also lead the commander to adopt passive management styles, as in the case of laissez-faire management, with detrimental consequences for security and assignments (Kelloway, Mullen & Francis, 2006). A number of foreign studies note a relatively high prevalence of undesirable destructive management (Reed, 2015). More and more scientific studies have begun to highlight the features of various forms of destructive management in military organizations (Fors Brandebo, Nilsson & Larsson, 2016). Thus, the above-mentioned relevance leads to the need to study management styles depending on the role model of the commander, which in turn provides an increase in the effectiveness of performing assigned tasks in military professional activities.

Methodology

Scientific works aimed at studying management styles most often operate with such concepts as leadership, management, which, of course, have their own specifics, but can be used interchangeably. In this paper, the authors focus on the term "management", relying on regulatory and legal documents regulating military professional activities: acts, directives, orders, instructions, etc. In particular, in Decree of the President of the Russian Federation dated 10.11.2007 No. 1495 (ed. Dd 24.12.2021) "On approval of the general military statutes of the Armed Forces of the Russian Federation" the general duties of the commander include the management of scientific, inventive and rationalization work, and the commander is also obliged to directly manage the combat training of subordinate military personnel.

Studying the impact of management on security in high-risk environments provides insight into how governance can be developed and measured to improve the effectiveness and safety of military personnel (Chen, 2017). Creating a certain climate in the organization, including in the military, helps to reduce the level of injuries and ensure the safety of personnel (Martinez-Corcoles & Stephanou, 2017). Effective management also helps to mitigate risky behavior in task execution, accident investigation, safety training, and so on. (Martinez-Corcoles & Stephanou, 2017).

M. T. D. Ta, T. Kim & A. H. Gausdal (Ta, Kim & Gausdal, 2022) identified nine management styles (transformational, transactional, authentic, ethical, charismatic, democratic, authorized, authoritarian, passive), which affect the safety indicators when performing tasks that are associated with a risk to life and health.

Researchers note that there is a relationship between the types of management in ensuring safety and effectiveness in performing professional tasks. Managers who use active management have a positive impact on ensuring safety in the team and efficiency in performing tasks (Willis et al., 2017). Transformational and transactional leadership is directly and positively linked to ensuring safety and compliance with labor discipline norms and requirements (Adjekum, 2017; Dartey-Baah & Addo, 2018). However, in most studies, team safety and compliance are effective if managers create a positive climate characterized by clear roles and regulate the performance of responsibilities by competent members (Fernandez-Muniz et al., 2017; Wu et al., 2017).

Martinez-Corcoles & Stephanou (Martinez-Corcoles & Stephanou, 2017) conclude that transactional management has a positive impact on security engagement and compliance. This finding consistent with data (Dartey-Baah & Addo, 2018), which suggested that overall transactional management has a positive impact on members safety and compliance rules and regulations, only if they are controlled by managers. In addition, transactional guidance has been found to be positively associated with safety training and accident investigation, as well as reduce risky behavior (Martinez-Corcoles & Stephanou, 2017). In terms of transformational management, this style can affect compliance with safety requirements by increasing work motivation (Adjekum, 2017).

Ethical management has a positive impact on creating an optimal organizational climate and organization members commitment (Lotfi et al., 2018). A study by S. C. Chen (Chen, 2017) found out that moral and ethical aspects of management were positively associated with effective communication of flight attendants on safety issues, while authoritarian aspects had the opposite effect.

Authentic management contributes to better understanding of the situation by informing subordinates about world events and their awareness of how this information affects the identity of a serviceman in the Navy, which, in turn, is negatively associated with risk-taking (Sandhaland et al., 2017).

Passive management has a negative impact on the team atmosphere and awareness (Sandhaland et al., 2017), on mentoring (Vignoli et al., 2018) and leads to a reduction in the level of risky behavior due to the initiative of subordinates and their involvement in work (Vignoli, 2018).

A positive relationship between management styles and the effectiveness of various teams, including military units, has been established in a number of studies (Bass & Avolio 1997; Dvir, Eden, Avolio, Shamir 2002, Judge, Piccolo 2004). On the other hand, there is directly opposite scientific evidence indicating that some management styles are negatively associated with performance (Bass, Avolio, Jung & Berson, 2003). The

relationship between role models and management styles is reflected in a recent study (Andronnikova, Perevozkina, Seryi, Yanitsky & Petrovskaya, 2020), which proves that in a situation of complex management decisions, heads of educational institutions prefer role models related to the period of adulthood, which are distinguished by a pronounced collegial component. The authors conclude that the style of managers in an educational organization is closely related to such features as control and exactingness, which are combined with democratic decision-making, delegation of authority and sharing of responsibility with subordinates in the implementation of adult male and adult female role models. Furthermore, the authors admit that managers with predominant destructive patterns in making complex decisions are characterized by toxic leadership. According to (Avolio, Kahai, Dum & Sivasubramaniam, 2001), managers with a democratic style can strengthen the emotional response of their subordinates and their loyalty to the team by motivating and showing attention to subordinates. Empirical studies consistently show a positive relationship between a democratic management style and work satisfaction of the members (Judge & Piccolo, 2004).

According to research by T. Kim & A. H. Gausdal (Kim & Gausdal, 2017), close interaction between all team members and the manager has an important impact on achieving overall safety indicators. Turning to the military team, it should be noted that to ensure success in the implementation of military-professional tasks, the commander, on the one hand, must be an effective leader with the ability to lead the unit entrusted to him. On the other hand, it is the responsibility of the commander to create special conditions for effective execution of military-professional tasks that involve ensuring successful interaction between team members. Presumably, when all team members have a common understanding of the situation and therefore interpret new information in the same way, it becomes easier to predict each other's behavior and needs. It also allows team members to choose appropriate behaviors and actions. Therefore, we are talking about the formation of a general mental model that will be aimed at the effective implementation of the military-professional task. On the contrary, if the team members have mental models that do not agree with each other, it may be difficult for them to predict the future behavior of their fellow soldiers, and this is likely to lead to inefficient functioning of the military team. Mental models of tasks in any professional activity contain information related to the task statement, the process of completing the task, strategies, conditions, equipment use, and problems that can be encountered in the process of completing tasks (Klimoski, Mohammed, 1994, Mathieu et al., 2000, Cannon-Bowers, Salas, & Converse, 1993). J. E. Mathieu et al. (Mathieu et al., 2000) studied common mental models and their correlates and found that convergence of mental models has an impact on team performance mediated by team processes (communication, coordination, interpersonal relationships, and collaboration).

In turn, collective mental models of social interaction contain information related to the roles and responsibilities of team members, role contact between team members, sources of information and knowledge, skills and abilities of each team

member. Considerable attention is paid to the study of role behavior in a military team, since the communication of military personnel is defined by the Statute, which strictly regulates the roles of participants in this interaction at all levels. At the same time, any performance of the role is set not only by the situation, but also mediated by personal characteristics of the military personnel, which include knowledge, values, experience, needs, etc. (Perevozkina, 2019). Moreover, all of the above elements are included in the structure of the mental model (Badke-Schaub, 2007). A number of our works show the influence of combat experience on the formation of the collective mental model of military personnel (Mekebaev, Perevozkina & Fedorishin, 2021), reveal the features of the role identity of military personnel and the structure of their social interaction (Mekebaev, Perevozkina, Perevozkin, 2021). In another study (Mekebaev, Perevozkina & Fedorishin, 2022), it was proved that Rusguardiya cadets most often identify with two role models – the role of father and hero, which is most often associated with the role of commander. The dominant need for cadets with a predominance of these role models is the need for achievement, and for cadets with the role of father, the need for order is additionally expressed, which implies the readiness of the subject of military professional activity to implement high standards.

According to research by J. R. Rentsch and R. J. Klimoski (2001), the main focus should be on the consistency of all elements of mental models of teamwork, since this is essential for team coordination and effectiveness (Mathieu et al., 2000).

Thus, the formation of common mental models will allow cadets, as future commanders, to coordinate, adapt and predict events without having to constantly develop strategies for coordinating the unit. This, in turn, involves determining effective role models in solving military-professional tasks and identifying the features of the management style with the expression of various role models of the commander, which served as the purpose of the study.

As a **hypothesis**, we put forward the assumption that cadets as future commanders who choose for themselves the role model of an adult and a young man will differ in a democratic leadership style that combines the ability to coordinate and direct the activities of a military team. Another hypothesis was the assumption that cadets who choose the destructive role of a young man as a commander's role model will demonstrate a conflictual and destructive leadership style.

Methods

Test subjects

The study was conducted on the basis of the Novosibirsk Military Order of Zhukov Institute in name of General I. K. Yakovlev of the National Guard of the Russian Federation. The study involved 150 fifth-year cadets aged from 21 to 27 years.

Equipment and incentive material

Were developed 10 cases aimed at solving service and combat tasks, which were combined into three blocks: the first block – "Interpersonal relations during the organization of service and combat activities"; the second block – "Injuries of personnel in military and professional activities"; the third block – "Non-standard situation when performing service and combat tasks".

To determine role identification, we used the projective technique called "Kaleidoscope" (Perevozkina, Panshina, Andronikova, & Dmitrieva, 2016). The technique contains 10 figures, five of which are female and five of which are male. In addition, all figures are divided into the following ages: childhood, youth, adulthood, and old age. In the period of youth, four roles were included: two creative ones aimed at society, implementing the attitudes and normative expectations of society, and two destructive ones directed against society, rejecting moral and ethical rules.

To diagnose the management style of cadets, the questionnaire "Management style" was used using the program "Psychologist-BB".

Procedure

The study included the solution of introductory tasks by each cadet (10 service and combat tasks). In the process of solving the introductory task, the cadet had to choose the role model with which he identifies himself as a commander.

After that, for each block, the most common roles of the cadet commander were identified. Thus, each cadet was assigned a role for each unit, with which he was identified most often as a group commander.

In addition, all cadets were tested on the questionnaire "Management style" using the program "Psychologist-BB", on the basis of which the cadet was awarded points in three management styles: authoritarian, democratic, liberal.

Next, a one-factor analysis of variance (ANOVA) was performed, in which the grouping variable was selected for the "Role" attribute, which had only three gradations, since the cadets chose only three role models, designated by us as follows:

– Role model 1 (RM 1) – represents an adult male, characterized by leadership and strengthening of the social structure, identified with collective values.
– Role model 2 (RM 2) – the role of a young man with a creative orientation, characterized by the desire and achievement of goals, the desire to win for the benefit of society.
– Role model 3 (RM 3) – the role of a young man with a destructive orientation, characterized by the destruction of both himself and the social environment, having no moral and social foundations, he confronts the world around him while feeling alien to society (Perevozkina, 2019).

The dependent variables were three management styles (authoritarian, democratic, and liberal). After establishing statistically significant differences, a posteriori comparisons were made between the three groups of cadets according to the LSD criterion (criterion of least significant differences).

Results

In the process of applying ANOVA (uniformity of variances was established by the Leven criterion, Table 1) statistically significant differences were found in the two styles depending on the role model in three blocks.

Table 1

Influence of the commander's role model on the peculiarities of the cadet management style in solving service and combat tasks

Blocks	Management style	Leven		ANOVA	
		F	p	F	p
1 block	Authoritarian	1,64	0,204	4,45	0,012
	Democratic	2,24	0,115	0,64	0,530
	Liberal	2,12	0,072	3,85	0,023
2 block	Authoritarian	2,52	0,089	7,65	0,000
	Democratic	1,73	0,186	2,76	0,045
	Liberal	2,29	0,110	0,89	0,447
3 block	Authoritarian	2,636	0,080	3,05	0,004
	Democratic	1,349	0,267	1,84	0,143
	Liberal	1,73	0,186	2,36	0,021

Depending on the role model of the commander in solving service and combat tasks aimed at optimizing interpersonal relationships during the organization of service and combat activities, authoritarian and liberal management styles statistically very differ ($p \leq 0,03$), which also have significant differences in solving tasks related to non-standard situations ($p \leq 0,03$). In addition, statistically significant differences were found in authoritarian and democratic management styles when solving service and combat tasks related to injuries of personnel in military professional activities. Therefore, it can be argued that the role model of the commander is a decisive factor in the expression of a certain management style among cadets.

Posteriori comparisons according to the LSD criterion (criterion of least significant differences, Table 2, fig. 1) showed that cadets with the chosen role of an adult male, as a commander, when solving the introductory of block 1, show lower results in terms of the severity of the authoritarian management style (M = 51.7 points).

Table 2

Assessment of differences in the authoritarian style of management depending on the role model of the commander when solving cadets tasks aimed at optimizing interpersonal relationships during the organization of service and combat activities

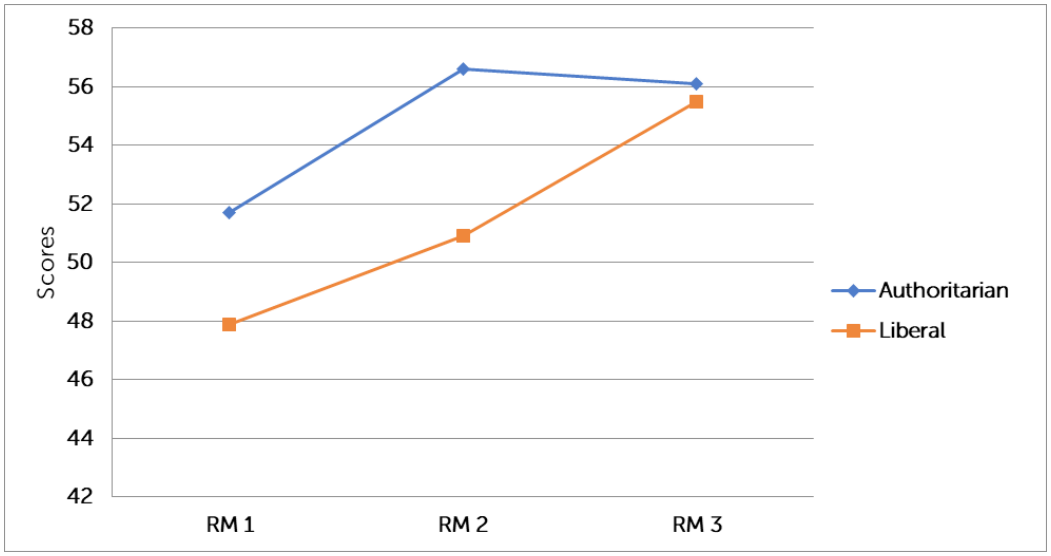
Commander role model	Average values by group		
	PM 1 (M = 51.68)	PM 2 (M = 56.64)	PM 3 (M = 56.04)
RM 1	–	–	–
RM 2	0,034	–	–
RM 3	0,035	0,830	–

Note. *The number in the table cells indicates the level of significance. The table is a matrix that is symmetrical diagonally, so the same significance levels have been removed. Symbols used in this table and in the following tables: RM – role model; M – arithmetic mean.*

While respondents with role models 2 and 3 showed statistically significant ($p<0.05$) higher results in the authoritarian management style (M = 56.6 points and 56.1 points, respectively).

Figure 1

The severity of authoritarian and liberal management styles depending on the role model of the commander in solving problems aimed at optimizing interpersonal relationships during the organization of service and combat activities



Similar results were obtained in the liberal management style of military personnel. Cadets with the identification of role model 1 as a group commander have the lowest results (M = 47.94 points), cadets with role model 2 have a slightly higher expression of liberal style (M = 50.90 points), and cadets with role model 3 have the highest results (M = 55.53 points).

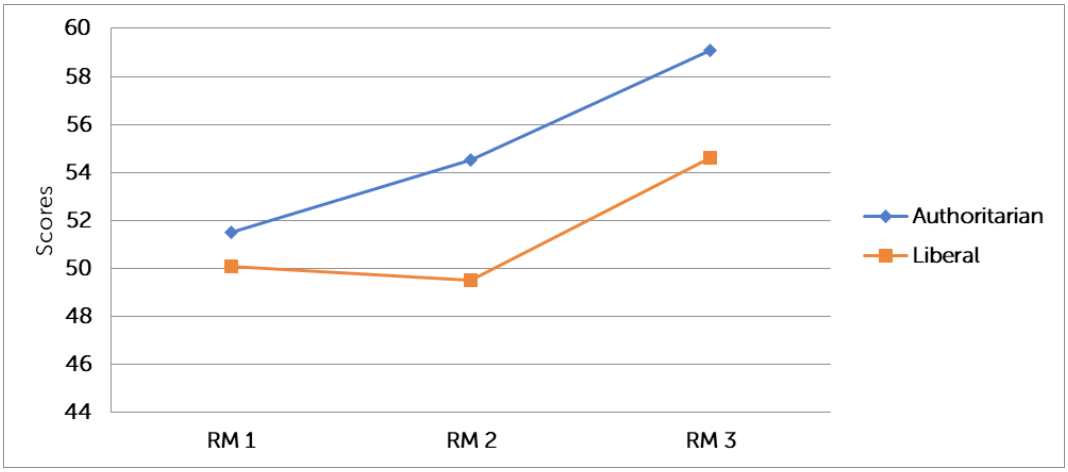
Assessment of paired differences in authoritarian and democratic management styles among cadets when solving problems related to personnel injuries in military professional activities demonstrates that the authoritarian management style is least pronounced among cadets who identify as a commander with the role of 1 (M = 52.94 points).

This style is slightly higher in cadets with role model 2 (M = 54.02 points) and the highest in cadets with role model 3 (M = 58.27 points). In turn, the highest values were found in cadets with role models 1 and 2 (M = 60.80 points and M = 60.58 points, respectively), and the lowest in cadets with role model 3 (M = 52.94 points).

Statistically significant differences ($p < 0.02$) in the two management styles were revealed in the process of solving tasks related to non-standard situations when performing service and combat tasks (Fig. 2).

Figure 2

Differences in management styles among cadets depending on the role model of the commander when solving tasks related to a non-standard situation when performing service and combat tasks



Authoritarian style consistently dominates among cadets with role model 3 (M = 59.08 points), which significantly differs from cadets with role model 2 (M = 51.51 points). Military personnel with role model 1 have an average value for authoritarian management style (M = 54.45 points, Table 3).

Table 3

Assessment of differences in the authoritarian management style of cadets depending on the role model of the commander in solving tasks related to a non-standard situation when performing service and combat tasks

Commander role model	Average values by group		
	PM 2 (M = 54.45)	PM 3 (M = 51.51)	PM 4 (M = 59.08)
RM 1	-	-	-
RM 2	0, 933	-	-
RM 3	0,007	0,008	-

A similar distribution is observed in the severity of the liberal style of cadets. Thus, the liberal style is more represented among cadets with role model 3 (M = 54.55 points), and military personnel with role models 1 and 2 have less pronounced values for this style (M = 50.10 points and M = 49.49 points, respectively).

Discussion

Summarizing the results obtained, we note that the role model of the commander, with which cadets are identified when solving service and combat tasks, is a factor that determines the implementation of a certain management style.

Thus, cadets with the role model 1 as a commander, which is characterized as the role of a leader, responsible and controlling (Perevozkina, 2019), show a democratic amnagement style when solving problems related to injuries of personnel in military professional activities. Military personnel with the dominance of this role model are able to coordinate and direct the activities of the team. They take into account the abilities of their subordinates and give them the initiative in military-professional actions at the right time. Such military personnel seek to study the individual qualities of personnel and socio-psychological processes that take place in the military team, which contributes to the prevention of conflicts and creates a friendly atmosphere in the unit.

Role model 2 is most often associated with the authoritarian management style of cadets, when solving problems related to the normalization of interpersonal relations during the organization of service and combat activities and injuries of personnel in military professional activities. This role model is described as striving to win and overcome obstacles, purposeful and confident (Perevozkina, 2019). Cadets with a pronounced role model 2 are characterized by highly developed leadership qualities, the ability to manage the actions of subordinates, demanding and persistent, the desire to influence the team by force of order and coercion.

Finally, the most conflicted and destructive management style is demonstrated by cadets with the dominant role model 3, which captures such characteristics as lying, resourcefulness, and insubordination to general rules and regulations (Perevozkina, 2019). In particular, cadets who chose this role model as a commander in solving the tasks of the three blocks are distinguished by the expression of authoritarian and at the same time liberal management styles. On the one hand, military personnel with this role model demonstrate pronounced leadership qualities and a desire for sole power, and ignore it. they take the initiative of their subordinates, are ambitious, and disregard public opinion. On the other hand, they are characterized by complete indifference to the interests of the team, irresponsibility, unwillingness to make difficult decisions, connivance and self-exclusion. It should be noted that both management styles refer to destructive forms (Fosse, Skogstad, Einarsen & Martinussen, 2019). The high prevalence of disruptive leadership can lead subordinates to react negatively to the commander's behavior (Thoroughgood, Tate, Sawyer & Jacobs, 2012). However, military personnel pass thorough strict professional selection process that includes such criteria as endurance, stress tolerance, self-regulation, etc. (Bartone, Eid, Johnsen, Laberg & Snook, 2009), which can mitigate the negative consequences of destructive management. Along with a strong professional identity and pride in one's profession, destructive leadership style this contributes to a negative attitude towards one's commanding officer, and can

have detrimental consequences (Reed & Bullis, 2009). At the same time, trusting one's commander is very important in a war situation, as subordinates are expected to give up their right to self-determination and they will follow orders. This is in sharp contrast to the consequences of destructive management, which include a lack of trust and willingness to follow the commander (Fors Brandebo, Nilsson & Larsson, 2016). This conflict aspect, related to the possible consequences of destructive management, is reflected in contradictory empirical data obtained from a sample of military personnel. For example, G. E. Reed & R.C. Bullis (2009) found a negative association between destructive management and satisfaction, as well as with the desire to stay in the service.

Conclusion

Thus, the results obtained indicate that the role model of the commander is a determining factor in the dominance of the management style of cadets in solving military-professional tasks related to the normalization of interpersonal relations during the organization of service and combat activities, injuries of personnel and non-standard situations. It is the role model, integrating specific social expectations, that determines the style of management of a military team in service and combat activities. Cadets chose only male role models for the role of commander.

Role model 1, with such characteristics as responsibility and prudence, which was chosen as a commander in the process of solving problems regarding injuries to personnel in military professional activities, is characterized by a democratic management style associated with the coordination and direction of the military team's activities.

Role model 2, with such qualities as the desire to win and overcome obstacles in solving military-professional tasks, is associated with a pronounced authoritarian management style (destructive management), combining leadership qualities, demanding and perseverance, the desire to influence the team by force of order and coercion in solving problems aimed at normalizing interpersonal relationships during the organization of service and combat activities and injuries of personnel in military professional activities.

The most conflicted management style is demonstrated by cadets with the dominant **role model 3**, which captures such characteristics as resourcefulness and insubordination to general norms and rules. Such military personnel are distinguished by the expression of authoritarian and at the same time condoning management styles, which relate to destructive management styles and manifest themselves in the form of striving for sole power, disregard for the interests and opinions of the military team, irresponsibility and self-withdrawal when solving tasks related to the normalization of interpersonal relations during the organization of service and combat activities, with injuries to personnel in professional activity and decision-making in a non-standard situation when performing service and combat tasks.

The potential consequences of active and passive forms of destructive mqnagement

are related to the role model and have equally harmful consequences. Our results support the view that both passive forms of management, such as laissez-faire management (liberal management style), and active ones (authoritarian style) can be considered an integral element of the concept of destructive management (Skogstad, Nielsen, Einarsen, 2017). At the same time, the combination of both management styles, which is typical for the role model 3, is the most harmful for military personnel. Our findings are largely consistent with what has been reported in other studies on destructive management (e.g., Mackey, Frieder, Brees & Martinko, 2017).

In practical, the results of our research will contribute to understanding that the combination of two forms of destructive management (passive and active) will have a detrimental effect on both the military team and the individual soldier. In this regard, it is necessary to take measures aimed at countering both forms of unacceptable behavior of the commander, as well as preventing identification with an undesirable role model.

Limitations of the study

As limitations of the study, it is necessary to indicate the probabilistic nature of the role identity of cadets with the role of commander and the assumed leadership style, whereas it would be much more productive to use real situations of the commander's role behavior. This opens up the prospect of conducting such a study not on cadets, but on military personnel performing service and combat tasks in garrisons and in THEIR own zone.

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Happiness in the Workplace of Women Lecturers Based on Work-Family Balance and Work Engagement

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Abstract

Introduction. Happiness at work is one of the components that can determine the achievement of one's success at work. Lecturers are teaching staff at the tertiary level who are an important component of the education system. Lecturers who have happiness at work will have a higher work engagement with their work, have a high concentration in doing their work, are always enthusiastic in doing all their work, and are always enthusiastic in completing all their work. The purpose of this study was to theoretically test the variables of work-family balance and work engagement on the happiness of female lecturers. **Methods**. This research is quantitative research with non-experimental methods. Respondents in this study consisted of 200 female lecturer respondents, who had worked for at least 1 year, had been married for at least 1 year, and had a Masters's degree. The sampling technique in this study was purposive sampling. There are three measurement tools used in this study, namely happiness at work, work-family balance, and work engagement. **Results and Discussion**. Retrieval of data in this study using a questionnaire in the form of google form. Testing the validity of this study using the Content Validity Ratio (CVR) which involves an expert in psychology. Data analysis in this study used multiple linear regression analysis techniques with the help of the SPSS.26 for windows program. The research results show that the hypothesis in this study is accepted. This means that the work-family balance and work engagement variables have a very significant effect on the happiness of female lecturers by 67.8%.

Keywords

work-family balance, work engagement, happiness at work, female lecturers, multiple roles, career women, working mothers, working women, education, colleges

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Introduction

Being a woman who is successful in her career and taking care of the household is every woman's dream. But the demands of work that are increasingly pressing from day to day make many women stressed and depressed. However, not a few women are still happy with their careers and raising their children (Fimela, 2013). According to the Central Statistics Agency (Badan Pusat Statistik) (2018), the number of married women who're working was 60.17% as of March 29, 2018. This shows that women are a very potential workforce. Many factors underlie the increase in the number of working mothers' participation. As mentioned by Almquist, Nieva, and Gutek (in Matlin, 2012) that women who have an education level up to college will tend to work more than those who do not have an education up to college. In addition to educational factors, economic factors are also mentioned, namely increasing family income, not being economically dependent on husbands, dissatisfaction in marriage, having certain skills that can be utilized, self-development and self-actualization. This is because the husband's salary is not enough to meet the needs of daily life.

Working women today have become a common phenomenon. However, the involvement of women in work careers has both positive and negative impacts on individual women, their families, and organizations as well. To minimize these negative impacts, women workers are needed to balance their roles both in the realm of work and family (Handayani, 2013). Sometimes working mothers find joy in raising children and responsibility in their work as a worker. Working moms have made a choice, and are given the ability to balance the demands between family and work or allow both demands to go hand in hand. By caring for her happiness, a married and working woman will be better at everything she does, both as a mother, worker, and partner (Greenberg & Avigdor, 2009).

The research on the happiness model in the workplace conducted by Fisher (2010) has the aim of testing the contribution variables of work engagement, job satisfaction, job involvement, Thriving and vigor, Flow and intrinsic motivation, Affect at work, and affective organizational commitment to happiness in the workplace. This model has provided evidence that job engagement, job satisfaction, and affective commitment

contribute to happiness in the workplace. In addition, this research also explains that aspects of happiness are related to pleasant moods and emotions for individuals. Then Fisher (2010) also explained in the results of his research, that welfare and a positive attitude can also influence individual work experiences. Fisher's research (2010) also explains the description of theoretical insights from positive psychology that develops about happiness in general.

Higashide's research (2016) also found that several criteria can be used as a benchmark for happiness in the workplace, among others, the first is individual factors which include job status, job meaning, job security, relationships with coworkers, recognition, autonomy, job satisfaction, job involvement, and organizational commitment. Then the second is a factor from the organization which includes training and development, management and leadership, competence or rewards, recognition of individual skills, relationships with subordinates, opportunities for career advancement, employee retention, and employee engagement..

Rahmi (2018) also explains that happiness in the workplace is one of the problems that must be considered, especially in the work environment. Still, according to Rahmi (2018), happiness in the workplace is based on employee satisfaction with work and individual lives where he or she works and tends to focus on individual work to increase individual productivity in their work.

Happiness in The Workplace

Diener and Diener (2008) suggest that happiness is also referred to as subjective well-being, which is a person's evaluation of his life that is cognitive, for example, an assessment of life satisfaction and affective in the form of pleasant reactions that affect one's emotions. Huang (2016) defines individual happiness as having a positive effect on the individual's performance because employees who are happy and remain enthusiastic will be happy to be involved in various organizational tasks. Baker, Greenberg, and Hemingway (2006) define happiness in the workplace as a condition in which every individual, at all levels of the hierarchy, has power, performs teamwork towards a common goal, gains satisfaction after developing a new product or service, and, through this new products or services, usually makes a positive difference in the lives of others. Diener and Bean (2007), (Wulandari and Widyastuti, 2014), Abadi, Choiriyah, Sukmana, and Karuniawan (2018), suggest that one of the factors that influence happiness is a harmonious family. A harmonious family is a family that is full of calm, tranquility, love, descent and continuity of generations of people, compassion and sacrifice, complementing and perfecting each other, as well as helping and working together. So it is appropriate, if a mother has decided to work, a female lecturer must be able to carry out her role both as a lecturer and as a mother while maintaining the harmony of her family. In this case, family harmony will be created. Of course, support from the husband, children, and other family members is also needed.

Work Engagement

Schaufeli, Salanova, Gonzalez-Roma, & Bakker, in Gagne (2014) define work engagement as a positive activity, to fulfill a work-related state of mind characterized by enthusiasm, dedication, and absorption. The discussion of work engagement is understood as a mediator mechanism and is embedded in 3 dimensions, namely strength, absorption, and dedication. The organizational reward model assumes employee engagement as a force that can encourage positive employee attitudes at work. This driving force can help employees, in this case working mothers, to overcome stress and fatigue at work and feel happy in carrying out the tasks assigned (Saks, 2006; Crawford, Rich., Buckman. and Bergeron (2014).

Work Family Balance

The condition that reflects the orientation of individuals in various life roles, the phenomenon of multiple roles is called work-family balance (Marks & MacDermid, 1996). The concept of positive role balance, whereby individuals view and lead a balanced life as ''achieving a satisfying experience in all areas of life, and to do so requires personal resources such as energy, time, and commitment to be well distributed across domains (Kirchmeyer, 2000).

Hypotesis

This study aims to empirically examine the effect of work-family balance and work engagement on happiness at work for female lecturers. This study hypothesizes that there is work-family balance and work attachment to happiness at work for female lecturers.

Methods

In accordance with the research objectives, namely to see the magnitude of the effect of work-family balance and work engagement on happiness in the workplace, the researchers used non-experimental quantitative research methods. Quantitative research method is an analysis of numerical data (numbers) which is processed by statistical methods (Azwar, 2013). The population of this research is women who work as lecturers at universities in Indonesia. The sampling technique in this research is using purposive sampling, where the researchers determine a number of characteristics that are in accordance with the objectives of this research. The characteristics of the sample in this research are female lecturers with a minimum of one year of service and have been married with a minimum of one year of marriage age, the minimum education is Masters (S2).

Happiness in the workplace in this research can be identified through the Happiness Scale in Workers from Alarcon (2006) which consists of 27 statement items, which are arranged based on the components of happiness in the workplace, namely positive

meaning in life, life satisfaction, personal achievement; and joy of life (Arias, Caycho, Ventura, Maquera, Ramírez, and Tamayo, 2016). The Work-Family Balance scale in this study uses the Work-family balance scale from Carlson, Grzywacz, & Zivnuska, (2009) which is composed of Work-Family Balance elements, namely: work-family conflict and work-family enrichment. This scale consists of 6 items. Furthermore, the work engagement scale was measured using a questionnaire adapted from the Utrecht Work Engagement Scale by Schaufeli & Bakker (2003). The questionnaire consists of 17 item statements about how respondents feel at work based on the dimensions of work engagement which consists of vigor, dedication, and absorption. Respondents' results showed how many respondents stated that they were very appropriate or very inappropriate with each item using a Likert scale type consisting of a 6-point scale ranging from 6 very appropriate to 1 very inappropriate.

Validity testing in this research uses the Content Validity Ratio (CVR). The item discrimination power and reliability test in this research also used the help of the SPSS 24.0 for windows program. The reference value of discrimination power of the measuring instrument in this research was 0.3 (Azwar, 2013), whereas for reliability in this research, Cronbach alpha was used with a reference value of 0.7 (Azwar, 2013).

The questionnaires in this research were distributed via a google form, due to the pandemic. This research was conducted from April 20 to September 1, 2021, where 200 samples were collected in this research. The characteristics of respondents in this research are female lecturers, who have worked for at least 1 year, have been married for at least 1 year, and have children, with the latest education of Masters (S2).

In the validity test, the researchers conducted a CVR or content validity ratio to test the measuring instrument. Some experts in the field of psychology were asked to examine the components of the measuring instrument used in this research. The CVR test was carried out on all measuring instruments used in this research, namely the happiness in the workplace scale, the work-family balance scale, and the work engagement scale. The panelists or experts who conducted the CVR test on this research scale amounted to 11 panelists. According to Lawshe (1975), the minimum CVR score for 11 panelists is 0.59. The results of the CVR test on the happiness in the workplace scale show that of the 27 items, 21 items have good validity and 6 items have poor validity, the results can be seen in table 1.

Table 1
Results of CVR in the Happiness in the Workplace Scale

Item No.	CVR	Item No.	CVR	Item No.	CVR
1	1	10	1	19	0,45455*
2	0,45455*	11	1	20	1

3	0,27273*	12	1	21	0,45455*
4	1	13	0,63636	22	0,63636
5	0,81818	14	0,63636	23	1
Item No.	CVR	Item No.	CVR	Item No.	CVR
6	0,27273*	15	1	24	0,81818
7	1	16	1	25	0,81818
8	0,63636	17	0,81818	26	0,27273*
9	1	18	0,81818	27	0,63636

The CVR test results on the Work-Family Balance scale of 6 items show that all items have a good CVR value, which is above 0.59. The results of the CVR test of the work-family balance scale can be seen in Table 2.

Table 2
CVR Results of Work-Family Balance Scale

Item No.	CVR	Item No.	CVR
1	0,63636	4	0,81818
2	1	5	0,81818
3	1	6	1

While the results of the CVR test on the work engagement scale show that from 17 items, there are 16 items with good validity and 1 item with poor validity. The results of the CVR test on the work engagement scale can be seen in table 3.

Table 3
CVR Results of Work Engagement Scale

Item No.	CVR	Item No.	CVR
1	1	10	1
2	0,81818	11	0,81818
3	0,81818	12	0,63636
4	1	13	1
5	0,81818	14	0,81818
6	0,81818	15	1
7	1	16	0,81818
8	0,27273*	17	0,81818
9	1		

Meanwhile, for the discriminatory power of the measuring instrument items in this research, none of the item tools failed. In the following table 4, the results of the item discriminatory power and reliability of each measuring instrument will be described.

Table 4
Test of Discriminatory Power of Items, Validity and Reliability of Measuring Instruments

Variable	Range of Item Discrimination Power	Reliability Value
Happiness in the Workplace	0,563 - 0,933	0,97
Work Family Balance	0,641 - 0,920	0,945
Work Engagement	0,429 - 0,859	0,952

Results and Discussion

The results of the correlation test showed that the three variables, namely happiness in the workplace, work-family balance, and work engagement have a significant correlation. Based on existing data, it is known that the work-family balance variable has a correlation coefficient of 0.744 on happiness in the workplace, meaning that the work-family balance variable has a significant relationship with happiness in the workplace. Then, the work engagement variable has a correlation coefficient of 0.719 to happiness in the workplace. This means that the work engagement variable has a significant relationship with happiness in the workplace. The results of the correlation test for happiness in the workplace, work-family balance, and work engagement can be seen in Table 5.

Table 5
Correlation Test Results

Variable	Corelation Karl Pearson	Sig
Work Family Balance-Happiness in the Workplace	0,744	0,001<0,05
Work Engagement-Happiness in the Workplace	0,719	0,001<0,05

Table 6 shows the results of multiple linear regression analysis, which is known to have an F value of 207,556 with a significance of 0.000 (p <0.05) and an R Square value of 0.678. This shows that there is an effect of work-family balance and work engagement which together have an effect on happiness in the workplace for female lecturers by 67.8%. The results of multiple linear regression can be seen in Table 6.

Table 6
Multiple Linear Regression Test Results

F	Sig	R Square
207,556	0,001 (p<0,05)	0,678

This research aims to see how much influence work-family balance and work engagement have on happiness in the workplace for female lecturers. Based on the value of R square, it can be seen that the influence of the work-family balance and work attachment variables on happiness in the workplace is 67.8%, while the remaining effect is known to be 1-0,678 = 0.332 or 33.2% determined by other variables that not included in the research variables. So it can be concluded that the hypothesis in this study is accepted. Female lecturers will realize that there may be a lot of lack of freedom and less time off, and there may always be time spent discussing work. However, because work is a choice that must be carried out, female lecturers must remain committed to the organization where they work. Because after all, if an employee can carry out her work activities well, this can affect her happiness in the workplace.

Based on the literature data, there have been found studies examining happiness in the workplace. Work-family balance has a relationship with happiness in the workplace (Ratnaningsih and Prasetyo, 2019). Furthermore, work-family balance and quality of life effectively contribute 39.7% to predicting happiness at work for female LAPAS officers. In addition, the results of Rahmi's research (2018) also explain that happiness at work is influenced by job satisfaction, work engagement, stress, and self-confidence. Roy & Kowar (2020); Ullah & Sisiqui (2020) explained in their research results that there is a significant positive relationship between work-family balance and happiness at work. Shui, Xu, Liu, and Liu (2020) stated that the factors that affect the subjective well-being of women mostly come from work-family conflict, which is then followed by work-family balance and also self-confidence. Then, in accordance with Khoiriyah, Sari, and Widiana (2020), happiness can mediate the impact of organizational support and work-life balance on work engagement. Field and Buttendach's (2011) research found that there is a significant positive relationship between work involvement and happiness. Fisher (2010) and McGonagle (2015) also found that happiness at work is influenced by work engagement. Prakash and Kashyap (2021) employee engagement and workplace well-being were shown to be linked, according to the findings, if an employee is mentally well and fulfilled, they are totally involved in their work

Diener and Diener (2008) suggest that happiness is also referred to as subjective well-being, which is a person's evaluation of his life that is cognitive, for example, an assessment of life satisfaction and affective in the form of pleasant reactions that affect one's emotions. Some think that happiness does not only refer to material things but rather refers to feelings related to the meaning of many events that occur in life (Wulandari

and Widyastuti, 2014). In addition, some think that happiness is a feeling that arises due to the balance of hopes and desires (Efida, 2008).

Furthermore, to complement the existing data, the researchers added a discussion of descriptive data from research respondents. Researchers divided the age of the respondents into two categories, namely the age of 26-40 years old and 41-64 years old. Based on descriptive analysis, it is known that the 41-64 years old age group has an empirical average score in the high category on the variable of happiness in the workplace of 38.80. A study of the happiness of 60,000 adults in 40 countries divided happiness into three components: satisfaction with life, pleasant feelings, and unpleasant feelings. Life satisfaction increases slowly with age, the pleasant effect decreases slightly, and the unpleasant effect does not change (Seligman, 2005).

Descriptive calculation of happiness in the workplace based on the respondent's last education, it can be seen that happiness in the workplace in respondents with the last education of Masters is in the high category, which is 37.52. Education can slightly increase the happiness of those on low incomes because education is a means of achieving better incomes. The climate in the area where a person lives and race also does not affect happiness. Meanwhile, in terms of gender between men and women, there is no difference in their emotional state, but this is because women tend to be happier and sadder than men (Seligman, 2005).

Based on the respondent's working period as a female lecturer, it can be seen that the working period of >10 years has happiness in the workplace in the high category, which is 37.58. Carr (2004) suggests that individuals who work tend to be happier than those who are unemployed, especially if the goals achieved are goals that have high value for individuals. Furthermore, if you look at happiness in the workplace based on the age of marriage, it can be seen that respondents with a marriage age of 7-10 years have happiness in the high category, which is 38.4. Marriage has a greater effect when compared to money in influencing perceived happiness. Married individuals tend to be happier than unmarried individuals. Because by marrying individuals will feel physical and psychological intimacy, the desire to have children, and build a household (Seligman, 2005) and (Carr, 2004).

In this research, researchers have tried as much as possible in preparing to measure instruments. However, the condition of PPKM at Level 4, which was still in effect at that time, made this research have limitations, among others, the number of respondents was still small and could not represent the population of female lecturers in Indonesia, then because researchers used google forms as a data collection tool, researchers did not can accompany the respondents directly in filling out the questionnaire, besides the distance, because the respondents are spread almost throughout Indonesia.

Conclusion

The results of this research prove that the hypothesis proposed in this research states that there is a match between the data in the field and the theory. This research model

can explain how work-family balance and work engagement can affect happiness in the workplace for female lecturers by 67.8%. The biggest role that has an influence on happiness in the workplace is derived from the work-family balance variable, which is 74.4%, while the work engagement variable is 71.4%.

- Female lecturers will recognize that there may be a lack of freedom and time off, and there may always be time to talk about work. However, because work is a choice that must be made, female lecturers must remain committed to the organization where they work.
- Furthermore, it was also found that individual career-related factors can positively influence employee happiness at work.
- Marriage has a greater effect than money in influencing perceived happiness

Recommendation

This research has suggestions for several parties, including for female lecturers to achieve happiness in the workplace, where what must be done is to always be grateful for what has been achieved, and participate in activities that can explore the potential within so that female lecturers can develop more. In addition, female lecturers can also participate in training that can foster gratitude within themselves.

For the University, it is hoped that this research can be a reference for creating happiness in the workplace. Many things can be done to achieve or provide happiness in the workplace for female lecturers, including providing facilities and infrastructure to carry out the tridharma of the college and involving female lecturers to participate in self-development training.

As for further researchers, to be able to examine other variables that can be related to happiness in the workplace, it is hoped that they will be able to capture more respondents so that further research can better represent the conditions of happiness in the workplace for female lecturers throughout Indonesia.

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Nita Sri Handayani – has contribute to conceptualizing and designing research, finding respondents and collecting data, statistical analysis and interpreting the results, writing and editing research report manuscripts as well.

Djamaludin Ancok – has contributed to the conceptualization of the research, preparing the theory and literature reviews, compiling and validating the measurement scales, and interpreting the results.

Dian Kemala Putri – has contribute to planning research and data collections, analyzing data and interpreting results, and writing the research reports as well.

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The Process of Comparing Images of Emotional Expressions

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Abstract

Introduction. We conducted an experiment in the paradigm of direct comparison of images of strong and weakly expressed emotional expressions with a detailed justification of the assessment made and registration of eye movements. **Methods**. Photo images from the VEPEL database (video images of natural transient facial expressions: joy, sadness, fear, surprise, anger, disgust, calm face) were used as stimulus material. The subjects were students of Moscow universities (72 people, of which 10 men, 62 women; age from 18 to 39 years, average age = 22.0, standard deviation = 4.0. Exposure time is unlimited, until the justification is completed. Research objective: image comparison (rank scale of similarity between images from 1 to 9) with registration of eye movements. **Results**. Based on individual assessments of similarity between images of emotional expressions, the reconstruction of the two-dimensional space was performed using the multidimensional scaling method. The reconstruction is described by Core Affect model by J. Russell. The presence of individual variability of similarity scores (the tendency to select a certain range of scores) is shown. *The following individual indicators were singled out for further search of possible predictors: the average similarity score between images, the standard deviation of the similarity score between images, and the average individual duration of fixations*. The presence of variability of estimates for different pairs of compared images is shown. The minimum variability of similarity estimates is achieved for the next pairs: fear–fear weak, joy – joy weak; anger – anger weak; disgust weak – anger; neutral – sadness weak. The maximum variability of similarity estimates is achieved for pairs of joy weak – fear weak; joy – fear weak; sadness – joy weak; joy weak – anger weak; neutral – joy weak. The analysis of the duration of visual fixations during the similarity assessment was carried out. It is shown that different similarity scores correspond to different distribution patterns

of fixation durations in the evaluation process. **Discussion**. Based on our results, we can conclude that there are several convergent evaluation justification processes based on an initial similarity score between images.

Keywords

emotional expressions, emotions, comparison, Core Affect, valency, scoring process, eye movements, fixation, decision time, multivariate scaling

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Introduction

For decades, research on emotions and their perception has been actively carried out within the framework of the neurocultural theory of P. Ekman (Ekman, 1971; Ekman 1999; Ekman & Corado, 2011; Ekman, 2017). The attractiveness of neurocultural theory is due to the fact that the idea of emotional expressions as universal communication signals facing outward, carrying information about the internal state of a person, opens up wide opportunities for practical application. For a detailed background and criticism of the theory, see (Crivelli & Fridlund, 2019).

The popular experimental paradigm, based on neurocultural theory, involves the performance of two tasks: the task of identification and the task of discrimination (Etcoff & Magee, 1992) on the material of transition series between images of “basic” emotional expressions according to P. Ekman. When performing a discriminatory task, the subject is sequentially presented with two similar but different images A and B, which are successive phases of the transition from one emotional expression to another, and then the target image X. It is required to indicate which of the images A or B matches X. Accordingly, this variant is called **ABX discrimination task**. In the task **of identification**, it is required to indicate what kind of emotional expression is present in the image, which is a transitional form between the "basic" emotional expressions.

This experimental paradigm assumes that the distinction between transitional forms between "basic" emotional expressions is carried out solely due to their different

identification as corresponding to different "basic" emotional expressions. Thus, the result of solving the identification problem will be an S-shaped curve with a well-defined boundary between the categories, and in the discrimination task there will be a maximum accuracy of the solution corresponding to the boundary between the categories.

The theoretical model and experimental procedure were developed in analogy with previous studies of categorical perception in acoustic modality (Liberman, Harris, Hoffman & Griffith, 1957). By the end of the 1980s, the concept of categorical perception as the basis for distinguishing acoustic stimuli became widespread (Harnad, 1987).

Numerous studies in this paradigm - for a review, see (Barabanschikov, Zhegallo, Korolkova, 2016) have shown that the experimental results obtained are not consistent with Ekman's neurocultural theory of emotions. Individual results can vary greatly, and the distinction between images is not always associated with their different categorical assignment.

The newly developed experimental paradigm is based on the component theory of emotions by K. Scherer (Scherer, 2001; Scherer, 2019). Considering the generation and perception of emotions as a process divided into separate components, we come to the need to choose an experimental paradigm that contains a single monolithic task that allows obtaining the maximum amount of various kinds of information, which facilitates further interpretation of the results. At the same time, the component theory, in principle, allows for a certain "flexibility" of individual components associated with the individual characteristics of the observer.

In our study, we propose to use the task of **comparing images of emotional expressions**. The subject needs to indicate the value of the similarity between the images on the Likert scale and justify his assessment in free form. Thus, the researcher simultaneously receives information both about the similarity between images and about the reasons for such similarity. It should be noted that, according to the predictions of P. Ekman's theory of "basic" emotions, there should be significant differences between images of strongly expressed "basic" emotions and slight differences between images of strongly and weakly expressed "basic" emotions of the same modality. Thus, the result of multidimensional scaling would be a space of dimensions equal to the number of "basic" emotions. At the same time, explanations of similarities and differences will be given in terms of expressed emotions. On the other hand, according to the predictions of "multidimensional" theories of emotions (Russell, Barrett, 1999; Russell, 2017), the reconstructed space should have a low dimension, and similarity scores should be explained in terms of "dimensions".

The proposed experimental paradigm is based on the tradition of comparison studies in the structure of cognitive processes (Samoilenko, 2010; Nosulenko, Samoilenko, 2019). According to the available data (Basyul, Samoilenko, 2019), the comparison results depend on the "comparison context", that is, the entire set of objects compared with each other, and the context is set explicitly through the presentation of strongly pronounced "basic" emotional expressions on the periphery of the image frame.

It should be noted similar studies with a relatively shorter exposure time without substantiating the similarity score with the further use of the multidimensional scaling method to reconstruct the similarity space between images. These studies included the study of perceived differences between schematic representations of a human face (Izmailov, Korshunova, Shekhter, Potapova, 2009); study of perceived differences between composite images of emotional expressions (Bondarenko, Menshikova, 2020).

The ongoing work is a continuation of the study (Zhegallo, 2021) and is aimed at studying the individual characteristics of similarity scores and eye movements when performing a comparison task.

Methods

Photographic images of "basic" emotional expressions (joy, sadness, fear, surprise, anger, disgust, calm face) from the VEPEL database were used as stimulus material in the study (Kurakova, 2012). We used images with a maximum (100%) degree of expression and with a 40% degree of expression of emotions, selected from the corresponding transition series (Kurakova, 2012; Barabanshchikov, Zhegallo, Korolkova, 2016). Image sizes - 227 x 315 pixels.

To present the stimulus material, an ACER KG251Q monitor with a resolution of 1280x1024 was used (the working area occupied the central part of the screen). A pair of images was located vertically in the center of the screen, and the distance between image centers was 240 points horizontally. On the periphery of the screen were six images of strongly pronounced "basic" emotional expressions that set a constant context for comparison. The images were displayed on a neutral gray background: RGB (102, 102, 102). The angular dimensions of the compared images at a distance of 60 cm from the screen were 9.1° x 6.6°.

The experiment was carried out individually. Presentation of stimulus material, fixation of ratings, and audio recording of the responses of the subjects regarding the justification of their ratings were performed using a modified version of the PxLab software (Zhegallo, 2016). The volume of the experiment when comparing 13 emotional expressions with each other, with the exception of comparison with oneself and without taking into account the location, is (13 * 12) / 2 = 78 experimental situations (ES) per subject.

The study involved students of Moscow universities in the framework of training courses in specialized disciplines, 72 people (10 men, 62 women). Age – 18 to 39 years old, mean age = 22.0, standard deviation = 4.0. Images of emotional expressions remained on the screen all the time while the subjects assessed the degree of similarity of the images. The exposure time of the images and, accordingly, the duration of the description offered by the subjects were not limited, the subjects could provide as complete a justification for the differences between the images as they considered necessary. The median duration of description of one image was 1 2.9 seconds, IQR (interquartile range) = 7.7–22.4 seconds.

The maximum time for describing one image was about 4 minutes. The total time for completing the task by the subjects ranged from 7 to 65 minutes, median – 21 minutes, IQR – 14–27 minutes.

During the experiment, two experimental setups were involved. One with eye tracker Eyegaze Analyzing System (sampling rate 120 Hz), another with an eye tracker GazePoint (sampling rate 150 Hz). The eyetrackers were paired with the PxLab software using author's proxy programs that received UDP control packets from PxLab (the beginning and end of the experiment, marks on the progress of the experiment) and transferred control to standard control programs in the required format. Thus, the uniformity of the experimental procedure was achieved on different types of eye trackers.

Further processing of the eye-tracking data was performed using the ETRAN package in the statistical processing environment R (R Core Team, 2020). Fixation detection was performed using the I – DT algorithm (Dispersion Threshold Identification), threshold dispersion – 60 pixels, minimum duration of fixations – 12 samples for the eye tracker EyeGaze, 15 eyetracker samples Gaze Point, which in both cases gives a minimum commit duration of 100 milliseconds. In view of the high noise level of the initial data on the eye tracker GazePoint before detection, additional kernel smoothing was performed (ksmooth function, KernSmooth library, bandwidth = 120).

Results

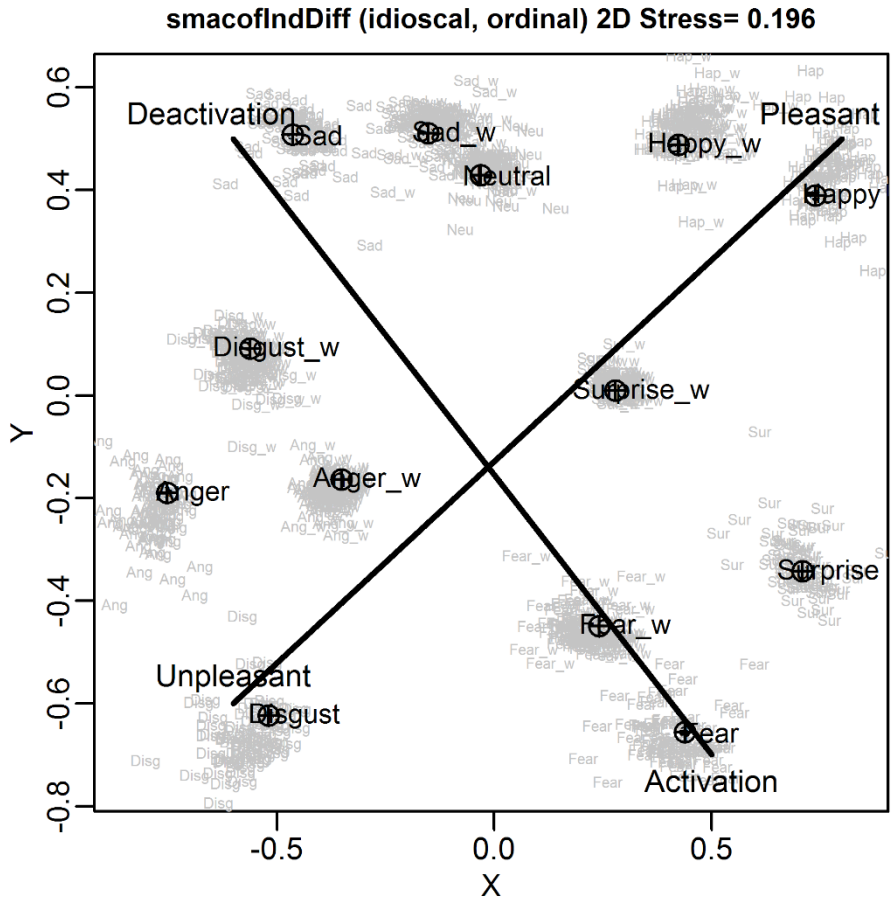
Space reconstruction

The reconstruction of the semantic space according to individual data of comparison of emotional expressions was carried out in the R statistical processing environment, the smacof library (De Leeuw & Mair, 2009), smacofIndDiff function, IDIOSCAL model (Individual Differences in Orientation SCALing). The model assumes that the weight of judgments may differ for different observers, and individual variations in the orientation of the similarity matrices are also possible. The additional argument type = ordinal indicates that the comparison data is presented in an order scale.

The quality of the reconstruction is assessed using the stress -1 value. For dimensions from 1 to 6, the stress -1 value takes on the values 0.321; 0.196; 0.14; 0.108; 0.086; 0.068 respectively. For the reconstruction of dimension 2, the "pleasant-unpleasant" and "activation-deactivation" axes described by the J. Russell's Core Affect model can be distinguished (Russell & Barrett, 1999). It should be noted that in our earlier study, with the qualitatively same image similarity structure, the value of stress -1 was 0.116. The deterioration in the quality of the new reconstruction may be due to increased individual variability in participant scores in the new study. The results are shown in Figure 1.

Figure 1

Reconstruction of space, based on individual results of pairwise comparison of images of emotional expressions.



***Note**. Black color shows the position of the compared images in the reconstructed space for the sample as a whole. Individual results of individual participants are plotted in gray, which allows you to visually assess the individual variability of estimates. The interpretation of the selected axes "fear" - "sadness" (activation-deactivation) and "joy" - "disgust" (pleasant-unpleasant) is given in accordance with the Core Affect model by J. Russell.*

Variation in Similarity Scores Between Pairs of Images

To assess the degree of variability of similarity scores between different pairs of images, their standard deviations were calculated. The median standard deviation is 2.09; IQR = 1.93–2.55. The maximum standard deviation is 2.53, the minimum is 1.30.

Ten pairs of images with **the minimum** variability of assessments (ordered in ascending order sd): fear - fear weak (hereinafter, "fear" means an image of emotional

expression with maximum severity; "fear weak" means an image of a weakly expressed emotional expression - 40% severity); joy - joy weak; anger - anger weak; Disgust weak - anger; neutral - sadness weak; surprise weak - disgust; disgust weak – anger weak; joy - anger; joy weak - anger; joy - disgust

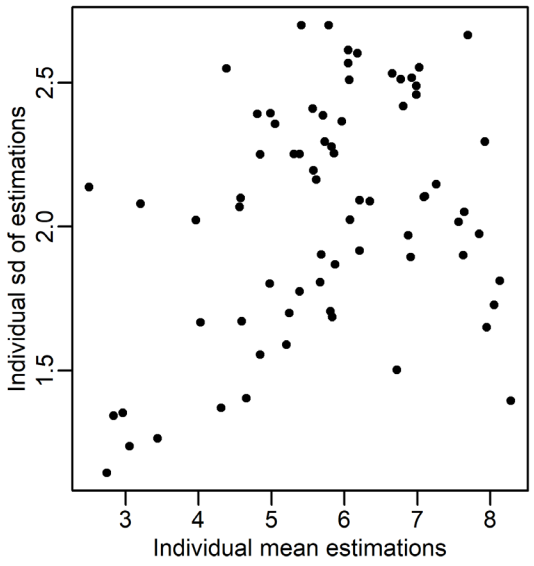
Ten pairs of images with **the maximum** variability of ratings (sorted in ascending order sd): sadness – anger weak; anger weak – fear weak; sadness weak – joy weak; joy – fear; joy weak – fear weak; joy – fear weak; sadness – joy weak; joy weak – anger weak; neutral – joy weak.

The analysis of sources of high variability of similarity estimates requires the use of verbal characteristics of compared images and will be performed in the course of further data processing.

Variation in Individual Similarity Scores

The individual features of the assessment are characterized by the average value of the similarity score and the standard deviation. The average similarity score for individual study participants ranges from 2.5 to 8.28. Me = 5.81; IQR = (4.94, 6.88). The standard deviations of the similarity score range from 1.14 to 2.70. Me = 2.09; IQR = (1.76, 2.39). The magnitude of the similarity score positively correlates with the standard deviation: r = 0.33, p = 0.005. At the same time, visualization shows the presence of a U -shaped trend (Figure 2), low values of the standard deviation correspond to high or low average individual similarity scores. The maximum variability of similarity scores is achieved with average values of scores from 5 to 7.

Figure 2
Ratio of means and standard deviations of individual similarity scores

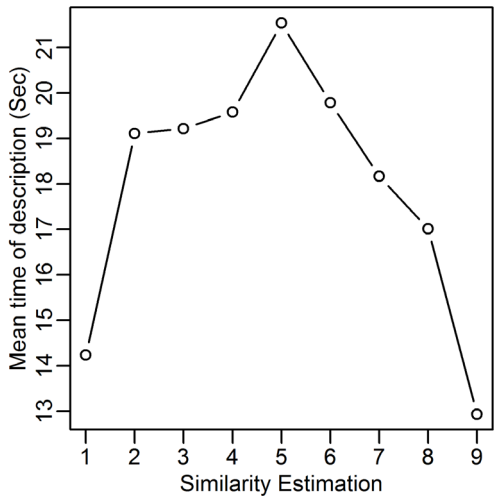


Dependence of the problem solving time on the estimation option

The duration of the task solution depends statistically significantly on the assessment option given by the participant; Kruskal -Wallace criteria $\chi^2 = 296.7$ (8), $p < 10^{-6}$. The maximum description time is reached for a score of "5", which may be due to the fact that in order to justify it, it is necessary to equally provide evidence of both similarities and differences between images (Figure 3).

Figure 3

The ratio of the similarity scores given by the participants and the average length of the description



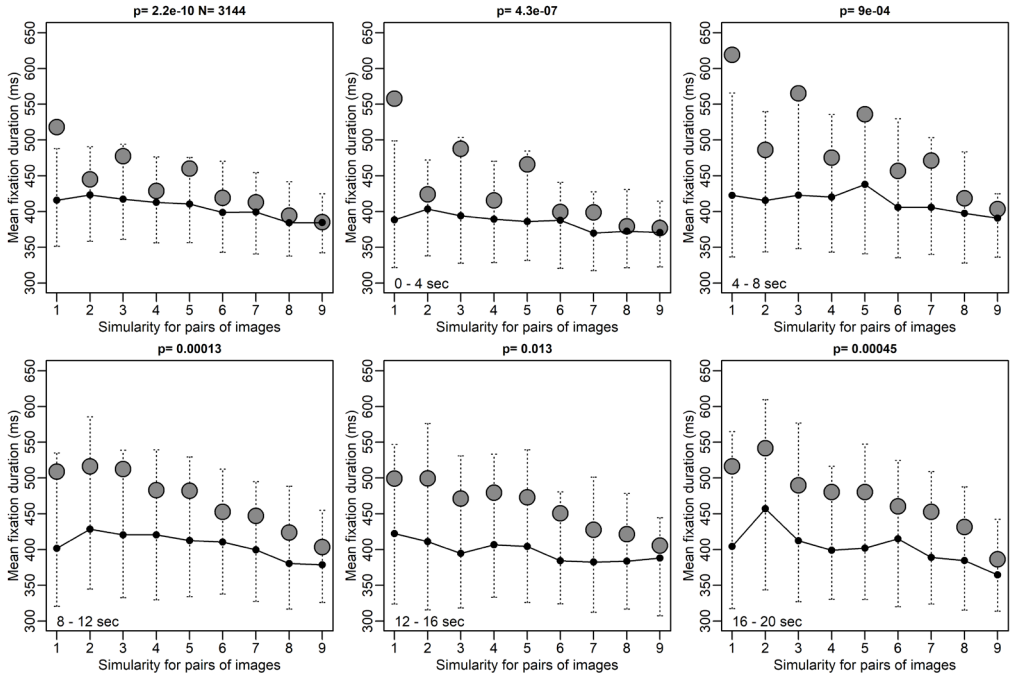
Eye Movement Parameters When Performing Similarity Assessments

For each experimental situation (ES), the recording quality (Prop) was estimated as the ratio of the total duration of the detected fixations to the total duration of the ES. For eye tracker EyeGaze Me(Prop) = 0.85, IQR = (0.78, 0.88). For eyetracker Gaze Point Me(Prop) = 0.61, IQR = (0.45, 0.73). For the sample as a whole, Me (Prop) = 0.74, IQR = (0.56, 0.83). Further analysis was carried out for ES with a recording quality above 0.7. For each ES, as a characteristic of the ES, the average duration of fixations along its entire length was calculated. Also, the average duration of fixations was calculated over consecutive intervals of 4 seconds (fixations that began in a given interval were taken into account). Next, the average duration of fixations for the ES as a whole and consecutive 4-second intervals was compared with the similarity score given to the subjects in this situation.

The Kruskal-Wallace test shows that significant differences in the duration of fixations for different assessment options are observed for the average duration of fixations for ES as a whole, as well as for the average duration of fixations during the first five 4-second time intervals. The results obtained are shown in Figure 4.

Figure 4

Dependence of the duration of fixations on the similarity score given by the research participant



Note. *Data on ES as a whole and 5 consecutive time intervals lasting 4 seconds. The solid line is the median values, the whiskers are the interquartile range, the gray circles are the average values.*

Differences in the duration of fixations for different variants of the similarity assessment are fixed throughout the entire time interval, not exceeding 75% quantile of the duration of the assessment. The obtained results can be interpreted as an indication that different similarity scores can be considered as processes requiring different levels of cognitive load. The most "simple" in cognitive terms are the "most similar" estimates; as the degree of difference increases, the rationale for the estimate becomes more "cognitively complex". Additional analysis of the duration of fixations for time intervals of 1 second shows that the initial assessment interval is characterized by a significantly shorter duration of fixations than subsequent intervals ($p < 10^{-6}$), the average duration of fixations at subsequent time intervals does not differ significantly.

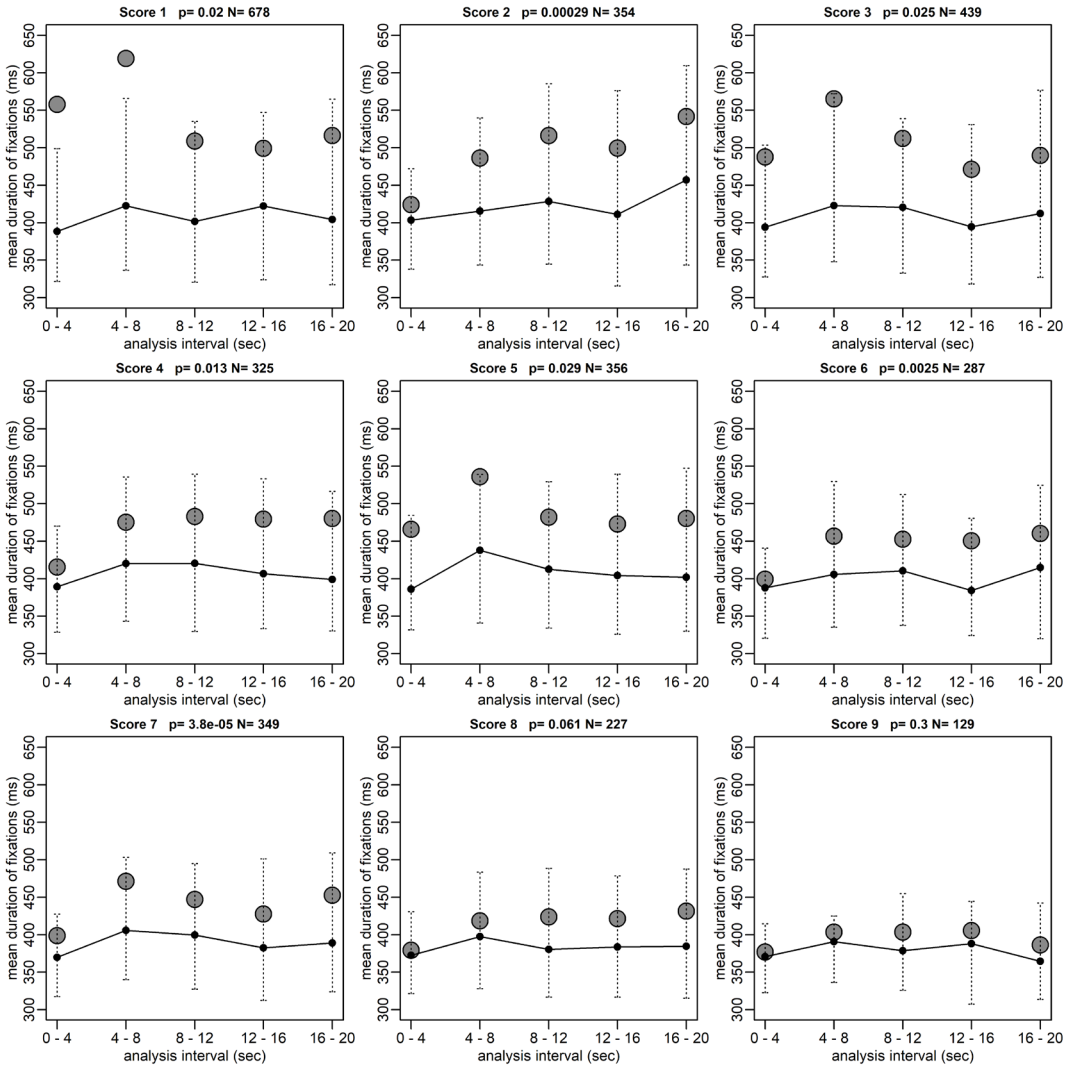
Comparison of the average individual duration of fixations with the preferred options for assessing similarity gives a correlation at the level of trends.

When calculating the individual average duration of fixations based on ES with a quality of record greater than 0.8, 45 participants are left for analysis. Pearson's correlation coefficient between the individual average duration of fixations and the experiment average similarity score $r = 0.32$ at $p = 0.03$.

Comparison of the average duration of fixations at the level of ES by 4–second time intervals gives the following results: score "1" – p = 0.02 (the number of ES n = 678); score "2" – p = 3 * 10 $^{-4}$ (n = 354); score "3" – p = 0.025 (n = 438); score "4" – p = 0.013 (n = 325); score "5" – p = 0.03 (n = 356); score "6" – p = 0.025 (n = 287); score "7" – 4 * 10 $^{-5}$ (n = 349); score "8" – p = 0.06 (n = 227); score "9" – p = 0.3 (n = 129). Thus, different estimates correspond to unique patterns of fixation duration distribution (Figure 5).

Figure 5

Duration of fixations at 5 consecutive analysis intervals for different similarity scores



Note. *Solid line – median values, "whiskers" – interquartile range, gray circles – average values.*

Discussion

The analysis performed shows the presence of differences at the level of individual subjects using one or another preferred range of estimates. Also, a comparison of the characteristic durations of fixations indicates that the process of comparing images, including the substantive justification of a particular assessment, should be considered differentially depending on the similarity assessment given by the observer.

Scherer's component theory of emotions, relevance, importance, coping potential, and normative significance stand out as the basis for evaluation (Scherer, 2019). Each of the grounds can then be expanded into several sub-tests. At the same time, the observer himself with his life experience, motives and needs is the central element of the evaluation process. The solution of the comparison problem indirectly also relies on the previous experience of the observer. However, in this case, the grounds for evaluation are not directly expressed in the verbalizations of the subjects.

It can be assumed that there are several convergent mechanisms for evaluating facial expressions, which are updated depending on the task assigned to the observer. Under normal conditions, the operation of different evaluation mechanisms gives an equivalent result. Here we can draw an analogy with the level system of construction of movements by N. Bernshtein (1990). In this system, the same motor task can be implemented at different levels of movement construction. Valence and activity are measured by direct evaluation of memories of past events (Yik, Russell & Steiger, 2011), and by direct evaluation of video recordings of emotional expressions (Mehu & Scherer, 2015). In our study, the substantiation of differences is given at the level of discrete emotional states and their partial mimic signs, but at the same time, the required dimensions are implicitly found in the structure of differences. Thus, the dichotomy between "discrete" and "continuous" approaches to describing emotions is removed (Zachar & Ellis, 2012). The work of various components (levels) of the assessment system is generally mutually consistent, but in conflict situations, it is possible to simultaneously generate several inconsistent assessments (Russell, 2017). Outlining the paths to interpreting the next dimensions of the space we are reconstructing, we can start from the results of a semantic analysis of the characteristics of emotional states (Beermann et al, 2021); the highlighted measurements are interpreted as valency, power, arousal and novelty.

We consider the assessment of similarity between images as a process that is repeated many times by observers throughout the description interval. At the same time, stable differences in the duration of fixations for different assessments indicate that different variants of similarity assessment are performed by processes with different levels of cognitive load.

When performing a similarity assessment, two stages can be distinguished. During

the preliminary stage, characterized by shorter visual fixations, an initial assessment of the degree of similarity is performed, which, as a rule, remains unchanged in the process of further description. At the second, **main** stage, multiple re-evaluation is performed and specific arguments are given that testify in its favor. Multiple reassessment of similarity may be due to the need to achieve a high level of confidence in judgments (Shendiapin, Skotnikova, 2015). The authors of the component model of emotions indirectly imply its possible cyclic nature (Sander, Grandjean & Scherer, 2018).

The use of eye movement registration in this study proved to be effective. At the same time, the chosen design turned out to be too complicated for a detailed analysis of fixation localization. Almost the entire volume of visual fixations is concentrated in the central part of the screen; qualitative analysis shows that context-setting images are considered by individual participants only during the first few ESs. Most of the participants in the study ignore contextual images. In the future, one could limit oneself to a single setting of the context at the beginning of the experiment by demonstrating the entire set of images used in the experiment. In this case, it would be possible to increase the size of the compared images. Unfortunately, the images in the VEPEL database are small, which is due to the technical capabilities of the equipment used for shooting.

The study shows that the registration of eye movements, in principle, makes it possible to single out individual steps within the similarity assessment process, which could then be compared with the elements of the component model (Scherer, 2001, 2019). However, to solve this problem, equipment is needed that is more resistant to small changes in the position of the subjects and, possibly, with better temporal resolution. Using the available equipment, we cannot unambiguously judge whether the differences in the form of distribution for successive time intervals reflect certain features of the process of evaluating the similarity of images.

The originally set task of identifying individual features that characterize the features of image comparison can be considered solved. As such features, we can further consider: the average score of similarity between images; standard deviation of the similarity score between images; average duration of fixations when performing similarity assessment.

Conclusions

Comparison of images of emotional expressions, performed with an additional justification of the assessment, with an unlimited exposure time, is a reciprocal-cyclic process, at the initial stage of which an initial similarity assessment is performed, and then multiple repeated confirmations of this assessment are performed. The comparison process may use several convergent mechanisms, depending on the originally generated similarity score.

Estimates of the similarity of images of emotional expressions are individually variable, the search for determinants of similarity estimates is the task of further research. As characteristic indicators of an individual similarity assessment, one can consider: the average individual assessment of similarity between images; standard deviation of the similarity score between images; the average individual duration of fixations when performing a similarity assessment.

Thus, the following main provisions of the article can be distinguished:

– Multidimensional scaling of the results of pairwise comparison of images of emotional facial expressions gives a two-dimensional space described by the Core Affect model by J. Russell ;

– Different similarity scores correspond to specialized evaluation processes characterized by specialized cognitive strategies that correspond to unique patterns of distribution of fixation durations;

– The range of similarity scores given by the observer is individually variable. The duration of fixations during the comparison task is individually variable.

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Solving the Issue of Finding Differences in an Illusory Context

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Abstract

Introduction. There are two opposite theoretical descriptions of visual perception: constructivist and ecological. To solve the issue of whether the perception of visual illusions is the result of a decision or whether such perception is natural and can be described using an ecological approach, an experiment was conducted to find differences in an illusory and nonillusory context, which reflects the novelty of this study. **Methods.** The subjects were offered a series of paired images in which it was necessary to find the difference as quickly as possible. The images could be the same: One picture could be 10 % larger than another, or, due to the illusory context, one picture could seem larger than another, and the image size was subjectively distorted due to the illusion of Ponzo and Delboeuf. According to the instructions, the size difference (real or apparent) should be ignored, and it was necessary to look for other differences. The time and precision of the response were measured for each option. **Results and Discussion**. Significant differences in visual field search time were found for images with an illusory difference, a real difference in size, and identical ones. For the first time, it was found that the problem is solved more efficiently (faster and more accurately) in the presence of two exact images, and the lowest efficiency is observed when solving a problem with an illusory difference in the size of images. It is concluded that the illusory context has an additional inhibitory effect on the process of solving the problem of finding differences. The advantage of describing the perception of visual illusions using a constructivist approach is experimentally shown.

Keywords

perceptural illusions, differences tracing, constructivism, Ponzo illusion, Muller-Laier illusion, Delboeuf illusion, ecological approach, visual perception, post-conflict slowdown, cognitive errors

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Introduction

Illusions are usually defined as errors in which subjective perception does not correspond to the actual parameters of the object. Errors can be associated with various reasons: optical phenomena (for example, the effects of light refraction), the device of the senses (blind spot phenomenon), insincere limitations of information (size illusions that occur when observed through a hole with one eye in the Ames room), incorrect judgments about size, shape, colour (geometric illusions, some colour, and contrast illusions). For this study, it is the last significant set of illusions, namely geometric illusions. They are the subject of active theoretical discussions in the field of visual perception.

There have been two opposite descriptions of visual perception in the scientific literature for more than a century (Glotzbach & Heft, 1982) – constructivist and ecological. Both approaches have deep philosophical roots. The founder of the **constructivist** approach in the study of visual perception is G. Helmholtz (1821-1894), and the **ecological** one is J. Gibson (1904-1979) (Gibson, 1950, 1979). These approaches are also commonly referred to as «indirect» and «direct», respectively. The indirect approach assumes the need for the existence of «unconscious conclusions» based on past experience, knowledge, attitudes. The process of perception is accompanied by transformations and calculations in the visual system, thanks to which the subjective image corresponds to reality. For representatives of the **constructivist approach**, the illusions of perception are convincing proof that our perception is not direct but depends on assumptions, hypotheses, and processes of a «higher level» instead (Men'shikova, 2007). Richard Gregory, a prominent representative of constructivism, described illusions as deviations from reality, situations when what we perceive does not correspond to any physical characteristic of a particular scene (Gregory, 1997). For example, two equal segments seem to be different in length (Muller-Laier illusion or Ponzo illusion), two same circles seem to be different in size (Delboeuf and Ebbinghaus illusions) (Stuart, Day & Dickinson, 1984; Bertamini, 2018; Evans, 1995). You can check and verify your own mistake by using a ruler, but even knowing that objects are equal does not free a person from illusory perception.

From the point of view of the **ecological («direct») approach** representatives, illusions are not at all a valid justification for the correctness of constructivists (de Wit, van der Kamp, & Withagen, 2015). J. Gibson emphasises that the process of obtaining information is «direct», that is, there is no need for intermediaries in the form of «installations», «thinking», or experience. Perception is presented as a direct «scooping» of information from structured optical stimulation. Stimulation contains all the information about the outside world, so there is no need to use any mental constructs for subjective perception to correspond to reality since it already corresponds to reality. The correspondence of reality is provided by the optical system, which is constantly changing under the influence of the movements of the observer and the surrounding space and is specific to different situations.

Thus, an **illusion** from the point of view of an ecological approach is a certain situation in which perception corresponds to what is commonly called an illusion. Brian Rogers writes that the best definition of illusion is the discrepancy between the available information and what we perceive. With this interpretation, the available «information» becomes an «objective or physical reality». That is, there are no illusions in the sense that this phenomenon is not a mistake at all, but the inevitability of processing «available» information (Rogers, 2017). The author compares the illusion with thresholds: If dim light is not visible or a quiet tone is not heard, we assume that this is how our **perception systems work**. That is, all sensory systems have thresholds, but we do not believe that these are visual or auditory illusions. Naturally, under certain conditions, we may not hear a sound or see light if these are subthreshold stimuli. We do not consider our inability to see the smallest details of objects far away from us as an illusion, it is just a consequence of our limited visual acuity. It follows from this fact that perception effects such as illusions, by analogy with the phenomenon of thresholds, demonstrate the work of perception systems. As soon as we understand how and why a specific effect is created, for example, colour metameres (or thresholds), we no longer consider it as an illusion but a specific aspect of the perception system. If this is the case, then it suggests that the only remaining «illusions» are those aspects of perception that we do not yet understand! (Rogers, 2022) It seems that the statement that illusions are perceptual phenomena that we do not yet understand is very convincing. If only there were aspects that we would understand well. It is known that sensory systems have thresholds, but the very nature of the threshold remains a mystery (Allakhverdov, Karpinskaya, 2021), however, as well as the phenomenon of metamerism, which still has no unambiguous explanation (Hurlbert, 2019). Thus, such a view does not reveal the nature of illusions of perception, but only states the fact of their existence.

It is impossible to determine with the help of perceptual illusions which of the approaches – constructivist or ecological – is preferable. However, the issue of whether the illusion is a mistake, the result of a decision and an unconscious conclusion, or a natural phenomenon caused by the work of the senses under certain conditions is of interest in itself.

Decision-making occurs when it is necessary to choose two or more alternatives. The effect of the so-called «post-conflict slowdown» is known when solving problems where incongruent stimuli are introduced that must be ignored. (Rey-Mermet & Meier, 2017). Post-settlement deceleration is investigated in the task-switching paradigm, the prospective memory paradigm, as well as in Stroop, Simon and flanker tasks (Stroop, 1935; Simon & Rudell, 1967; Eriksen & Eriksen, 1974). All these tasks are united by the need to ignore stimuli that conflict with the correct answer, since one or more properties of these irrelevant stimuli correspond or corresponded to the correct solution in the previous series of tasks, which led to the learning to answer according to the (already) irrelevant characteristic. Since the slowdown is present in all tasks where there is a conflict of several stimuli or properties, you can use this indicator as an indicator of conflict. That is, a decrease in the reaction rate in a task where it is necessary to ignore any characteristic implies the presence of a conflict. The mechanism of such a slowdown is described in various works on the study of cognitive control. It is believed that when a person is faced with a conflict, cognitive control allows them to choose properties relevant to the goal and block irrelevant properties. Thus, the presence of a conflict and the reaction to it affect the effectiveness of solving the problem (for example, Moroshkina & Gershkovich, 2008; Allahverdov, 2014; Botvinick, Braver, Barch, Carter, & Cohen, 2001).

If we imagine a task in which the subjects need to find differences in two pictures that differ in two parameters (one explicit and one parameter that requires additional effort in the search), then due to the conflict of obvious and hidden differences, we should expect a decrease in the efficiency of searching for the second difference compared to two images with only one implicit difference. For example, if the subject needs to find differences in two identical images and two images that are different only in size (while the size is declared insignificant, an irrelevant parameter that should be ignored), then it is likely that the time to search for differences in two images that are different in size will be longer than in two identical images. A similar deceleration effect can be assumed for two pictures that differ in size only due to an illusion. Even if the difference in size is illusory, the stimuli are still recognised and perceived as different, which means that this fact must be ignored, so cognitive control mechanisms associated with slowing will be involved.

Let us imagine that the hypothesis that the search for differences will be less effective if it is necessary to ignore differences in the size of images (it does not matter if the differences are actual and illusory) has been confirmed. This would only indicate that illusory perception does not differ from the perception of actual differences; similar patterns can be observed when solving the problem of finding differences in illusory and nonillusory stimuli. But this does not allow us to answer the question whether the illusion is the result of an unconscious conclusion and a kind of «erroneous» decision or is it a natural result under given conditions and not at all a manifestation of a cognitive error.

The study of errors has a long history. The effect of slowing down after an erroneous decision «post-error slowing» is widely known. Rabbit (1966) wrote about the slowdown that occurs after an error, but in their experiments, it was mainly about conscious mistakes

that the subjects could correct. Presumably, the delayed response to the stimulus that followed after the erroneous response is associated with the need (to correct the error, be more careful in the future, and not make a new mistake), as well as with the fact that the error knocks out of the «rhythm» when solving a series of problems (Rabbit, 1966). Currently, it is believed that the primary purpose of slowing down and correcting after making a mistake is to optimise the behaviour and avoid its recurrence. There are a large number of studies revealing the effect of slowing down after an error (Jentzsch & Dudschig, 2009; Hoonakker, Doignon-Camus & Bonnefond, 2016; Purcell & Kiani, 2016; Wang, Pan, Tan, Liu & Chen, 2016). The response time increases even after an unconscious error. For example, in Cohen's electroencephalographic studies (2009), neurophysiological effects associated with errors (post-error adaptation) were recorded regardless of whether the error was realised or not. In addition, the «go/no-go» paradigm revealed that the slowing effect occurring after an error is also characteristic of unconscious errors. In particular, the subjects performed «go» trials after unconscious errors more slowly compared to correct answers. In the case of conscious errors, more time is required for a subsequent response than in the case of unconscious ones (Cohen, 2009). Presumably, greater involvement of cognitive control resources is required to confirm unconscious errors, which leads to a lack of these resources in the subsequent processing of new stimuli (Shalgi, O'connell, Deouel & Robertson, 2007). If we consider an illusion as some kind of judgement error, then the error presence should affect the speed of solving the problem (slowdown) associated with this error, regardless of whether the error can be corrected or not.

In our studies, we offered the subjects a series of paired pictures in which it was necessary to find the difference as quickly as possible. There were three options for pairs: in the first option, the images in the pair were exactly the same; in the second option, the images of the pairs differed in size by 10 percent (one image in which it was necessary to look for a difference was larger than the other); in the third option, the size of the images was subjectively distorted due to the illusion of Ponzo and Delboeuf, so that one image only illusory seemed larger than the other. The subjects had to decide whether there were differences or not, ignoring the difference in size (subjective or objective).

Purpose of the study: Revealing the differences in the efficiency of solving the problem of finding differences in identical images, in images differ in one parameter (size), and in images having illusory differences in one parameter (size).

Hypotheses:

– In a difference search task, the response time will be longer for images that already have an obvious difference in size (illusory or real) compared to images without size differences. This is due to the need to ignore information that corresponds to the parameters of the problem solution, but, according to the instructions, appears irrelevant.

– Finding differences in images that only illusory differ in size will take longer

compared to images that actually differ in size. The increase in reaction time is the result of the unconscious fixation of the error (illusion) and the subsequent slowing effect after the error.

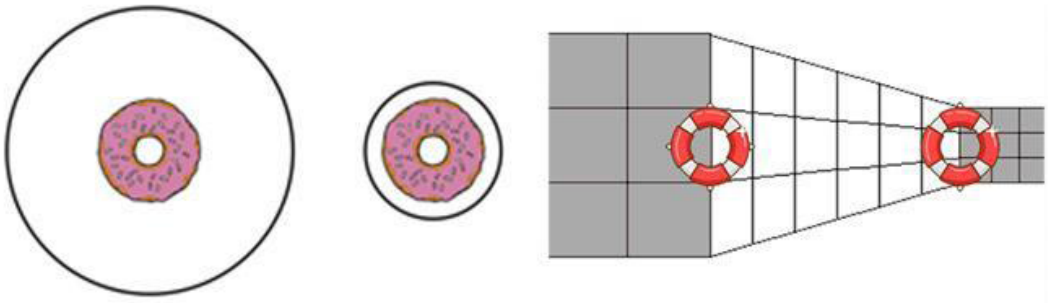
Methods

The experiments involve 49 people (42 women and 7 men aged 18 to 35 years), who participated voluntarily. Subjects had normal or corrected to normal visual acuity.

Pairs of images were used as stimuli. An example of stimuli is shown in Figure 1.

Figure 1

Example of stimuli with the Ebbinghaus and Ponzo illusion



All stimuli were presented on a 19-inch computer screen. PsychoPy software was used to present stimuli and record responses.

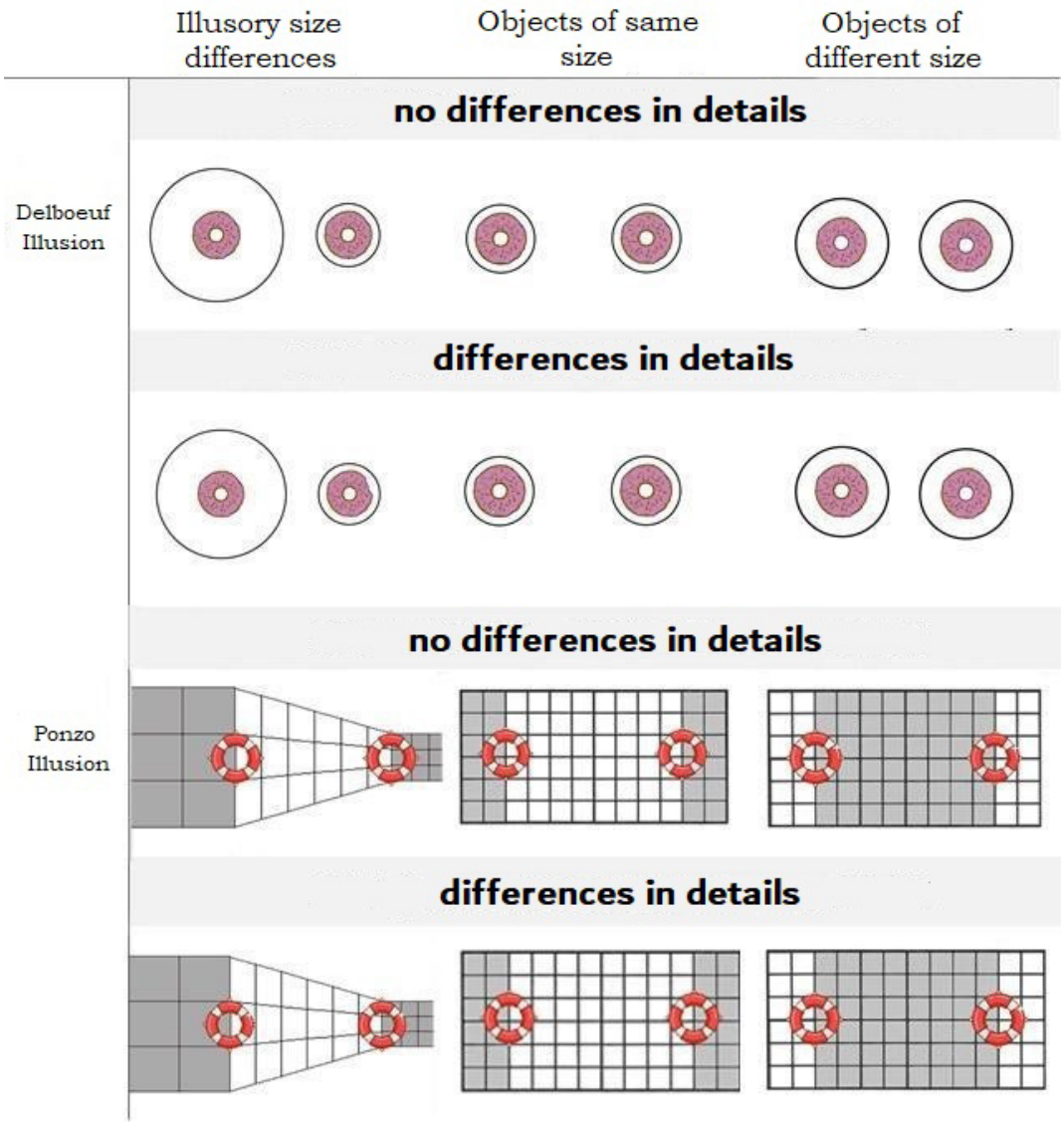
Participants were asked to answer whether the two images differ in **details**, such as extra strokes or lack of some details. The differences in size or context surrounding the image had to be **ignored**. The stimulus images were divided into two equal parts: one had differences, and the other did not.

In total, the subject was shown 72 pairs of objects in random order: 24 pairs of objects of the same size, 24 pairs with a 10% difference in size, and 24 pairs with an illusory size difference. Of every 24 pairs, 12 had differences and 12 did not. A pair of images were shown on the screen simultaneously for 5 seconds, then the participants had 2 additional seconds to respond by pressing the keys on the keyboard (there is a difference, there is no difference).

For the illusory difference in size, we used 12 pairs of Ponzo illusions (+12 pairs without illusions and 12 pairs with a 10% difference in size), as well as 12 pairs of Delboeuf illusions (+12 pairs without illusions and 12 pairs with a 10% difference) (Fig. 2). As a result, each

subject received 12 pairs with illusions and the same number of control stimuli (without the illusion of equals and different in size).

Figure 2
Examples of stimuli with and without differences



Note: *Extra attention should be paid to the sides of the donut, and the details on the lifebuoy edges in the examples «with differences in details». These are the relevant differences in the pair that the subject must find.*

Results

Experiments were conducted, and the response time was recorded in a situation where a decision was made about the presence/absence of differences in pairs of images, where there were no differences and where differences were actually present (in addition to the stated real or illusory size differences). Everywhere in the results we are talking about differences that have nothing to do with size (real or illusory) or context. The differences are the details of the drawing, as indicated above in the example in Fig. 2.

We found that when there was an illusion of a difference in size, participants took longer to respond compared to situations where there was no illusion ($F(2,48) = 3,32$; $p < 0,05$) (Fig. 3, Fig. 4).

Figure 3

Response time when searching for differences in pairs of objects without differences

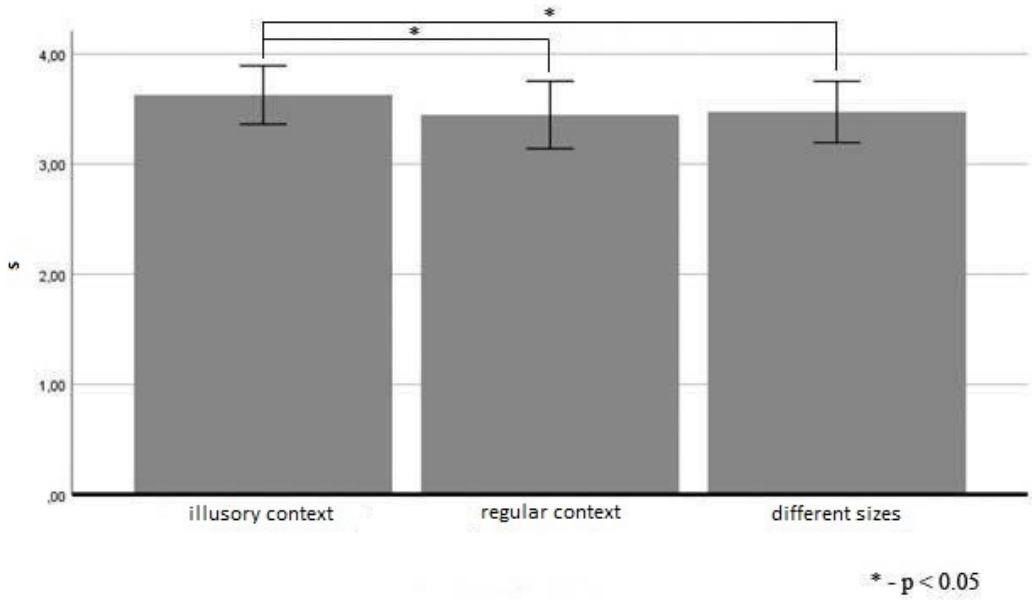
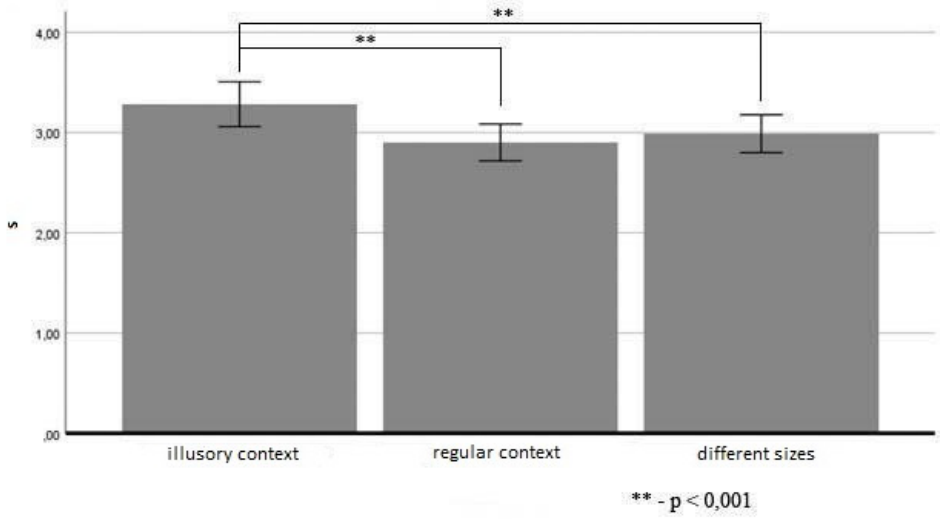
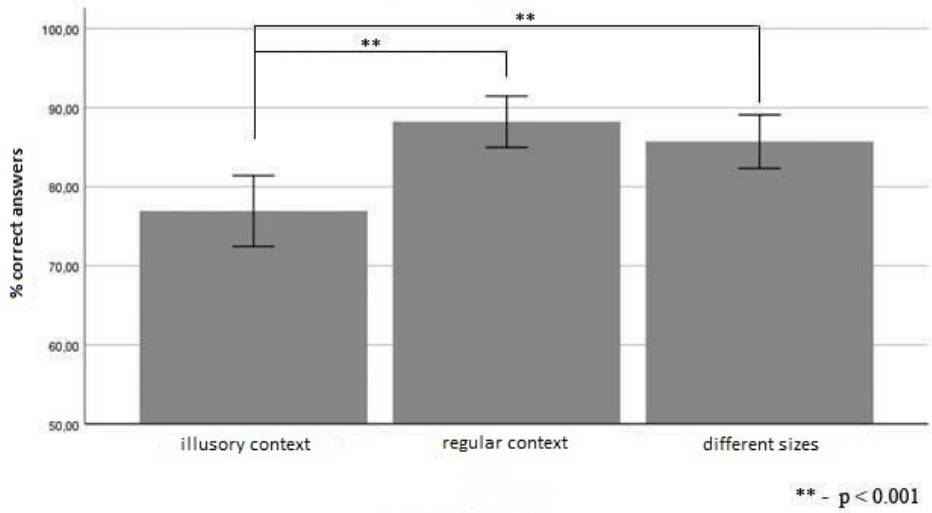


Figure 4
Response time when searching for differences in pairs of objects with differences



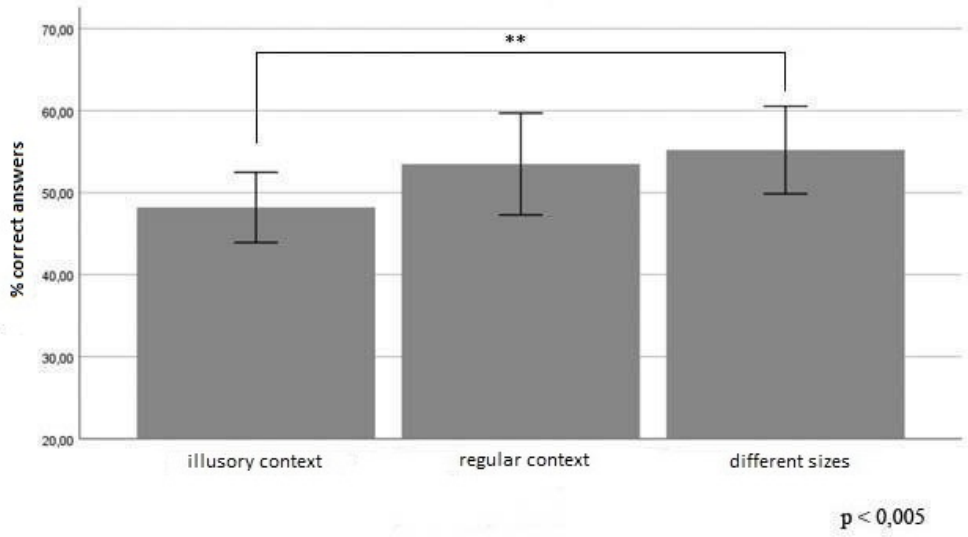
In addition, in the illusory context, participants made more mistakes and reacted more slowly than in other contexts (Fig. 5, Fig. 6). This is true both for pairs of the same size and for pairs with a 10% size difference. In the absence of differences between the objects, the subjects made more false alarm errors than in the illusory context ($F(2,48) = 13,7$; $p < 0,001$).

Figure 5
Response accuracy when searching for differences in pairs of objects without differences



In cases where there were differences between objects, the subjects made more omission errors in the illusory context ($F(2,48) = 3,68$; $p < 0,05$). The difference was significant between pairs with illusion and pairs with an illusory context.

Figure 6
Response accuracy when searching for differences in pairs of objects with differences



As a result, we found that illusory conditions lead to a decrease in the efficiency of finding differences between two objects (in cases with and without differences). This affected both accuracy (the number of errors) and reaction time.

Discussion

The results of the experiment showed that the efficiency of finding differences in an illusory context differs significantly from that in conditions without illusion. This is expressed in an increase in reaction time when deciding on the presence/absence of differences in the pictures, as well as in an increase in the number of errors (both false alarms and omission errors). There is no unequivocal opinion in the literature on what aftereffect an erroneous decision has on the parameter of subsequent errors. There are experiments that demonstrate both a decrease and an increase in the number of errors after a wrong answer. The mechanism associated with increasing the accuracy of responses after an error is most often cited as cognitive control, due to which subjects become more careful with subsequent responses (Williams, Heathcote, Nesbitt & Eidels, 2016). The articles most often report a follow-up increase in the accuracy of answers,

which is considered a consequence of increased cognitive control. However, there are other studies that show that the relationship between error and subsequent increase in accuracy is not so conclusive (Buzzell, Beatty, Paquette, Roberts & McDonald, 2017). It is known that with a short interval between the stimulus and the response, there is not an increase, but a decrease in the accuracy of the response (thus, the subjects make more errors of missing or false alarms). The authors state that the very process of error detection leads to a limitation of attention due to the fact that resources are directed to determine whether an error has been made. In turn, this can actively inhibit task-related sensory processing. The results show that errors do not lead to increased control and suggest that there are competing processes of distraction and control that follow errors (Dutilh et al., 2012).

In our study, the hypothesis that the task with illusion will be solved least efficiently compared to other conditions was confirmed. As it turned out, the effect of illusory size differences leads to a more significant increase in response time compared to the effect of real differences in size. The data show that for the observer, the situation of illusory size differences is not identical to the situation of equal objects' sizes, nor the situation of real size differences. The illusion complicates the task, which expresses itself in an increase in the solution time and the number of errors.

As we mentioned above, there are two opposing views on the nature of illusions: the ecological approach considers illusions as a natural consequence of perception in the environment, where the observer is not able to perceive illusory different objects as equal; and constructivism that considers the perceptual illusion as an error of interpretation (in the case of our study, this error concerns precisely the size of objects).

When looking for differences, a person needs to identify two objects and then choose the parameter by which these objects differ. If there are no obvious differences (colour, size, shape, and others) between the two stimuli, the search process begins as soon as the task is given. If there are any differences, for example, different sizes of stimuli, then these differences will interfere with the search for other differences for some time. It will be until the observer is distracted from this parameter and stops considering it in their task, thus identifying two stimuli. Only after that one can move on to the next difference. This effect, which manifests itself as an increase in response time, is observed in the task with actually different stimuli compared to the task with identical images.

However, what if the difference between the stimuli is an illusion? When comparing the task with the illusion and the task with real differences, we found a decrease in performance in the task involved with the illusion. We believe that the nature of this slowdown in our experiments is similar to what happens in experiments with an unconscious error: the observer fixes the illusory difference as an error, which has an additional inhibitory effect on the search for a relevant difference (not related to size). Thus, the solution time increases not only in comparison with the situation of identical stimuli, but also in the situation of indeed different stimuli.

The results of our experiment testify in favour of the constructionist idea on illusion as an erroneous perception.

Conclusion

– Perceptual illusion is a unique phenomenon, concerning which discussions are developing within the framework of two opposite approaches to visual perception: constructionist and ecological. According to the constructionist, illusory perception is the result of a decision; and, according to ecological, illusory perception is natural under certain conditions, since this is how our senses operate.

– The lowest efficiency of problem solving was revealed when using illusory differences compared to the presence of differences and their absence.

– It is concluded that the illusory context has an inhibitory effect on the problem of finding the differences. This is consistent with the constructionist approach to visual illusions.

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The Relationship Between Psychological Capital and Students' Choice of Interaction Positions and Self-affirmation Strategies

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Abstract

Introduction. The relevance of the problem is caused by the importance of studying the role of various factors, in particular, psychological capital, in people's choice of interaction positions and self-affirmation strategies. The novelty of the research is to identify the relationship of psychological capital, its individual components, and the choice of students' positions of interaction, strategies of self-affirmation. **Methods**. The study was attended by students of a number of universities in Moscow, Ivanovo, Cherepovets; a total of 342 people, including 72 men (21.06%), 270 women (78.94%), aged 17 to 26 years, the average age is 19.8 years (standard deviation = 1.88). As specific methods we used the author's questionnaire to identify the positions of interaction (V. G. Maralov, V. A. Sitarov (2018)), the Russian-language version of the questionnaire Lutans, Joseph and Avolio on the identification of psychological capital in the author's modification, a questionnaire by S. A. Kireeva and T. D. Dubovitskaya on the identification of self-affirmation strategies. **Results**. The study has found that the choice of positions of coercion and manipulation negatively correlates with psychological capital and a constructive strategy of self-affirmation, is positively associated with a destructive strategy of self-affirmation.

Choosing a position of nonviolence positively correlates with psychological capital and with a constructive strategy of self-affirmation. The choice of a non–interference position is negatively associated with psychological capital and positively with the rejection of self-affirmation. **Discussion**. It was found that psychological capital was interrelated with the students' choice of interaction positions and self-affirmation strategies, which is consistent with the results obtained by other researchers. The obtained results can be used for research and practical purposes, for example, to build an individual trajectory of self-development in the process of working with students.

Keywords

psychological capital, self-affirmation strategies, self-efficacy, resilience, hope, optimism, coercion, manipulation, nonviolence, non-interference

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Introduction

A person is a social being who is constantly existed in interaction with other people. When each of the parties pursues its own goals, which often may not coincide, this interaction can become tense or even conflicting. As a result, a contradiction arises, the outcome of which is determined by the acceptance of various positions of interaction: coercion, manipulation, nonviolence, humility (non-interference) or the choice of a constructive or destructive strategy of self-affirmation.

The position as a whole is understood as the integration of a person's position in the system of social relations and his relations to various aspects of reality. Coercion is a position that is associated with the implementation of multidirectional forms of pressure on a person using various means, up to the manifestation of aggressive actions. According to G. R. Patterson's theory of coercion, the tendency to coercion is formed under the influence of aggressive behavior of parents and peers (Patterson, 2016). Manipulation refers to milder forms of coercion, when a person, using various tricks (for example, flattery, deception, intimidation), seeks to achieve his goals by any means. Nonviolence is the opposite of coercion and manipulation. As D. Mayton defined nonviolence, it is "an action that uses force and influence to achieve its goal without direct harm or violence against a person or people..." (Mayton, 2009, p. 8). Non–interference acts as a kind of attitude of humility and

implies a refusal to actively interfere in the course of events, non-participation in them.

The choice of a particular position in the process of interaction is closely related to the process of self-affirmation of the individual, the choice of a constructive or destructive strategy.

In foreign psychology, self-affirmation is understood as the process of maintaining the integrity of the "I" and a global sense of personal identity and adequacy (Cohen & Sherman, 2014). Self-affirmation is activated by processing information that threatens the perceived adequacy or integrity of the "I" (Steele, 1988). In Russian psychology, self-affirmation is considered as "verification of a new experience included in the context of an individual's personal space in order to assert one's identity, preserve and develop it" (Kharlamenkova, 2021, p. 462). In relation to the student's youth, self-affirmation is interpreted as "the need and realization of the desire to show their individuality in the profession, to gain recognition from others and to assert themselves in their role and their opinion" (Podymova, Dolinskaya, Shouwen, 2018, p. 143).

Self-affirmation as a process is carried out with the help of various strategies. E. P. Nikitin and N. E. Kharlamenkova (2000) in their classification distinguish three strategies: constructive strategy, dominance strategy and self-suppression strategy. E. A. Kireeva and T. D. Dubovitskaya (2011), similarly, distinguish constructive strategy, destructive strategy and strategy of rejection of self-affirmation.

It is believed that the most effective position for organizing interaction of a tense or conflict nature is the position of nonviolence, manifested in the ability of a person to choose from a number of alternatives those that carry the least charge of coercion.

What determines the choice of a position of nonviolence? Modern research shows that the range of factors that determine the choice of nonviolence is diverse and wide. Firstly, this is due to the child's assimilation of the concept of nonviolence as a universal value, which is carried out in early childhood, where parents' "messages" about the permissibility or inadmissibility of violence play an important role (Farrell & Bettencourt, 2020). Secondly, the choice of nonviolence may be associated with an individual combination of neuropsychological, motivational and personal qualities of a particular individual, his irrational beliefs (Maralov, Sitarov, 2021; Maralov et al., 2022). Thirdly, it is largely determined by the implementation of the program of education in the spirit of peace and nonviolence, which is carried out by educational organizations, forming students' abilities for nonviolent interaction at different age stages (Danesh, 2008; Dutta, Andzenge & Walkling, 2016; Wang, 2018).

Recently, to explain social and psychological phenomena in science, more and more often resort to the use of complex concepts that integrate a number of characteristics that act as resources for people to achieve certain life goals. Such concepts include the concept of capital. **Capital** is a resource that people use in the course of their lives and activities. In modern science, there are several types of capital: economic capital, human capital, social capital and **psychological** capital.

– Economic capital is finance, movable and immovable property, everything that is

necessary for the implementation of production, life and human activity;

– Human capital is a set of skills and productive knowledge embodied in people (Rosen, 1989), achieved through education and training;

– Social capital is a set of human social ties based on benevolence, as well as empathy, trust and help (Adler & Kwon, 2002);

– **Psychological capital** is a positive psychological state characterized by confidence (self-efficacy), optimism, hope and resilience when faced with difficulties and problems (Luthans, Youssef & Avolio, 2007).

Literature review

In modern psychology, there is a number of research areas of psychological capital. The most significant are two of them. The first direction is focused on the study of the relationship between psychological capital and performance. The second is to study the relationship between psychological capital and the nature of relationships that develop during such interaction.

In particular, within the framework of the first direction, G. Alessandri and colleagues (Alessandri, Consigli, Luthans & Borgogni, 2018) have found that psychological capital is positively associated with involvement in work and thereby increases labor productivity. Similar results were obtained by S. Demir (2018), who studied the peculiarities of the manifestations of psychological capital among teachers. It is proved that the psychological capital of a person is positively associated not only with the effectiveness of labor activity, but also with the results of students' studies or academic performance (Ortega-Maldonado & Salanova, 2018).

In the second direction, an attempt to identify the relationship between psychological capital and various indicators of prosocial behavior is being made, interpersonal relationships, spirituality, nonviolence and self-affirmation. For example, A. Zünbül and A. Gördesli (Sünbül & Gördesli, 2021) revealed a positive relationship of psychological capital with the prosocial behavior of teachers, their job satisfaction, S. A. Usman with colleagues (Usman, Kowalski, Andiappa & Parayitam, 2022) – with trust in people, X. Zou and co–authors (Zou, Chen, Lam & Liu, 2016) - with behavior in interpersonal conflict situations. Interesting results were obtained by S. M. Norman and a team of co-authors (Norman, Avey, Nimnicht & Graber Pigeon, 2010), who proved that employees of an organization with high psychological capital are more likely to exhibit organizational civic behavior (helping and supporting colleagues at work) and are less prone to deviant behavior than employees with a low level of psychological capital.

In modern science, the problem of the relationship between psychological capital and nonviolence, the choice of self-affirmation strategies, has not been fully resolved. Nevertheless, there is a number of works which show that such a connection exists. In particular, A. Sarkar and N. Garg (Sarkar & Garg, 2020) conducted a study of the

relationship between spirituality, psychological capital and nonviolence. The results showed that all four components of psychological capital (self-efficacy, hope, optimism, resilience) mediate the relationship between individual spirituality and nonviolent behavior in the workplace. In the article by A. Rostami and colleagues (Rostami, Ahadi, Abolmaali & Dortaj, 2022), it was convincingly proved that purposeful work of educating schoolchildren in the spirit of peace and nonviolence positively affects the development of such components of psychological capital as self-efficacy and resilience. In the study of T. Sun and colleagues (Sun, Zhao, Yang & Fan, 2012), conducted on a contingent of nurses, it was shown that higher psychological capital increases labor productivity and self-esteem of rootedness (positive self-affirmation) in work.

Thus, the available studies indicate only the existence of a relationship between psychological capital and nonviolence, as well as self-affirmation, but do not reveal the specifics of this relationship. It is possible to formulate a number of questions that need additional study. Firstly, is psychological capital connected only with nonviolence or with the choice of other positions of interaction: coercion, manipulation, non-interference? Secondly, which components of psychological capital are more related to the choice of interaction positions, and which are less? Thirdly, how are psychological capital and the choice of certain positions of interaction related to self-affirmation strategies? The need to answer these questions prompted us to organize a special study, the purpose of which was to identify the nature of the relationship of psychological capital, its individual components and positions of interaction, as well as self-affirmation strategies. As a hypothesis, we proceeded from the assumption that a high level of psychological capital and its individual components will be positively associated with a position of nonviolence and a constructive strategy of self–affirmation, and its low level with positions of coercion, manipulation and non-interference, while in the first two cases a destructive strategy will dominate, and in the third – the rejection of self-affirmation.

Methods

Sample group

The study was conducted in September-November, 2022 in a number of universities of psychological, pedagogical and medical training profiles in Moscow, Ivanovo, Ivanovo region, Cherepovets, Vologda region. It was attended by 342 students aged 17 to 26 years old, the average age was 19.8 years old (SD = 1.88) – 72 men (21.06%), 270 women (78.94%). 209 people were students – future teachers and psychologists (Moscow City Pedagogical University – 60 people, Moscow Humanitarian University – 28 people, Cherepovets State University – 121 people), 133 people were students – future doctors (Ivanovo State Medical Academy).

Methods

The methodological basis of this study was a systematic approach, as well as the theoretical provisions of modern science about the processes of human interaction, about nonviolence as a universal value. Let's focus on the characteristics of specific techniques.

– **The author's questionnaire to identify the positions of interaction** (Maralov, Sitarov, 2018) consists of 40 questions-statements with answer options, which allows us to differentially identify the preference of subjects for certain positions of interaction: coercion, manipulation, nonviolence, non-interference. Each scale assumes the calculation of the total score, which is then translated into a standard scale.

– **The Russian-language version of the psychological capital questionnaire by F. Lutans, K. Josef and B. Avolio** (Luthans, Youssef & Avolio, 2007) in the author's modification (Maralov, Kudaka, Smirnova, 2022) includes 24 statement questions, each of them assumes 6 answer options: from "completely disagree" to "completely agree", points from 0 to 5 are assigned to each option. The result is data on variables: self-efficacy, hope, optimism and resilience, as well as a generalized index of psychological capital. The questionnaire has passed all the procedures related to the determination of reliability and validity. As a result, conclusions about the possibility of its application in the field of higher education for the diagnosis of psychological capital of students were drawn. The final scores for individual parameters and for the entire questionnaire as a whole were translated into a ten-point scale.

– **The methodology of the study of the features of self–affirmation by S. A. Kireeva, T. D. Dubovitskaya** (Kireeva, Dubovitskaya, 2011) is a questionnaire that includes 18 statements with the possibility of three possible answers, one of them is estimated at 2 points, the opposite in meaning is 0 points, the intermediate one is 1 point. The final result is obtained as a result of summing up the points. The final scores were converted to a standard ten-point scale.

Statistical analysis

The results of the study were processed using the methods of mathematical statistics. The criterion φ* - Fisher's angular transformation and correlation analysis were applied, linear Pearson correlation coefficients were calculated. The processing was carried out using the capabilities of the Excel program.

Results

Let's start analyzing the results with the general characteristics of the obtained data. Table 1 presents the results of a study of students' propensity to choose positions of interaction, parameters of psychological capital and self-affirmation strategies. All data are given according to the high level of severity of the studied indicators.

Table 1

Interaction positions, psychological capital, self-affirmation strategies of students

Level	Data in general		Medical students		Pedagogical students and psychologists		Statistical significance of differences between medical students and students - future teachers and psychologists (criterion φ* - Fisher angular transformation)
	n	%	n	%	N	%	
Interaction positions (high level)							
Force	106	30,99	47	35,3	59	28,23	φ*=1,37, not significant
Manipulation	114	33,33	49	36,84	65	31,1	φ*=1,09, not significant
Nonviolence	142	41,21	46	34,59	96	45,93	φ*=2,08, p≤0,05
Non-interference	147	42,98	64	48,12	83	39,71	φ*=1,53, not significant
Psychological capital (high level)							
Self-efficacy	107	31,29	45	33,83	62	29,66	φ*=0,79, not significant
	103	30,12	58	43,61	45	21,53	φ*=4,30, p≤0,001
Hope	159	46,49	66	49,62	83	44,5	φ*=0,92, not significant
Optimism	118	34,50	58	43,61	60	28,71	φ*=2,8, p≤0,01
Stability	118	34,50	55	41,35	63	30,14	φ*=2,13, p≤0,05

Level	Data in general		Medical students		Pedagogical students and psychologists		Statistical significance of differences between medical students and students - future teachers and psychologists (criterion φ* - Fisher angular transformation)
	n	%	n	%	N	%	
Self-affirmation strategies (high level)							
Constructive	122	35,67	53	64,31	69	33,01	φ*= 5,73, p≤0,001
Destructive	62	18,13	13	9,77	49	23,44	φ*=3,36, p≤0,001
Rejection of self-affirmation	114	33,33	34	25,56	80	38,28	φ*=2,47, p≤0,01

Note: *the sum of points for interaction positions and self-affirmation strategies is not equal to 100%, since the same student can choose different positions and different self-affirmation strategies, or they may not be clearly expressed.*

As can be seen from Table 1, about a third of students in the process of interaction are able to take either a position of coercion (30.99% or 106 people), or a position of manipulation (33.33% or 114 people), the position of nonviolence is occupied by 41.21% (142 people) of the subjects, the position of non–interference - 42.98% (147 people). We emphasize that the same student, depending on the situation, may occupy different positions. Most often, positions of coercion and manipulation are combined, but other combinations are also possible, for example, nonviolence and non-interference or manipulation and non-interference. A comparison of these positions among students – future doctors and students – teachers and psychologists showed that differences are found in one position, namely the position of nonviolence. Pedagogical and psychological students are statistically more likely to adopt a position of nonviolence than medical students (45.93% as opposed to 34.59%, $\varphi^* = 2.08$, $p \leq 0.05$).

Similarly, we consider the results of the study of psychological capital. In general, 34.5% (118 people) demonstrated a high level of psychological capital. The most pronounced parameter was optimism (46.49% or 159 people), less pronounced – hope (30.12% or 103 people) and self-efficacy (31.29% or 107 people). Significant differences were found in the groups of medical students and students – future teachers and psychologists. The general level of psychological capital among medical students turned out to be higher and amounted to 41.35% (55 people) as opposed to 30.14% (63 people) among students-future teachers and psychologists ($\varphi^* = 2.13$, $p \leq 0.05$). This difference is obtained due to two parameters: hope (43.61% as opposed to 21.53%, $\varphi^* = 4.30$, $p \leq 0.001$) and stability (43.61% as opposed to 28.71, $\varphi^* = 2.8$, $p \leq 0.01$).

As for self-affirmation strategies, a constructive strategy dominates at a high level here (35.67% or 122 people), a destructive strategy is manifested in 18.13% (62 people), rejection of self-affirmation is a characteristic of 33.33% (114 people). Recall that strategies can be combined with each other, for example, in some cases a constructive or destructive strategy is used, in others – a rejection of self-affirmation. At the same time, medical students prefer a constructive strategy more often than pedagogical students and psychology students (64.31% as opposed to 33.01%, $\varphi^* = 5.73$, $p \leq 0.001$), and destructive, on the contrary, pedagogical students and psychology students (23.44% as opposed to 9.77%, $\varphi^* = 3.36$, $p \leq 0.001$). Rejection of self-affirmation more characterizes pedagogical students and psychology students (38.28% as opposed to 25.56%, $\varphi^* = 2.47$, $p \leq 0.01$).

The general conclusion that follows from the analysis of the sample of subjects is: pedagogical students and psychology students more often use the position of nonviolence in the process of interaction, compared with medical students, however, the latter are more prone to manifestations of perseverance in achieving goals (hope), are more resistant to negative environmental influences and they use a constructive strategy of self-affirmation more often.

Let us turn to the solution of the main task of this study – to identify the relationships between the positions of interaction, psychological capital and self-affirmation strategies. The results of the correlation analysis are shown in Table 2.

Table 2

*Matrix of correlations of interaction positions, psychological capital and self-affirmation strategies**

Indicators	5	6	7	8	9	10	11	12
1. The position of coercion	-0,09	-0,16**	-0,20**	-0,30**	-0,23**	-0,11*	0,21**	-0,01
2. Manipulation position	-0,04	-0,22**	-0,10	-0,15**	-0,15**	-0,19**	0,21**	-0,03

Indicators	5	6	7	8	9	10	11	12
3. The position of nonviolence	0,21**	0,17**	0,25**	0,19**	0,25**	0,32**	-0,11*	-0,08
4. The position of non-interference	-0,23**	-0,19**	-0,14**	-0,24**	-0,22**	0,05	-0,12*	0,23**
5. Self-efficacy	1	0,52**	0,57**	0,54**	0,77**	0,23**	0,03	-0,28**
6. Hope		1	0,51**	0,49**	0,71**	0,30**	-0,11*	-0,28**
7. Optimism			1	0,68**	0,81**	0,29**	-0,12*	-0,41**
8. Sustainability				1	0,80**	0,22**	-0,07	-0,34**
9. Psychological capital in general					1	0,30**	-0,13*	-0,38**
10.Constructive strategy						1	-0,14**	-0,14**

Indicators	5	6	7	8	9	10	11	12
11. Destructive strategy							1	-0,04
12. Rejection of self-affirmation								1

Note. ** – connections significant at the level of p ≤ 0.05; ** – connections significant at the level of p ≤ 0.01*

The position of coercion negatively correlates with psychological capital (r = -0.23, p ≤ 0.01), with all its parameters, except self-efficacy, the greatest negative relationship between coercion and stability (r = -0.30, p ≤ 0.01) was found. A positive correlation between the named position and the destructive self-affirmation strategy (r = 0.21, p ≤ 0.01) was found. Approximately the same picture is found while analyzing the interrelationships of the position of manipulation, psychological capital and self-affirmation strategies. There is a negative relationship with hope (r = -0.22, p ≤ 0.01) and stability (r = -0.15, p ≤ 0.01), and a positive relationship, as in the previous case, with a destructive strategy (r = 0.21, p ≤ 0.01).

The choice of a position of nonviolence positively correlates with all indicators of psychological capital and with a constructive strategy of self-affirmation (r = 0.32, p ≤ 0.01).

The position of non-interference was negatively associated with psychological capital in general (r = -0.22, p ≤ 0.01) and with all its parameters. A negative relationship was found with stability (r = -0.24, p ≤ 0.01) and with self-efficacy (r = -0.23, p ≤ 0.01). At the same time, a negative relationship was found with the destructive strategy of self–affirmation (r = -0.12, p ≤ 0.05), but a positive one with the rejection of self-affirmation (r = 0.23, p ≤ 0.01).

The connection of psychological capital with self-affirmation strategies is also revealed. Almost all of its parameters turned out to be positively associated with a constructive strategy and negatively – with a destructive strategy and with the rejection of self-affirmation.

Thus, a low level of psychological capital while choosing a destructive strategy of self–affirmation will contribute to the choice of either a position of coercion or a position of manipulation, and while refusing self-affirmation – a position of non-interference. A high level of psychological capital combined with a constructive strategy of self-affirmation will contribute to the choice of a position of nonviolence.

Discussion

The problem of the relationship between psychological capital and interpersonal interaction is actively discussed in modern psychology. In particular, I. Gustari and V. Widodo (Gustari & Widodo, 2022) found that psychological capital influences the organizational commitment of teachers (the desire to work in an organization and contribute to its success) through interpersonal communication. S. A. Usman with colleagues (Usman et al., 2022). revealed a positive relationship of trust and psychological capital. U. Udin and A. Yuniawan (Udin & Yuniawan, 2020) proved that psychological capital and personal qualities of the "Big Five" are largely associated with organizational civic behavior or the behavior that goes beyond role prescriptions. S. E. Hashemi and co-authors (Hashemi, Savadkouhi, Naami & Beshlideh, 2018) studied the relationship of stress and impolite behavior in the workplace with the parameters of psychological capital. As a result, it was found that the relationship between stress at work and impoliteness of employees with high resilience is weaker than the relationship between these two variables of employees with low resilience. Ts. Chen and colleagues (Chen et al., 2019) found that the psychological capital of leaders had a positive impact on the psychological capital of their followers.

In the context of the stated problem, the data obtained in relation to students is of particular interest. I would like to point out two works. In an article prepared by M. Carmona-Halti, V.B. Shaufeli and M. Salanova (Carmona-Halty, Schaufeli & Salanova, 2019), it was shown that the path from good relations between teachers and students to good academic performance is completely mediated by academic psychological capital. And in the article by B. N. Frisbee, A. M. Hosek and A. K. Beck (2020) positive relationships with peers, which turned out to be associated with academic stability and students' hope as components of psychological capital were emphasized.

The results, that we have obtained, confirm the available data on the relationship between the psychological capital of students and the choice of a position of nonviolence, a constructive strategy of self-affirmation (Sarkar & Garg, 2020; Sun et al., 2012), significantly supplementing them with new facts.

In particular, it was found that all components of psychological capital are associated with the choice of a position of nonviolence. In other words, the one who chooses nonviolence is fully confident in the success of any business he undertakes, including in the field of interpersonal interaction. The choice of a position of nonviolence is also associated with the implementation of a constructive strategy of self-affirmation, which, according to the authors of the questionnaire, implies independence, competence in communication, showing interest and respect for other people, as well as the expectation of a positive attitude from other people (Kireeva, Dubovitskaya, 2011, p. 121).

The choice of positions of coercion and manipulation is negatively related to psychological capital and its individual elements. If an individual has low stability and a low level of perseverance in achieving goals, he will use manipulation tactics. If disbelief

in success is added to this (a low level of optimism), then manipulation can easily turn into coercion. In both cases, the destructive strategy of self-affirmation dominates, which is characterized, according to S. A. Kireeva, etc. Dubovitsky aggressiveness, denial of the significance and personal value of other people, tactlessness, intemperance, expectation of a negative attitude towards oneself from other people (Kireeva, Dubovitskaya, 2011, p. 121).

Choosing a laissez-faire position is also negatively associated with psychological capital, especially with its component such as stability. That is, the one who chooses non-interference gives in to barriers and difficulties, so he slows down behavior, preferring not to interfere in the course of events. According to the authors of the questionnaire, the refusal of self-affirmation is characterized by "autoaggression, refusal of self-realization and self-development, low level of achievement, self-deprecation, passive-indifferent behavior" (Kireeva, Dubovitskaya, 2011, p. 121).

Thus, in general, the hypotheses were fully confirmed. Based on empirical research, it has been proved that the choice of a position of nonviolence is positively associated with psychological capital and a constructive strategy of self-affirmation. The choice of positions of coercion and manipulation, on the contrary, is negatively associated with psychological capital and positively with a destructive strategy of self-affirmation. Choosing a laissez-faire position is also negatively associated with psychological capital and positively with the rejection of self-affirmation.

Conclusions

So, based on the conducted research, we can draw a general conclusion that people, in this case students, can take different positions in the process of interaction, using different strategies of self-affirmation and resources of psychological capital. There were no obvious preferences for this or that position. Their use varies from 30% to 40%, while it is possible that the same person, depending on the situation, may use different positions. About a third of students show a high level of psychological capital. As for the choice of self-affirmation strategies, then, as expected, a constructive strategy dominates.

The differences in the choice of positions of interaction, in the level of expression of psychological capital and preferences of certain strategies of self-affirmation among medical students and students – future teachers and psychologists are revealed. If pedagogical students and psychology students more often use the position of nonviolence, then medical students have a higher level of psychological capital, especially its components such as hope and resilience, and more often use a constructive strategy as a leading self-affirmation strategy.

Based on the correlation analysis, it was found that the adoption of positions of coercion and manipulation is associated with low psychological capital, especially with its components such as hope, optimism and stability, and with the choice of a destructive self-affirmation strategy. The position of nonviolence positively correlates with psychological capital and a constructive strategy of self-affirmation. The position of

non–interference is negatively associated with psychological capital and positively with the rejection of self-affirmation.

The prospect of further research is to identify the interrelationships of the positions of interaction with the Dark and Light triads of personality.

The obtained results can be used both for research and practical purposes, in particular, in the process of working with students to assist them in choosing an individual trajectory of self-development.

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Coping Behaviors of Young Men and Women with Different Health Levels

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Abstract

Introduction. This paper addresses health issues of the modern young generation and introduces new experimental designs to examine the relationship between health and the most preferred coping strategies of young people, which can enable a broader study of the issue of health protection through the development of conscious and rational behaviors, including in stressful situations. The paper presents an analysis of the concept of health from the interdisciplinary perspective. The focus is on the necessity of considering a single sociopsychological aspect of health, including its somatic, social, and personal levels. Stress affects human health and stress resistance helps maintain mental and physical health. **Methods**. The experimental study aimed to identify the characteristics of coping behaviors of young men and women with different health levels. The study sample comprised male and female students of Bunin Yelets State University (N = 540, mean age of 20 ± 2.3 years). The study used (a) the questionnaire to identify the level of health and (b) the Ways of Coping Questionnaire by R. Lazarus modified by T. L. Kryukova, E. V. Kuftyak, and M. S. Zamyshlyaeva. The statistical analysis of the results was carried out using descriptive statistics (frequency analysis, analysis of ingroup mean values and standard deviations), Pearson's chi-square test, and non-parametric Mann-Whitney U test. **Results**. The results of the study indicated that young men and women with different health levels use different coping forms. Young women with health problems use productive coping more often than young men. The higher the level of health of young men, the more likely they are to use productive coping. **Discussion**. The study shows that the negative experiences of young women associated with the symptoms of chronic diseases enabled female respondents to adapt better to stressful situations associated with health losses. At the same time, health losses as stress factors affect the level of constructiveness in choosing models of behavior for young men and women.

Keywords

health, disease, health level, health preservation, stress, stress resistance, coping behavior, coping with stress, coping strategy, youth

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Introduction

The reality of modern life no longer makes sense to prove the need to maintain and promote health. Two years of the pandemic (2020–2022), the abundance of stress factors and a low standard of living could not but affect the health of the Russian population. Some authors have pointed out that health in the country is one of the main indicators of social progress (Serikov & Serikov, 1999; Tokaeva, 2011; Kobzev, Gavrilova, & Sukhanova, 2015; Nikolaevskii & Sukhova, 2016; Vatopina & Prokhorova, 2018; El'nikova et al., 2022). All this demonstrates that, even in the presence of a wide range of studies on health preservation and health formation, the issue mentioned does not lose its importance and relevance.

Human health is a multidisciplinary issue, and its research and development are carried out equally by scholars in the humanities and natural sciences. At the same time, representatives of these scientific fields agree that health is, firstly, stability within the body and its harmony with natural and social environments (Anan'ev, 2000; Nikiforov, 2000; Vasil'eva & Filatov, 2001; Kulikov, 2013; Kihlström, 2005).

V. Berezhnaya, V. R. Kuchma, I. K. Rapoport, N. N. Malyarchuk and Yu. V. Migunova, Yu. V. Nikolaeva and L. P. Chicherin also examined health issues.

One of the most important conditions for health preservation is the need to maintain an appropriate lifestyle, while the key factors are sufficient employment and regular rest. The health of the human body can be restored by three stages of rest, treatment and recovery (Nazarova & Zhilov, 2013; Voronova, 2014; Leung et al., 2022).

At the same time, we cannot fail to note the factors most often taken into account in social studies. From a social perspective, health can be characterized as adapting to the social environment, i.e. as a unifying combination of positions and prestige in the social environment (Aknin, DeNeve & Dunn, 2022; Gagn´e, Schoon, McMunn & Sacker, 2022).

The following indicators refer to the level of health of certain social communities:

– Physical healthy;
– Mental healthy.

Therefore, it is appropriate to consider a single socio-psychological aspect of health. Assessment of health status should be based on a system of levels that include the somatic, social, and personal levels. The somatic level is related to the level of perfection of self-regulation processes in the body, physiological processes and the level of physiological adaptation to the environment. At the social level, the level of ability to work and social activity, as well as the manifestation of an active attitude towards the world are assessed. The personal level of health characterizes an individual strategy of life, as well as the level of an individual's coping with life circumstances (Cohen, Janicki-Deverts & Doyle, 2015; Isaeva, 2016; Mcginty et al., 2020).

Therefore, health is currently considered to be a complex phenomenon with physiological, social, and psychological aspects.

Describing the concept of 'health' is impossible without analyzing the concept of 'disease', which is most demanded in the medical field of scientific knowledge. In modern medicine, two models for the occurrence and progression of diseases – biomedical and biosocial – are used as algorithms (Kulikov, 2013). The first model does not take into account the social aspect of the onset and progression of diseases, as well as their psychological or behavioral aspects.

According to the biomedical model, the resulting disorder, i.e. the disease, depends on somatic factors. Therefore, the progression of disease and its treatment depend entirely on the professionalism of medical staff, not on the patient, which is not always true. However, this model has been followed for many years and is often still being followed. In the early 20th century, Selye's theory of the general adaptation syndrome appeared and this model was revised. Selye's theory suggests that an intense adaptive reaction of the body indicates an inappropriate treatment.

It should also be noted that deviations from the norm may be the body's reaction to adaptation. The adaptation response model applied to mental deviations during disease is regarded as maladaptive or a kind of addiction, whereas it is not compared with the functional characteristics of the person and with the circumstances that have led to these psychological disorders (Aich, Potter & Griebel, 2009a).

The second model (biopsychosocial) of disease progression is based on theories that assume that any disease is a part of an integral hierarchy. At the same time, each component has similar characteristics, is linked to the individual and takes into account his/her experiences and behavior characteristics. We should note that, in this model, the progression of the disease and the result of recovery do not depend on the competence of medical professionals. The result depends entirely on the patient and his/her body resistance (Aich, Potter & Griebel, 2009b). The structure of this model is a diathesis–stress framework, where diathesis is the biological predisposition of the body to a particular

disease. At the same time, stress is an external factor influencing the development of disease states. Disease is a reaction of the relationship between diathesis and stress.

The biopsychosocial model, when defining the state of health, takes into account mainly psychological factors. Health is therefore dependent on optimism, physical and psychological balance, and the ability to build constructive behavioral models.

In other words, the biopsychosocial model shows that the disease is a body imbalance that causes disturbances of the activity of the organism or a lack of normal interaction between individuals in the environment and society.

Therefore, in addition to the main clinical factors, the causes of the disease are supplemented by mental and/or behavioral factors.

Therefore, since any disease implies an inability to meet a person's social needs, a special status of a patient and some restrictions on his/her role (social behavior) are automatically assigned to him/her.

Life in modern society is associated with an abundance of short-term and systemic stress situations. Stress affects the state of human health in everyday life. The ability to withstand stress events is defined as stress resistance. Living under stress can be expressed in various types of mental reactions and affect a person's physical health. Stress resistance is a quality that allows people to deal with emotional, intellectual, or voluntary stress in the psyche. Thus, stress resistance not only ensures the achievement of goals and individual success, but also helps to maintain mental and physical health.

Coping strategies or coping behavior strategies are described as mechanisms for coping with stress. N. V. Dvoryanchikov, S. V. Bulykin, D. N. Efremova, R. R. Nabiullina, G. Kraig, R. Lazarus, R. Moos, and S. Volkman considered coping behavior as the subject of psychological research. However, the analysis of the existing studies on the above-mentioned issues has pointed out the absence of comprehensive studies on the relationship between personal health and preferred coping strategies. Understanding and describing this relationship will enable a broader understanding of the problem of health maintenance through the development of conscious and rational forms of behavior, including in stressful situations (Holahan & Moos, 1987; Nakano, 1991; Lazarus, 1993; Skinner, 1995; Folkman & Lazarus, 1998; Amirkhan, 1999; Rexrode, Petersen & O'Toole, 2008; Belinskaya, 2009; Rasskazova & Gordeeva, 2011; Khachaturova, 2013; Alhawatmeh et al., 2021).

We assume that coping with disease (as one of the strongest stress factors) is a complex process determined by a combination of subjective and situational factors. In the use of specific forms of coping, individual attitudes to diseases and assessments of internal and external stress are of the highest importance. In general, people with diseases use several coping strategies simultaneously or alternately (Folkman, Lazarus, Gruen & DeLongis, 1986; Schwarzer, 1996; Kryukova, 2014). These or other coping strategies are not always constructive. The use of non-constructive strategies can lead to deterioration of physical status and/or new symptoms of the disease. This experimental study **aims** to

investigate the characteristics of coping behavior of modern young people with different health levels.

A detailed study of the above-mentioned aspects of health preservation will enable the process of treating diseases of any nosology to be redesigned. As mentioned above, therapeutic measures are currently being developed taking into account the biomedical model. In other words, doctors treat the human body as a kind of 'biological mechanism' and generally treat the organs that are sick (not the entire organism), which does not always lead to recovery. Taking into account a person's psychological state, in particular his/her coping strategies (or coping behavior strategies), we can understand what 'interferes' with recovery and/or what leads to health loss.

Methods

To diagnose coping behavior in young men and women with different health levels, we used a questionnaire to identify the level of health, medical records of respondents (the analysis was carried out after the written consent of the study participants), and the Ways of Coping Questionnaire by R. Lazarus modified by T. L. Kryukova, E. V. Kuftyak, and M. S. Zamyshlyaeva (Folkman & Lazarus, 1980; Lazarus & Folkman, 1984; Kryukova & Kuftyak, 2007; Wasserman, 2009; Kryukova, 2010).

The questionnaire to identify the level of health is a series of questions to determine whether the person has chronic and current diseases (during the year), moderate abuse (frequency of smoking and alcohol consumption), adherence to a healthy lifestyle (sports, etc.), and general physical development. Each manifestation level has 5 grades (except chronic diseases: only 3 levels). At the same time, the respondent theoretically can achieve the health level of 1 to 20 points in the first four items. In the absence of chronic diseases, the sum accumulated is saved; in the absence of one disease, three points are deducted from the sum; in the absence of two or more diseases, six points are deducted from the sum. In addition, we assigned the statistical label of '1' to respondents with a low level of health or physical well-being, the statistical label of '2' to respondents with an average level of health or physical well-being (who scored 10-15 points), and the statistical label of '3' to respondents with a high level of health (who scored 16 or more points).

The analysis of medical records presenting the results of the annual medical examination was used as an auxiliary method to confirm the respondents' health levels.

In the Ways of Coping Questionnaire by Lazarus, participants were asked to evaluate each of the fifty statements by occurrence; each answer received a corresponding score (from 'never' - 0 points to 'often' - 3 points). The analysis was performed for eight types of coping by scoring for each type. Forms of coping were divided into productive and non-productive. In this regard, the productivity / unproductivity of each person's coping was evaluated.

The sample comprised 540 individual participants. Representatives of three major health groups were selected as respondents (health groups were assigned based on

medical records analysis). The respondents were male and female students of Bunin Yelets State University (mean age of 20 ± 2.3 years). The main criterion for sampling was the presence of a particular health group. In addition, in the analysis of the results, gender was taken into account, as gender could influence the choice of behavioral strategies. The statistical reliability of the results was ensured by the following statistical analysis procedures: descriptive statistics (frequency analysis, analysis of intragroup means and standard deviations), Pearson's chi-square test, and Mann-Whitney U test. Quantitative and qualitative data processing is carried out using the IBM SPSS Version 21 software.

Results

The results of the health assessment survey showed that 12.1 % of male respondents had a low level of health; 36.4 % of male respondents had an average level of health; 51.5 % of male respondents had a high level of health. The generalized data obtained during the survey were compared with the results in medical records. We found no discrepancies in the data.

In the female sample, we found that there were more respondents with a low level of health compared to the male sample, i.e. 23.8 %; 42.9 % of female respondents had an average level of health and 33.3 % had a high level of health. The generalized data obtained during the survey were compared with the results in medical records. We found no discrepancies in the data.

As shown above, there are more males with a high level of health than females and fewer males with serious health problems compared to females. However, the Pearson's chi-square test calculations and statistical significance for statistical events of 'gender' and 'health level' (2 = 2.146 p = 0.342) showed that the static distribution of individuals by health levels was not directly related to gender.

Thus, in the first phase of the study, on the basis of questionnaire analysis to determine the level of health and analysis of the patient's medical records, we identified the following three main groups: (a) young men and women with a high level of health (the majority in the sample); (b) young men and women with an average level of health, i.e. young people with certain minor health problems that are not chronic; and (c) young men and women with a low level of health , i.e. young people with serious health problems that are chronic.

These groups enabled us to describe the characteristics of coping behavior for healthy young men and women, as well as for young people with chronic diseases (without taking into account the nosology of the disease).

We then analyzed the characteristics of coping responses of students with different levels of health. We compared male samples with different levels of health (low and average, low and high, average and high) and female samples as well as. We also compared male and female samples with similar levels of health in relation to the Ways of Coping Questionnaire by Lazarus. For comparison, a nonparametric Mann–Whitney U test was used.

The results of the diagnosis of young men and women with a low level of health showed:

– Significant differences in 'accepting responsibility' (U = 1.500 at p = 0.032); for females (M = 86.8 for σ = 12.6) this measure was significantly higher than for males (M = 62.5 for σ = 10.8);

– Differences in mean values for positive coping scales (U = 0.000 at p = 0.016); the ingroup mean values in the subsample of young women with a low level of health (M = 71.8 at σ = 5.8) were significantly higher than in the subsample of young men with a similar level of health (M = 56.5 with σ = 12.3 with high outliers in the male sample) (that is, young women with a low level of health use positive forms of coping more frequently than young men with a low level health);

– The trend of significant differences in 'self-control' (U = 2.000 at p = 0.063); for females (M = 71.2 at σ = 5.8) this measure was also significantly higher than for males (M = 56.0 at σ = 15.5);

– The trend of significant differences in 'planful problem-solving' (U = 3.000 at p = 0.111); for females (M = 67.6 for σ = 20.7) this measure was also significantly higher than for males (M = 47, 3 at σ = 5.5).

Thus, compared to young men, young women with low health levels had distinctive features of positive coping strategies, including 'self-control', 'accepting responsibility', and 'planful problem-solving'. In general, positive coping in young women with a low level of health was higher than in young men with the same level of health. In other words, young women with a low level of health (who suffer from chronic diseases) were better adapted to stressful situations such as health loss; they can control their behavior, make constructive decisions and plan the result, which is difficult to say about young men.

In the compared samples of young men and women with an average level of health, there were significant, however slight differences in 'seeking social support' (U = 24,000 at p = 0.034). Here the scores of young women (M = 79.6 at σ = 15.7) were higher than the scores of young men (M = 63.3 at σ = 16.7). There was a trend of slight differences in 'positive reappraisal' (U = 31.500 at p = 0.111). In this case, the scores of young women (M = 72.6 at σ = 13.0) were higher than the scores of young men (M = 60.3 at σ = 20.8), but in all cases the standard deviation is very high, indicating not pronounced differences with significantly different ingroup mean values.

Compared to young men with an average level of health, young women with an average level of health had higher scores in 'seeking social support' and 'positive reappraisal' (both positive). In other words, young women with certain non-chronic health problems were more likely to seek social support, which is more constructive. Young men were less likely to seek social support, leading to depression and resulting in deteriorating health status.

In the compared samples of young men and women with high levels of health, there were significant differences in 'seeking social support' (U = 19,000 at p = 0.009) and

'confrontive coping' (U = 18,000 at p = 0.007), the differences in the mean values for negative coping scales (U = 20.000 at p = 0.011), as well as the trend of differences in mean values for positive coping scales (U = 34.500 at p = 0.114). In this case young men had significantly higher scores of 'seeking social support' (M = 74.8 at σ = 16.6) and 'confrontive coping' (for boys M = 62.2 with σ = 15.1; for girls M = 42.1 with σ = 12.6) compared to girls (M = 55.6 with σ = 14.4). The average means for positive coping scales were higher in the male sample (M = 69.2 with σ = 10.0) than in the female sample (M = 60.9 with σ = 10.2).

Young men with a high level of health, compared to young women with a high level of health, had higher scores in positive coping of 'seeking social support' and negative 'confrontive coping', as well as higher average means for positive coping scales. In other words, as can be seen from the results obtained, the situation in healthy young men and women is completely different. Young men are more motivated than women to receive social support and to confront.

Discussion

The findings reported above indicate that the concept of 'health' determines individuals' ability to perform the fundamental functions, taking into account the fact that they are living integral systems, based on physical and spiritual, natural and social, and hereditary and acquired principles (Anan'ev, 2000; Nikiforov, 2000; Vasil'eva & Filatov, 2001; Kulikov, 2013; Kihlstrom, 2005). At the same time, while acknowledging the importance of health preservation and pointing out that disease can be a stress factor, the authors do not consider coping to be a behavioral model contributing to health.

According to E. N. Nazarova, one of the most important, but not the only condition for maintaining health, is a good lifestyle. At the same time, when describing the 'good lifestyle', researchers (Nazarova & Zhilov, 2013; Voronova, 2014; Leung et al., 2022) do not consider coping behavior to be an element of this lifestyle.

Meanwhile, coping behavior is the individual's activity to maintain or preserve a balance between the requirements of the environment and resources that meet the requirements.

Coping is a conscious action aimed at eliminating a stressful situation. The importance of coping is to adapt individuals more effectively to the needs of the situation and to enable them to take control of them, avoid or adapt to the needs of the social environment, or eliminate the stress effects of the situation. This will certainly help keep the individual healthy.

Coping with the disease is a complex process, determined by the combination of two factors – subjective and situational. When choosing specific forms of coping, individual

attitudes and assessments of internal and external stress are of primary importance.

The experimental study enables us to draw the following **conclusions**:

– In the compared samples of young men and women with low levels of health, young women had higher scores of 'self-control', 'accepting responsibility', and 'planful problem solving'. At the same time, young women had higher general positive coping scores compared to young men. This indicates that young women with health problems have a higher level of concentration than young men, enabling them to use more productive forms of coping.

– Compared to young men with similar levels of health, young women with average levels of health had higher scores of productive coping, including 'seeking social support' and 'positive reappraisal'.

– Compared to young women with similar levels of health, young men with high levels of health, had higher scores in productive coping of 'seeking social support', negative 'confrontive coping', as well as higher mean values for positive coping scales.

– Young women with high levels of health tend to overestimate their 'life force' and show excessive self-confidence in solving life problems, while young women with low levels of health, with excessive self-responsibility in certain areas, can show learned helplessness.

Consequently, based on the analysis of the results obtained in this study, we can conclude that the negative experience gained by young women during the systematic experience of chronic disease symptoms led to their better adjustment to such stressful situations as health losses. At the same time, the loss of health as a stress factor certainly affects the constructive level of the choice of behavioral models for young men and women. This is demonstrated by the results of a comparative analysis of the young men and women's scores and levels of health, i.e. in groups with high, average, and low levels.

Taking into account the ability to withstand strong stress factors such as loss of health and the choice, despite constant stress, of constructive behavioral models will provide more productive results in the treatment of chronic and episodic diseases. Unfortunately, the modern healthcare system builds treatment processes without taking into account the psychological state of patients, which has a negative impact on national health. We should also note that the psychological state of individuals with certain health problems is usually associated with disease nosology. However, the results presented in the paper indicate that there is a general tendency to choose a model of behavior based not only on gender but also on the health levels. We can therefore conclude that it is necessary to take

into account the trends identified in the study both in providing psychological support to individuals with different levels of health and in organizing therapeutic measures.

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Author Contribution

Oksana Evgen'evna El'nikova made a theoretical analysis of the scientific literature on the research problem, wrote the overview section of the article, planned and conducted the study, wrote the conclusion section of the paper, and revised the manuscript.

Irina Valer'evna Faustova conducted the experiment, interpretated and described the obtained quantitative and qualitative results, wrote the abstract and conclusions, and revised of the manuscript.

Lyubov' Yur'evna Komlik conducted the experiment, carried out quantitative and qualitative processing of the obtained data using the IBM SPSS Version 21 software, interpreted and described the obtained quantitative and qualitative results, and presented the results in figures and tables.

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Personal Predictors of Stress Resistance of Healthcare Professionals

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Abstract

Introduction. The article explores the problem of personal predictors of stress resistance of medical workers - subjects of clinical activity, insufficiently studied in the context of the predictor role of personal potential and its significant psychological education – dispositional optimism. The purpose of the study: to identify the relationships of optimism, properties that form personality adaptability, and neuropsychiatric resistance to determine the predictor role of the components of personal potential in the stress resistance of subjects of clinical activity. **Methods.** Applied: "Boston Stress Resistance Test", C. Scheyer and M. Carver optimism test, personality social adaptability questionnaire. Sample: doctors and nurses of medical and preventive institutions in Krasnodar (85 people). Statistical analysis was performed using methods of parametric, multifunctional and multivariate statistics in the SPSS-26 environment. **Results**. Subjects have a medium-high level of stress resistance, with high stress resistance prevailing among nurses ($p < 0.05$), and normal (medium) - in physicians ($p < 0.01$). The «positive expectations» indicator at the "high" and "above average" levels is set at 67,0%, and the «negative expectations» indicator is set at 33,0% of subjects. Adaptability is based on reduced creativity with an average level of conformity and lability. K-mean cluster analysis with inclusion of analysis of variance identified three clusters of different volumes. The first is the largest (55,3% of respondents); stress resistance corresponds to the normal range, and optimism is based on positive expectations. In the other two clusters, weak and very weak stress resistance is recorded during activity in the structure of optimism of the «negative expectations»

disposition. The properties of social adaptability remain unchanged under different manifestations of stress resistance. **Discussion.** Three types of stress resistance caused by different disposition indicators of optimism are statistically justified among healthcare professionals. The first type – "*Optimistic stress resistance*", is based on the predominance of positive expectations. The phenomenon of reduced optimism established in two other clusters acts as a predictor of weak stress resistance of medical professionals and can be generalized as the *"Type of alarming negative expectations".*

Keywords

adaptability, disposition optimism, conformity, creativity, lability, personality potential, healthcare professionals, stress resistance

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Introduction

The search for psychological resources of adaptation to changing living conditions, the preservation of emotional stability in the growing risks of technogenic, biogenic, sociogenic threats of the modern world today, without exaggeration, can be attributed to the most pressing problems of research in the human sciences. A lot of psychological research is devoted to the isolation of factors affecting the development of maladaptation states, and a significant part of them reveals the phenomenology of stress as a "trigger" of this process. A special object of analysis in a number of studies is the personality of a medical worker as a subject of professional activity, stressogenic in terms of the content of basic labor functions (Ilyasova, Farakhyanova, 2016; Soboleva, 2018; Pustashieva, 2017; Shadrina, 2019; Lambert et al., 2007; Abdollahi, Abu Talib, Yaacob & Ismail 2014; Rivera, Shapoval & Medeiros, 2021). Thus, in the materials presented by L. Sh. Kravchenko and Sh. U. Akhmedova (2017), it was shown that weak stress resistance leads to a decrease in the professional motivation of medical workers, to the manifestation of apathy, a negative attitude towards professional activity. In the studies of A. B. Rogozyans, on the

example of the personality of a doctor, the concept of an individual style of overcoming stress is substantiated, which the author considers as "a stable set of psychological means activated by the personality to overcome stressful situations and ensure the stability of the optimal level of mental stress, the preservation of holistic personality and authenticity of the personality" (Rogozyon, 2012, p. 2; Rogozyan, Yasko, 2012).

In analyzing the role of stress resistance in the process of coping with threats to the preservation of the integrity, authenticity of the person, the concept of personal potential, which defines this phenomenon as an integral characteristic of the level of personal maturity, which reflects the «measure of overcoming the given circumstances by the person» (Leontiev, 2011b, p. 7). Self-realization in social reality, resilience, openness to professional changes, a high level of personal maturity - distinctive features of the owner of a high level of personal potential formation (Leontiev, 2007, 2011a, 2011b; Yelnikova, Pronina, Faustova, Komlik, 2022; Yasko et al., 2021). Note that in a number of meaningful publications, works devoted to the analysis of the phenomenon of resilience are noticeably distinguished (Yelnikova et al., 2022; Makhnach, 2020; Tolochek, 2021, Fedotova, 2020; Yasko et al., 2021; Schwarz, 2018; Southwick, 2018, et al.)

In studies of different authors, some components of personal potential are noted: wisdom (Leontiev, 2011b); optimism (Gordeeva, 2010, 2011, 2018); adaptation to difficult life situations (Alexandrova, 2011); ability to withstand stress (Rasskazova, Gordeeva, 2011). Among these qualities of higher substructures of personality, adaptability stands out - an integral property determined by the correspondence/inconsistency between the goals, aspirations of the personality and the results achieved by it (Ermine, Titarenko, 2001, p. 9). Describing the psychological mechanisms of human adaptation, V. A. Bodrov assigned a special place to the roles of personal factors, including resistance to external influences, stressors of different etiologies (Bodrov, 2007, p. 58).

Personal potential includes a complex education defined as optimism - the ability to think constructively, positively assess your future, act purposefully and resist the impact of difficult life circumstances, preserving psychological well-being, show resilience and adaptability (Gordeeva, 2011, p. 131). In modern psychology, two main concepts of optimism have developed (Ilyin, 2015). One of them is based on the theory of positive psychology and attributive style (Seligman, 2006; Abramson et al., 1989; Abramson, Seligman, Teasdale, 1978; Luthans & Broad, 2022). On a variety of data, researchers have shown that optimists explain negative events as unstable, caused by external causes, pessimists in contrast, as stable, global related to internal causes (Peterson, 2000). It is noted that people with a pessimistic attributive style are prone to mental status disorders, to depression (Abramson, Metalsky, Alloy, 1989; Alloy, Kelly, Mineka, Clements, 1990).

In line with dispositional theories of personality, the concept of M. F. Scheyer and C. S. Carver (Carver et al., 2010; Scheier et al., 2001; Brissette, Scheier, Carver, 2002). It treats optimism as a dispositional construct and interprets it in the context of expectations. Optimism is the positive expectation of the individual regarding the results of his activities;

pessimism, in contrast, is characterized by negative generalized expectations of man regarding the future (Carver et al, 2010). Speaking of optimism/pessimism, C. Carver and M. Scheyer imply a generalized sense of doubt or confidence about the positive or negative outcome of achieving life goals. Studies of the phenomenology of dispositional optimism in domestic psychology are presented in various scientific publications that significantly complement and expand this construct (Sychev, 2010; Tsiving, Evnina, 2013; Gordeeva, Sychev, Osin, 2010). In particular, Russian-language versions of the diagnosis of optimism as a style of explaining success and failure (STONE questionnaire), as well as the disposition optimism test (LOT) (Gordeeva et al., 2009, 2010) became a significant contribution to the methodology of scientific search.

Numerous studies have made it possible to call dispositional optimism a significant predictive indicator of subjective well-being. Individuals with high optimism are not inclined to develop anxiety and distress, the positive perception of the activity performed does not allow them to experience strong negative emotions leading to mental overload. Optimists, faced with difficulties, demonstrate the ability to positively reformulate the problem. An analysis of optimist copying strategies showed that they more often than pessimistic-oriented subjects use constructive ways of coping (planning, positive reassessment, search for emotional and social support) and less often turn to non-constructive strategies for avoiding and avoiding the problem (Enikolopov, Petrova, 2009; Zaitsev, 2012; Gordeeva, Lunkina, Sychev, 2018).

The considerable activity of researchers in the field of personal potential issues leads to the actualization of the problem of its predictor role in ensuring the stress resistance of subjects of professional communities exposed to the risks of vital threats arising in the process of activity, in particular, medical workers. In the empirical search, we formulated a hypothesis: in medical professionals, dispositional optimism plays a predictor role in ensuring stress resistance. The **hypothesis** determined the **purpose of the experimental study**: on a sample of medical professionals to identify the relationships of optimism, properties that form personality adaptability, and neuropsychiatric resistance to determine the predictor role of the components of personal potential in the stress resistance of subjects of clinical activity.

Methods

An empirical sample was made up of 85 medical workers of various medical and preventive institutions in Krasnodar (doctors, 52 people (Group n1); nurses, 33 people. (Group n2)). Applied: «Boston stress resistance test» (Shcherbatykh, 2006), Optimism Test by C. Sheyer and M. Karver (Sychev, 2008), social personality adaptability questionnaire (Posypanov, 2002).

The purpose of the «Boston stress resistance test» is to determine an individual's vulnerability to stress. The technique was developed by researchers at the University of

Boston Medical Center, adapted from a Russian-language sample of Yu. V. Shcherbatykh. The result obtained in testing determines one of the levels of stress resistance: high (from 0 to 10 points); normal (31 to 50 points); weak (more than 50 points).

The optimism test of C. Scheyer and M. Carver is based on the concept of dispositional optimism. It allows you to determine the predominant attitude of the personality to everyday or difficult life situations. The results are determined by two scales: «positive expectations» and «negative expectations». People with high levels of optimism see desired outcomes as achievable, and people with low levels of optimism are more passive to their desires. When processing results, the following levels of optimism are determined: high (22 points or more); above average (19-21 points); below average (17-18 points); low (16 or less).

The conceptual basis of the methodology «Questionnaire of social adaptability of personality» by O. G. Posypanov is the provision on social adaptability as a complex property of personality (Posypanov, 2002). As part of this complex, three properties are distinguished that form the main scales of the questionnaire: «adaptability – conformity» (**Kn**), «adaptability – lability» (**Lb**), «adaptability – creativity» (**Kp**). The questionnaire contains 25 statements (8 statements on each scale), one of which (approved. no. 9) gives reason to consider the effect of the effect of social desirability in the analysis of individual results. The match of the answer with the «key» is estimated at 1 point, so the maximum score on each scale is 8 points. The author proposes to consider five options for «profiles» of social adaptability, depending on the ratio of the levels of severity of indicators for each of the scales: the «profile» of the smallest social adaptability (indicators for all scales in the range of 0-2 points); «profile» of increased conformance (**Kn** scale 4-6 points, other scales in the range of 0-2 points); «profile» of increased creativity (**Kp** scale 4-6 points, other scales in the range of 0-2 points); «profile» of increased lability (**Lb** scale 4-6 points, other scales in the range of 0-2 points); «profile» of maximum adaptability (indicators on all scales in the range of 4-8 points).

Methods of parametric (mean, standard deviation, Student's t-test, Pearson correlation analysis), multifunctional (φ*- Fischer criteria) and multivariate statistics (cluster analysis by K-means; analysis of variance). Data processing is performed using the statistical program SPSS-26.

Results

The measure of stress resistance of health care professionals corresponds to the range of the average level (M = 32,6±7,45). If you group individual test results, we see that high stress resistance is observed in 38 people (44.7%), of which 24 doctors (46.2%) and 14 nurses (43.8%). Normal stress resistance was found in 37 people (43.5%), of which 22 doctors (42.3%) and 15 people (46.9%) of the average medical staff. Poor stress resistance was observed in 10 people (11.8%), of which 6 doctors (11.5%) and 4 (12.5%) nurses (Table 1).

Table 1

Measures of stress resistance of healthcare professionals

	High stress resistance			Normal stress resistance			Weak stress resistance		
	Pers.	%	M±σ	Pers.	%	M±σ	Pers.	%	M±σ
Doctors (n_1 = 52 pers.)	24	46.2	26.1 ± 3.6*	22	42.3	**35.3 ± 2.93****	6	11.5	47.5 ± 7.56
nurses (n_2 = 33 pers.)	14	43.8	**27.8 ± 2.04***	15	46.9	33.4 ± 1.92**	4	12.5	48.0 ± 0.02
Overall (N = 85 pers.)	38	44.7	26.7 ± 3.2	37	45.2	34.5 ± 2.70	10	11.8	47.7 ± 5.64

Note: *n1 ↔ n2: «*» - p < 0.05 at t = 2.37; «* *» - p < 0.01 at t = 5.88. Bold indicates indicators that are statistically significantly predominant in comparisons*

Comparison of the characteristic distribution parameters in subgroups n1 and n2, which found high and normal stress resistance, gives reason to say that the indicator corresponding to the high stress resistance range is more pronounced in nurses (at t = 2.37 p < 0.05), and the indicator of the «normal stress resistance» range has a higher value in the group of doctors (at t = 5.88 p < 0.01). There are no differences in the «weak stress resistance» parameter. There is also no difference in the proportions of the analyzed levels (in all comparisons $\varphi^*_{эмп.} < \varphi^*_{кр.}$).

Analysis of the results for the optimism test showed that it is in the range of diagnostic values of the average level (M = 20.0±3.00). 32 people (37.6%) have a high level of optimism, of which 24 doctors (46.2% of the n1 group) and 8 people are nurses (24.2% of the n2 group). The result above average was shown by 25 people (29.4%), of which 12 doctors (23.1% of the n1 group), and 13 nurses (39.4% of the n2 group).

The «below average» result was found by 16 (18.8%) respondents: 7 doctors (13,5% of the n_1 group) and 9 nurses (27.3% of the n_2 group). A low level of optimism was diagnosed in 12 respondents (14,1%). Of these, 9 doctors (17.3%) and 3 nurses (9.1%) (Table 2).

Table 2

Indicators of optimism of medical professionals

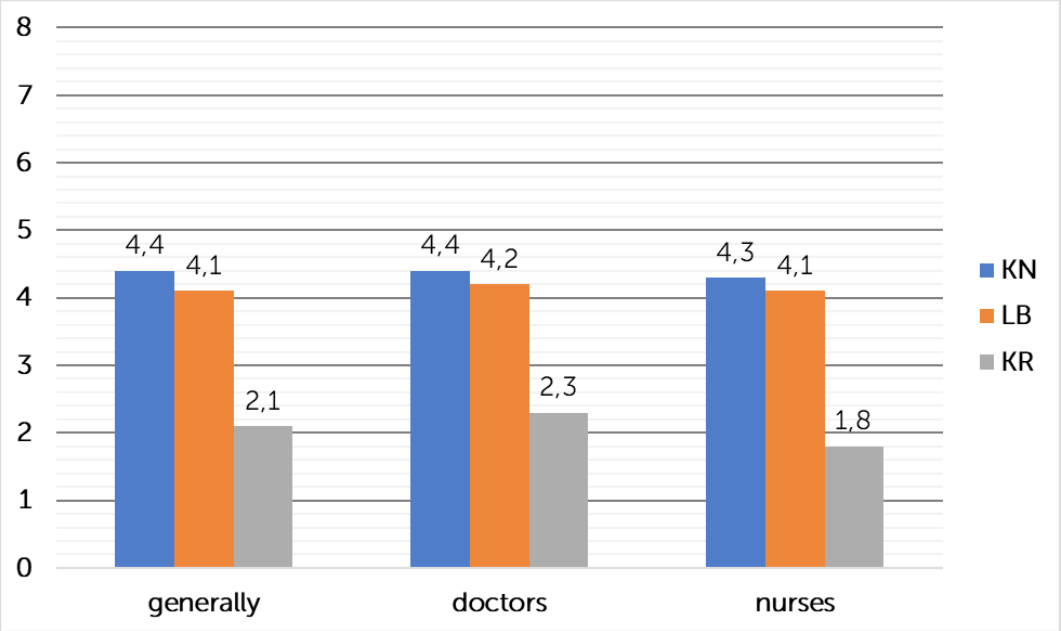
	High levels of optimism		Above the average		Below average		Low level	
	Pers. (%)	M±σ	Pers. (%)	M±σ	Pers. (%)	M±σ	Pers. (%)	M±σ
Doctors (n_1 = 52 pers.)	24 (46.2)*	23.25 ± 0.85	12 (23.1)^	19.83 ± 0.94	7 (13.5)+	17.57 ± 0.53	9*^ (17.3)	15.0 ± 1.5
Nurses (n_2 = 33 pers.)	8 (24.2)*	22.63 ± 0.52	13 (39.4)^	20.23 ± 0.73	9 (27.3)+	17.11 ± 0.33	3 (9.1)	16 ± 0
Overall (N = 85 pers.)	32 (37.6)	23.09 ± 0.82	25 (29.4)	20.04 ± 0.84	16 (18.8)	17.31 ± 0.48	12 (14.1)	15.25 ± 1.36

Note: *doctors ↔ medical staff: «*» φ*=2.09, p < 0.01; «^» - φ*=1.70, p < 0.045; «+» - φ*=1.56, p < 0,05. Bold indicates indicators that are statistically significantly predominant in comparisons.*

As can be seen from the data given in table 2, a high level of optimism is more typical for doctors than for nurses (at φ * = 2.09, p ≤0.01); above-average and below-average levels predominate among nurses (at φ * = 1.70 and φ * = 1.56, p ≤0.045 and r≤ 0.05, respectively).

At the next stage of the study, the diagnosis of social adaptability of medical workers was carried out. It was established: as an integral personality property, adaptability is at the average level (M = 10.7 ± 1.12, which is 44.4% of the maximum indicator). At the same time, there were no differences in indicators between the n_1 and n_2 groups ($t_{эмп} > t_{эмп}$>). The «profile» of adaptability is specific: it does not correspond to any of the «profiles» described by O. Posypanov and can be defined as a «profile» of reduced creativity with an average level of conformity and lability. The difference in the profiles of the analyzed subgroups is noted by the «**Кр**», parameter, which, despite being in the range of reduced values, is significantly more pronounced in the group of doctors (M = 2.33 ± 1.22) compared to nurses (M = 1.79 ± 0.41): at t = 2.94 p <0.05 (Fig 1).

Figure 1
«Profiles» of social adaptability of healthcare professionals



Notes: *KN – «Adaptability-Conformity» scale; LB – «Adaptability-lability» scale; KR – «Adaptability-creativity» scale; "*" - t = 2.94 p < 0.05. Bold indicates indicators that are statistically significantly predominant in comparison.*

Results of Processing the entire data array by cluster analysis by K-average followed by testing the intergroup differences by analysis of variance showed the following.

Seven variables ("stress resistance"; "optimism"; "negative expectations"; "positive expectations"; "adaptability-conformity"; "adaptability-lability"; "adaptability-creativity") formed indicators of three clusters of different volumes. The first cluster is the largest. It combined the characteristics of 47 respondents (n_1 - 28 people/59.6%; n_2 - 19 people/40.4%); the next largest - the third cluster, it includes indicators of 32 examined (n_1 - 22 people/68.8%; n_2 - 10 people/31.2%). The smallest is the second cluster: it includes data on six respondents, of which the third part is doctors (2 people), and 2/3 is nurses (4 people).

The results of the analysis of variance strongly show that the properties of social adaptability do not play a predictor role in the formation of stress resistance: they remain at the same level with both very weak and normal stress resistance. Differences between clusters are formed according to the criteria of stress resistance, optimism and integrating its qualities: «positive expectations»; «negative expectations» (table 3).

The most stress-resistant medical professionals included in the first cluster: the average SU score here was 27.7 points, which corresponds to the range of normal stress resistance. Physicians and nurses equally show high and above average optimism (M = 21.3). Here, significantly less than in the third cluster, the indicator of reflection of negative expectations is expressed (M = 1.74 versus 2.91) and these respondents are more actively guided to the desired results as achievable («positive expectations» M = 11,1 versus 7,2 and 9,3 in the second and third clusters).

Table 3

Results of K-mean clustering with inclusion of analysis of variance (ANOVA)

Number of observations in each cluster			Variable indicators (M)						
			CU [1]	Opt [2]	NE [3]	PE [4]	CP	LB	KR
Clusters	1	47	27.7	21,3	1,74	11,1	4,44	4,14	2,04
	2	6	51.0	18,0	1,2	7,2	4,2	4,2	2,0
	3	32	36.3 сл.	18,4	2,91	9,3	4,4	4,1	2,25
Valid		85							
Passed		0	inter-cluster differences from analysis of variance:						
			[1] – F=141.071 p<.000						
			[2] – F=13.79 p<.000						
			[3] – F=8.23 p<.001						
			[4] – F=21.86 p<.000						

Notes: *CU - stress resistance; Opt - optimism; NE - negative expectations; PE - positive expectations; CP – «adaptability-conformance»; LB – «adaptability-lability»; KR – «adaptability-creativity».*

The weak and very weak stress resistance characteristic of respondents included in the third and second clusters (M = 36.3 and M = 51.0, respectively) is accompanied by reduced optimism (M = 18.4 and M = 18.0, respectively), passivity in relation to their desires. This phenomenon is caused by a weakly expressed orientation to positive expectations (M = 9.3 and M = 7.2, respectively), with the activity of the internal mood of the personality to negative expectations (M = 2.91 and M = 1.2, respectively).

Discussion

In the process of analyzing psychological resources of coping with threats to the preservation of the integrity, authenticity of the person, the concept of personal potential, which defines this phenomenon as an integral characteristic of the level of personal maturity (Leontiev, 2007, 2011a, 2011b), has special heuristics. Personal potential includes complex education - optimism explored in the methodological framework of two main concepts: positive psychology and attributive style (Seligman, 2006; Abramson et al., 1989; Abramson, Seligman & Teasdale, 1978) and dispositional theories of personality (Carver et al., 2010; Scheier et al., 2001; Brissette, Scheier, Carver, 2002). Numerous studies make it possible to call dispositional optimism a significant predictive indicator of subjective well-being, constructive coping with stresses (Enikolopov et al., 2009; Zaitsev, 2012; Gordeeva et al., 2018). The considerable activity of researchers in the field of personal potential issues leads to the actualization of the problem of its predictor role in ensuring the stress resistance of subjects of specific professional communities, in particular, medical workers, which determined the problem of the study we conducted: the justification of personal predictors of stress resistance of subjects of clinical activity.

The differences established in the data of the first stage of statistical analysis in the indicators of stress resistance, levels of optimism, properties of adaptability-creativity between subjects of medical and nursing activities were confirmed in the results of multidimensional statistics, which made it possible to consolidate persons with congruent diagnostic indicators into certain clusters.

The obtained results indicate that adaptability as a complex property of the personality of a medical worker is determined by the average level of conformity formation and lability, while insufficient creativity does not allow to actively influence the structure of interaction of the personality with the social environment, creating specific "barriers" in the implementation of joint activities, which is especially important in changing environmental conditions.

Three types of stress resistance are identified depending on the level of severity of this property. For the first, having the greatest representation among medical professionals (55.3%), normal stress resistance is characteristic, closely interrelated with actively demonstrated optimism, based on a significant predominance of positive life expectations

over negative ones. This species can be defined as «*Optimistic stress resistance*». It forms the core of personal potential and characterizes a mature, authentic personality.

The personal potential of respondents who made up two other types of stress resistance (weak and very weak) does not have a resource of positive expectations. The phenomenon of reduced optimism established in these clusters obviously acts as a predictor of weak stress resistance of medical professionals. There is reason to define conditionally these combinations of personal qualities in general as «*Type of disturbing negative expectations*».

The study confirmed the hypothesis of the predictor role of dispositional optimism in ensuring the stress resistance of medical professionals. The results of the analysis indicate that in the practice of consulting work, special attention should be paid to providing psychological support to owners of the type of alarming negative expectations, directing efforts to find personal resources for the formation of positive expectations, developing personal potential - the basis of individual sustainability in a changing world, a world of threats to stability and well-being of both society and each individual.

Conclusion

It has been established that medical professionals are characterized by an average level of stress resistance, and it is more pronounced in the group of doctors, while among nurses there are significantly more owners of high stress resistance.

It has been shown that dispositional optimism is a component of the personal potential of doctors and nurses who have predominantly medium-high stress resistance, which gives reason to consider positive expectations as a psychological education that plays the role of a predictor of stress resistance.

It has been shown that the predictor role of dispositional optimism in the manifestation of stress resistance among medical professionals can be represented by the types: "Optimistic stress resistance" and "Type of alarming negative expectations" – a type that involves active psychological support for subjects of medical activity.

Adaptability of medical professionals is ensured by an average level of conformance and lability, however, the «adaptability-creativity» property is poorly developed, which can complicate the adoption of flexible, non-standard decisions when carrying out activities in conditions of vital threats.

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Lyudmila Sergeevna Skripnichenko – mathematical and statistical processing of empirical data in the SPSS-26 program; writing the sections "Results", "Annotation", "Guidelines"; preparation of the general text of the article; working with sources.

Sergey Nikolaevich Strikhanov – formation of an empirical sample, discussion of the results and their practical significance, writing of the review part of the article.

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Specifics of Closeness at Various Age Stages of Adulthood in the Contemporary World

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Abstract

Introduction. The article discusses the acute problem of researching the specifics of close relationships between men and women at different ages. Changes in living space and context, as a sociocultural factor, affect the quality and dynamics of close relationships. However, relationships with the significant Other throughout a person's life are the most important resource for development, a factor in psychological well-being and a condition for socialization. The authors focus on dynamic changes in the parameters of close relationships, resulting from internal processes that take place against the backdrop of unprecedented changes in the modern world. The academic originality of the study lies in identifying the specifics of close relationships at different stages of adulthood. **Methods**. The sample included 558 adults aged 18 to 65 years (288 women, 270 men) of different age categories. The design of the study included the collection of socio-biographical information about the respondents; self-assessment of the degree of closeness and relationship problems; standardized methods to verify the main categorical features of close relationships. **Results.** In adolescence, avoidance of closeness is well seen. In early maturity, sexual, recreational, intellectual types of closeness with a partner are most pronounced, relationships are characterized by a high degree of involvement, positive emotional colouring, and are a resource for coping with the high uncertainty of the future and the stressfulness of the present. In the period of middle maturity, flexible coping develops, relationships are characterized by emotional ambivalence. At the stage of late maturity, relationships become more predictable, the importance of sexual closeness decreases, trust and mutual support come to the fore, and a high level of life

satisfaction is achieved. **Discussion**. Age in adulthood predicts a decrease in indicators of sexual, intellectual, recreational closeness in relationships with a partner and an increase in indicators of social closeness, life satisfaction, and coping rigidity. Gender differences in the severity of the parameters of close relationships, characteristic of adolescence and youth, are levelled by the time of late maturity. It is concluded that there are age and gender differences in close relationships at different stages of adulthood.

Keywords

adulthood, age-related tasks, close relationships, type of closeness, socialization, attachment, emotional experiences, involvement, resourcefulness, support, coping behaviour

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Introduction

Close relationships play a significant evolutionary role, are the most important resource for development and a key condition for human socialization throughout life, contribute to maintaining the integrity of the individual in a complex highly uncertain world, support individual and dyadic well-being, and maintain physical and psychological health (Laursen & Bukowski, 1997; Collins & Laurens, 1999).

The importance of close relationships becomes especially relevant in the context of new contemporary challenges, alarming everyday life and unprecedented uncertainty of the future (Li et al., 2021; Xiang et al., 2022). The natural shifting of norms, the emergence of new functionality and dysfunction are clearly represented in close relationships. This results from the fact that in the situation of a "linear life route" loss, a stable sociocultural context, as well as the "fluid" nature of many communities and social groups, modern people are forced to seek and construct their identity in more or less stable and unambiguously interpretable social contacts and connections, labelled with such

concepts as "trust", "love", "attachment", etc. This is the key socializing function of close relationships (including family) in modern society.

In recent decades, an ambivalent process has been observed in the study of close relationships. On the one hand, there is an active processing of the accumulated theoretical and empirical material that clarifies the phenomenology and typology of close relationships (Gruzdev, Ekimchik & Ershov, 2020). On the other hand, against the background of the structural complexity of the phenomenon and the active change in sociocultural contexts, it is difficult to study the age-dynamic characteristics of close relationships and their role in solving age-related problems and implementing life strategies.

We consider close relations as a type of interpersonal relationships, as significant, selective relationships between subjects aimed at satisfying the need for love and belonging, based on affiliate feelings and affection for a partner, characterized by closeness, informality, significance, long-term existence, emotional depth (Saporovskaya et al., 2021). Close relationships are stable over time (Berscheid, Snyder & Omoto, 1989). At the same time, they are extremely dynamic due to changes in the links between the structural components and the impact of the sociocultural factor throughout the lifetime of individuals. In ontogenesis, the range of relationships that are defined as close expands, their content changes. In childhood, close relationships are usually established with family members; in adolescence and youth, relationships with friends and romantic partners dominate; at more mature ages - marital, "ideological" sense-forming and supportive relationships. It should be noted that the nature of close relationships in adolescence and early adulthood has been studied most (Shulman, 1993; Adams, Laursen & Wilder, 2001; Giordano, 2003; Morosan et al., 2022). There are extremely few works devoted to the study of close relationships at different stages of adulthood, which is the longest and most productive period of life. At the same time, the developmental structure in adulthood is "significantly more complex than any homogeneous and unidirectional structure of periods of maturation and aging" (Ananiev, 2001, p. 352). The effect of heterochrony law is enhanced; development is, to a greater extent, determined by the subjective position of a person, the processes of self-consciousness, reflection, solving life problems (Golove & Manukyan, 2003).

According to the epigenetic concept by E. Erickson, at the adult stages of the life path, a person solves bipolar age-related tasks, each of which is directly related to the formation of identity and the quality of established close relationships (Erickson, 1996). With regard to the middle age, D. Levinson (the study was conducted on a male sample) expands the list of age-related tasks, considering attachment/separation, destructiveness/creation; masculinity/femininity, youth/old age. The author notes that both poles of polarity coexist within one "I" (Levinson, 1979) and colour the relationships established with partners. L. Wrightsman completes the list of "dialectical unresolved issues" that require a person to self-determine in the sphere of close relationships during adulthood (Wrightsman, 1994). In addition, R. Havinghurst defines the developmental tasks in adult life that are directly

related to the implementation of the main types of close relationships: educate children, help them grow up as happy people who are able to take responsibility (child-parent relationships in the position of a parent); choose a spouse, establish relations with him/her (marital relationship); separate from parents, adapt to the life of aging parents (child-parent relationship in the position of a child); find a congenial social group (friendships) (Havighurst, 1972). In this paper, we limit the perspective of considering close relationships only to intergenerational relationships, without considering the intergenerational aspect (child-parent relationships).

On the one hand, the nature of close relationships that a person has developed by a certain age is the most important resource for effectively solving age-related developmental problems, since relationships with "close" people provide emotional support, mitigate the consequences of stressful events, help structure time and ensure social and role continuity. In particular, intergenerational close relationships promote understanding of life, shared experiences, and enable faster and easier adaptation to changing life contexts (Allen, Blieszner & Roberto, 2000). On the other hand, the individual way and nature of a person's solution of bipolar age-related tasks determine the quality of close relationships in which he is included at a given age stage. Parameters such as the degree of attachment, closeness, involvement, the specifics of emotional experiences, psychological distance, value-semantic unity, trust, empathy, which are invariant categorical features of close relationships (Saporovskaya et al., 2021), are largely determined by the way there is a formation of a person's identity (closeness/isolation, productivity/self-absorption, attachment/separation, destructiveness/creation, etc.).

Nowadays, there are several models that describe the dynamics of close relationships during adulthood: the equilibrium model of maintaining relationships (Murray, Holmes, Griffin & Derrick, 2015); the functional model (La Guardia & Patrick, 2008; Murray et al., 2013); the model based on emotional dynamics in intimate and close relationships (Schoebi & Randall, 2015). The meta-analytic review on relationship dynamics contains fragmentary studies aimed at studying the predictors of the development of relationships and maintaining their qualitative parameters. Thus, psychological flexibility (Twiselton, Stanton, Gillanders & Bottomley, 2020), empathy and empathic accuracy (Ickes & Hodges, 2013), the degree of consistency between the ideal idea of relationships and their real implementation (Fletcher, 2000) are considered as relationship-satisfaction factors. Variables such as devotion, sexuality, passion, coping behaviour (including dyadic behaviour) also play a large role (Shaver & Miculincer, 2002; Li & Chan, 2012).

As far as the transformation of close relationships in an adult couple (in the long term and in a favourable scenario) is concerned, such dynamic features are noted as a tendency to increase similarity in a couple over time, including in the area of sharing values and interests (Tobore, 2020; Schul & Vinokur, 2000; Davis & Rusbult, 2001), striving for togetherness and coexistence, maintaining mutual attraction (Sprecher, Christopher & Cate, 2006); moving from a model of closeness based on passion to a model based on friendships, shared interests, mutual respect and concern for each other's well-being

(Grote & Frieze, 1994); decreased sexual desire and emotional attachment (Freud & Rieff, 1997; Sprecher et al., 2006; Berscheid et al., 2010), increased social closeness (Seshadri, 2016).

Thus, the following questions remain relevant in psychological discourse: *Is there a specificity of close relationships at different stages of adulthood (from 18 to 65 years)? How do the main categorical signs of close relationships change at different stages of adulthood? Are there gender differences in close relationships at different stages of adulthood?*

These problematic issues have determined *the purpose of the study* – to identify the specifics of close relationships in men and women at different stages of adulthood.

Methods

Sample

The study involved 558 people, including 288 women from 18 to 65 years old, M = 31.28, SD = 11.88; 270 men aged 18 to 64, M = 32.46, SD = 12.62. The male and female samples were unrelated, the respondents were not in a marital or romantic relationship with each other. Four research groups were formed based on the epigenetic concept of E. Erickson, taking into account the adjustments made to the age boundaries of the stages of adulthood by a team of scientists led by G. E. Vaillant (Malone, Liu, Vaillant, Rentz & Waldinger, 2016). The first group included adolescent respondents from 18 to 20 years old, on the verge of adulthood (N = 129; M = 18.85; SD = 0.94), 71 of which were women and 58 were men. The second group included young people (stage of early maturity) from 21 to 25 years old (N = 130; M = 22.97; SD = 1.58), 69 women and 61 men. The third included adults at the stage of middle maturity from 26 to 40 years (N = 159; M = 31.45; SD = 4.75), 77 women and 82 men. The fourth - adults at the stage of late maturity from 41 to 65 years (N = 140; M = 47.61; SD = 5.82), 72 women and 68 men. All respondents are in a relationship. Relationship length is directly related to the age of the respondents (R = 0.82**).

Data collection was carried out from May to November 2022, during a period of high social tension associated with the start of a special military operation, partial mobilization in Russia, and dramatization of people's consciousness. The study was based on the principles of voluntariness, environmental friendliness, anonymity and confidentiality.

Study design

At the **first** stage, the researchers *collected of socio-biographical information* about the respondents was: gender; the occupation of the respondent and the partner; duration of relationship with a partner; the nature of the relationship with the partner (married residence, residence without marriage registration, periodic meetings, etc.); the presence

of joint / non-joint children, their gender and age; family members living in the same territory as the respondent; close people who need special care and living in the same household. To expand the explanatory possibilities of the methodological complex, *parameters for self-assessment in relationships* were outlined: how happy they are in a relationship, the degree of closeness with a partner, affection for a partner, trust, positive colouring of feelings, manifestations of violence from a partner, psychological distance, interest/involvement, mutual support, resourcefulness - how relationships help to cope with stress, build relationships with other people, are a support in life, stimulate self-development. The assessment was based on a ten-point Likert scale.

Standardized methods that enabled verifying the basic empirical referents - *categorical signs of close relationships*, were selected according to their reliability, predictive value, adequacy to the levels of closeness analysis: *cognitive* (understanding, assessment of close relationships), *affective* (affiliate emotions and feelings), *behavioural* and *regulatory* (coping difficulties that arise in close relationships and resources that contribute to their constructive overcoming).

The methodological complex included:

– Method of Mark T. Schaefer, David H. Olson PAIR "Personal assessment of closeness in relationships" (Schaefer & Olson, 1981), primary testing of the Russian version by E. V. Tikhomirova, O. A. Ekimchik, 2021, diagnosing emotional, social, sexual, intellectual, recreational closeness;

– "Experiences in Close Relationships-Revised (ECR-R) Adult Attachment questionnaire" method by K. Brennan and R. K. Frehley, adapted by T. V. Kazantseva to assess the type of attachment, level of anxiety, avoidance in loved ones relations (Kazantseva, 2008);

– Methodology "Self-assessment of the generalized type of attachment" ("RQ") by K. Bartholomew, L. Horowitz, 1991, adapted by T. V. Kazantseva, which reveals the dominant type of attachment in close relationships ("reliable", "over-involved", "avoidant", "fearful") (Kazantseva, 2011);

– Evaluation of the affective component of closeness was made on the basis of the concept of K. E. Izard, where respondents assessed their feelings towards a partner on a five-point Likert scale;

– E. Diener's Life Satisfaction Method, adapted by E. Osin, D. Leontiev, to assess the subjective well-being of a person (Osin & Leontiev, 2020);

– "Trust Scale" (TS) J. K. Rempel, J. G. Holmes, M. R. Zanna, 1985) adapted by N. O. Belorukova to determine the degree of trust in close relationships (faith, reliability and predictability) (Belorukova, 2008);

– The self-perception of flexible coping with stress questionnaire (M. J. Zimmer-Gembeck, E. A. Skinner et al. (2018), adapted by T. L. Kryukova, O. A. Ekimchik, which detects multiple , rigid and situational coping (Ekimchik & Kryukova, 2020).

Statistical processing of empirical data was done with the SPSS Statistics V.19.0 software. Spearman's correlation analysis was carried out to identify the interrelationships of variables; in order to assess the significance of differences the Kruskal-Wallis test and the Mann-Whitney U-test was administered; to identify the predictive load of age – the linear regression analysis; free statements of the respondents were processed by ranking.

Results

The analysis of the structure of invariant categorical features and their correlations, i.e. indicators of close relationships with the age of respondents in the total sample (Table 1), showed that the most age-related categories are all types of perceived closeness with a partner, life satisfaction of subjects in close relationships, emotions and feelings that fill close relationships. The over-involved type of attachment to a partner and rigid coping are also found to be associated with age. The variables "trust", anxiety and avoidance of closeness in relationships were found not to be associated with age.

Table 1
Correlation analysis results (N = 558)

Variables related to the age of the respondents	Age of respondents
	R-Spearman test values
Scales of standardized methods	
Sexual type of closeness	-0.26*
Intellectual Closeness type	-0.15*
Recreational closeness type	-0.27**
Social type of closeness	0.17*
Emotional type of closeness	-0.19*
Social desirability in closeness assessment	-0.12**
Attachment style B (over-involved)	-0.16*
Satisfaction with life	0.19**
Rigid coping	0.12*

Variables related to the age of the respondents	Age of respondents
	R-Spearman test values
Self-esteem scales	
The level of happiness in close relationships with a partner	-0.11*
The degree of attachment to a romantic partner / spouse	-0.19*
The degree of manifestation of positive feelings and emotions in relationships that contribute to closeness	-0.13*
Joy	-0.11*
Surprise	-0.12**
Contempt / haughtiness	0.11*
Interest / attentiveness	-0.15*
Physical abuse by a partner	-0.16*
Relationships with a partner as a resource for building relationships with other people	0.18*

Note: ** – significance of differences p ≤ 0.05; ** – significance of differences p ≤ 0.01.*

To identify the predictive load of age, a linear regression analysis was performed, where age was an independent variable (Table 2).

Table 2

Results of linear regression analysis. The independent variable is the age of the respondents. The dependent variable– close relationship variables (N = 558)

Variables related to the age of the respondents	Age of the respondents	
	Value of criterion β	Significance level
Scales of standardized methods		
Sexual type of closeness	- 0.26	0.00
Intelligent closeness type	- 0.15	0.03
Recreational closeness type	- 0.27	0.00
Social type of closeness	0.17	0.03

Variables related to the age of the respondents	Age of the respondents	
	Value of criterion β	Significance level
Social desirability in closeness assessment	- 0.12	0.01
Attachment style B (over-involved)	-0.1	0.04
Satisfaction with life	0.17	0.00
Rigid coping	0.12	0.01

It was found that age predicts an increase in social closeness between partners, an increase in life satisfaction, and coping rigidity. At the same time, age predicts a decrease in indicators of social desirability in assessing proximity, that is, with age, the objectivity and realism of assessing a partner and relationships with him increases, and the over-involved type of attachment weakens, that is, a certain level of personal autonomy is achieved. This occurs against the backdrop of a weakening of sexual, intellectual and recreational closeness between partners.

To identify differences in the parameters of close relationships between groups of respondents of different age categories, the Kruskal-Wallis test was used (Table 3).

Table 3

Results of a comparative analysis of close relationship variables with the nonparametric Kruskal-Wallis test for different age groups

	Average ranges				Chi-square	Signi-ficance level
Variables	18-20 years old	21-25 years old	26-40 years old	41-65 years old		
Sexual type of closeness	266.6	282.5	255	211.1	17.69	0.00
Intellectual type of closeness	250.6	296.5	244.3	227.1	11.92	0.02

	Average ranges				Chi-square	Significance level
Recreational type of closeness	275.7	295	244.3	204.5	26.45	0.00
Closeness avoidance scale	251.3	201.3	257.5	262.2	15.96	0.00
Predictability	238	276.8	239	251.6	9.44	0.05
Satisfaction with life	224.3	216.9	262.3	265.3	16.62	0.00
Surprise	265.4	271.6	254.1	218	12.38	0,02
Contempt	232	228.7	255.8	266.2	9.87	0.04
Mutual support	250.9	292	242.5	229.5	13.3	0.01
Relationship as a life support	225	295.1	247.7	246.1	14.86	0.01
Relationship as a resource to overcome stress	252.1	288.3	242.8	230.6	10.32	0.04
Involvement	249	300.9	246.7	224.2	13.97	0.00

	Average ranges				Chi-square	Significance level
Positive feelings contributing to closeness	255.5	285.1	248	223.6	10.5	0.03
Trust	241.8	286.9	251.2	230.3	11.79	0.02
Attachment level	258.1	295.5	242.7	223.8	12.75	0.01
Closeness level	246.5	291.3	247.3	229.8	10	0.04

Reliably significant differences in the four age groups were obtained for a number of indicators. Thus, out of five types of closeness, differences are fixed in three: sexual, intellectual, recreational. There are no significant differences in emotional and social types. In addition, a significant change in indicators by age is typical for the parameters "avoidance of closeness", "life satisfaction", their highest values are observed in the age group from 41 to 65 years. Interestingly, "predictability", which emphasizes the consistency of the partner's behaviour with the previous experience of interaction with him, takes the highest values in young people (from 21 to 25 years old). In this age group, the subjective assessment of "degree of closeness with a partner", "attachment to a partner", "happiness", "positive feelings contributing to closeness", "involvement", "relationship as a resource", "trust", "mutual support" prevail.

The results of a pairwise sequential comparative analysis of the parameters of close relationships according to the Mann-Whitney U test are presented in Tables 4-6.

Table 4

Significant differences in levels of close relationships in adolescence and early adulthood

Variables	Average range of Group 1 (18-20 years old)	Average range of Group 2 (21-25 years old)	U-criterion	p-level of significance
Intellectual type of closeness	91.37	109.67	3401.5	0.032
Closeness avoidance	104.15	84.31	3335	0.019

Variables	Average range of Group 1 (18-20 years old)	Average range of Group 2 (21-25 years old)	U-criterion	p-level of significance
Closeness level	91.95	108.51	3477	0.04
Trust level	91.84	108,73	3462.5	0.04
Involvement	90.57	111.26	3298	0.013
Relationship as a life support	88.8	114.76	3070.5	0.002
Relationships with a partner as a resource for building relationships with other people	90.6	111.19	3302.5	0.015
Relationship as a joint effort to solve problems	91.62	109.18	3433.5	0.035

In the period from 18 to 20 years old, against the background of lower indicators of trust and involvement in relationships, the indicators of avoidance of closeness are significantly higher than in the period from 21 to 25 years old (Table 4). In the period up to 20 years old, relationships are viewed to a lesser extent as a support, as a resource for building a significant social network and solving difficult life situations. By types of closeness, significant differences were revealed only in the intellectual type, emotional, recreational, sexual and social types of closeness in these age groups do not differ.

Table 5

Significant differences in levels of close relationships in early and middle maturity

Variables	Average range of Group 2 (21-25 years old)	Average range of Group 3 (26-40 years old)	U-criterion	p-level of significance
Intellectual type of closeness	128.85	105.81	4104.5	0.015
Emotional type of closeness	128.03	106.15	4158	0.021
Recreational type of closeness	128.6	105.9	4121	0.017
Avoidance of closeness	93.97	120.08	3963	0.006
Life satisfaction	98.08	118.4	4230	0.033
Toxicity in relationship	125.09	107.35	4349	0.039
Closeness level	126.61	106.73	4250.5	0.01
Psychological distance in relationship	126.62	106.73	4249.5	0.033
Involvement	129.42	105.58	4068	0.01
Relationship as a life support	128.08	106.13	4155	0.016
Attachment	129.56	105.53	4058.5	0.01
Relationship as a mechanism of coping with stress	127.25	106.47	4209	0.025
Mutual support	128.8	105.84	4108	0.013

When comparing the data of the age groups, significant differences were revealed in three types of closeness, namely intellectual, emotional and recreational, which prevail in the period of youth. In middle maturity, as well as in adolescence, the value of the "avoidance of proximity" indicator is higher, thus, signs of cyclical dynamics are seen. In the period of youth, there is a certain ambivalence: on the one hand, the values for "attachment in relations with a partner", "resourcefulness of relations" (relationships help to cope with stress), "partner involvement", "mutual support" are higher, on the other hand, the indicator "relationship toxicity" (Table 5) also increases.

Table 6
Significant differences in levels of close relationships in middle and late maturity

Variables	Average range of Group 3 (26-40 years old)	Average range of Group 4 (41-65 years old)	U-criterion	p-level of significance
Sexual type of closeness	162.5	135.81	9143	0.008
Recreational type of closeness	160.99	137.52	9383	0.019
Interest/ attentiveness	159.4	139.33	9636	0.037
Surprise/ Amazement	159.9	138.76	9556.5	0.029
Anger/Irritation	161.74	136.67	9264	0.008
Rigid coping	139.69	161.71	9490	0.028

Comparing the periods of middle (from 26 to 40 years) and late maturity (from 41 to 65 years), the authors revealed the least significant differences in the characteristics of close relationships (Table 6). Thus, significant differences exist in sexual and recreational types of closeness with a partner towards their weakening in the period of late maturity against the background of a partial loss of interest in a partner and a decrease in the flexibility of coping with stress.

It should be noted that all other variations of the groups were also subject to a comparative analysis. The smallest number of differences was found between indicators of close relationships in the age periods from 17 to 20 years old - group 1 and from 26 to 40 years old - group 3: an indicator of happiness in relationships with a predominance in youth ($U = 8899.5$, $p = 0.04$), life satisfaction with a predominance in the period of middle maturity ($U = 8683$, $p = 0.03$). The largest number of differences was registered between groups 2 (from 21 to 25 years old) and 4 (from 41 to 65 years old) with a predominance of indicators of attachment, trust in a partner, involvement in relationships, resourcefulness of relationships and closeness in the period of early maturity. Closeness avoidance ($U = 3466$, $p = 0.006$) and contempt ($U = 3865.5$, $p = 0.033$) are predominant in late adulthood.

Further, to test the assumption about the presence of specific differences in the parameters of close relationships in men and women at each age stage, a pairwise comparative analysis of age groups was carried out (Tables 7–10).

Table 7

Gender differences in close relationship in adolescence

Variable	Average range in female sample (N = 71)	Average range in male sample (N = 58)	U-criterion	p-level of significance
Style C (detached avoidance)	71.65	56.85	1586.5	0.024
Style D (fearful)	70.68	58.05	1656	0.054
Surprise	59.06	72.27	1637.5	0.036
Satisfaction with life	56.39	75.53	1448	0.004

In the period of adolescence, in the female sample, compared to the male sample, the detached-avoidant and fearful types of attachment prevail, life satisfaction is lower, girls are less inclined to experience surprise in relationships (Table 7).

Table 8

Gender differences in close relationship in early maturity

Variables	Average range in female sample (N = 69)	Average range in male sample (N = 61)	U-criterion	p-level of significance
Style C (detached avoidance)	39.15	24.88	290.5	0.002
Recreational type of closeness	37.19	27.46	363	0.039
Situational coping	38.01	26.38	332.5	0.014
Interest in the partner	38.14	26.21	328	0.008
Joy/happiness	37.49	27.07	328	0.008
Faith	38.26	26.05	323.5	0.009

In the period of early maturity in the female sample, compared to the male sample, significantly higher indicators of the recreational (entertainment) type of closeness, interest in a partner, experiencing happiness and joy in relationships are recorded, but against the background of persistently high values for the detached-avoidant type of attachment to a partner (Table 8).

Table 9
Gender differences in close relationship in middle maturity

Variables	Average range in female sample (N = 77)	Average range in male sample (N = 82)	U-criterion	p-level of significance
Style D (cautious)	87.86	72.62	2552	0.035
Closeness scale	72.56	86.98	2584.5	0.048
Physical abuse	85.12	75.19	2762.5	0.05

In the period of middle maturity, women, unlike men, are more inclined to wishful thinking, to adjust relationships to socially approved patterns and requirements (conditional closeness scale). At the same time, it is women who note the presence of physical violence in relationships and show a cautious style of attachment (Table 9).

Table 10
Gender differences in close relationship in late maturity

Variables	Average range in female sample (N = 72)	Average range in male sample (N = 88)	U-criterion	p-level of significance
Reliability of the partner	63.73	77.67	1960.5	0.042

In the period of late maturity, no significant differences were actually found between men and women in terms of indicators of close relationships, the only exception being the assessment of partner reliability, which prevails in the male group (Table 10).

Discussion

The results showed that with age there is a decrease in indicators of sexual, intellectual, recreational closeness in relationships with a partner and an increase in indicators of social closeness. This happens against the background of a decrease in libido, the actualization of the self, the launch of separation processes from a partner, a more complete, deeper understanding of oneself, one's interests and capabilities. Due to this, a balance of autonomy-connectedness in relations with a partner is achieved. On the other hand, inclusion in common social and communication networks with age contributes to the achievement of a high level of social closeness with a partner, the boundaries between "friends" and "close partners" are gradually blurred. Relationships begin to be perceived more realistically, the assessment of closeness with a partner through the "prism of social expectations and requirements" goes away. With age, there is a decrease in the flexibility of the coping system, coping strategies are applied more rationally, based on the presence of positive experience of their use in similar situations, coping becomes more rigid.

Because the length of relationship in our sample closely correlates with the age of the respondents ($R = 0.81$; $p = 0.01$), we can assume that the obtained picture of the dynamics of close relationships by age reflects the situation in terms of length of relationship. There is a tendency to reduce anxiety in relations with a partner over time, the partner is no longer perceived as part of himself, there is a healthy separation from the partner, which is expressed in the achievement of personal integrity. One's own goals, values, meanings are fulfilled; at the same time there is an existential rapprochement. As the duration of relationship increases, there is a decrease in indicators of sexual and recreational closeness, but there is a convergence at the level of social ties, a common social network.

The findings are consistent with researchers' view that many of the variables that affect a partner's initial attractiveness remain important in long-term relationships, but other factors come into play over time. Thus, it is noted that as the relationship develops, the partners get to know each other better, show mutual care to a greater extent, feel compassion towards the partner, which is directly related and based on increased trust in the relationship (Clark & Monin, 2006, Salazar, 2015). In successful relationships, partners feel more and more close to each other over time, while in a less successful version, closeness can develop into distance, isolation, which, in turn, enhances the feeling of loneliness and inseparability of feelings. In addition, one of the reasons for the ambiguity and instability of the social situation among the subjects of relationships is the fundamental dilemma of approach-avoidance (Kryukova, 2017). At almost any stage of the relationship, partners can be motivated to decrease - increase the distance of closeness and closeness. Proximity means satisfying the fundamental need for belonging, affection, but at the same time associated with the restriction of freedom, mutual control (Cavallo, Murray & Holmes, 2014).

The most detailed characteristic of the close relationship system is observed at the ages from 21 to 25 years. Young people highly appreciate sexual, recreational, intellectual types of closeness with a partner, are less focused on avoiding closeness, are characterized by a high degree of involvement in relationships with a partner, and experience positively collared feelings and emotions towards the partner. At the same time, at this age, such closeness is achieved against the background of low life satisfaction. Lower satisfaction with life during this period is primarily explained by the fact that young people begin to perceive the surrounding reality more deeply and critically, react painfully to the destructive processes taking place in modern society, reach a separation peak, begin to measure ambitions, development tasks and achieved results. It is at this age that close relationships with a partner, to a greater extent than in adjacent age groups, are considered as a resource for coping with high uncertainty of the future, with emerging difficulties, increase the stability of the subject in the face of modern challenges and level out the risks associated with possible dissatisfaction with life.

By late maturity, relationships become more predictable, the behaviour of a partner is predicted, there are fewer personal discoveries in relationships, and sexual closeness is levelled against the background of a decrease in sexual activity. At the same time, the resource capacity of relations is growing, they are considered as a life support, as a means of overcoming difficulties and stresses. Trust and mutual support come to the fore. A high level of life satisfaction is achieved. This is consistent with the opinion of foreign researchers that at a time when a couple begins to run a household together, have children and, possibly, have to take care of elderly parents, the requirements in a relationship become correspondingly higher. As a result of this complexity, partners in close relationships increasingly turn to each other not only for social support, but also for help in coordinating activities and completing tasks (Wegner, Erber & Raymond, 1991). Thus, as the complexity of relationships increases, interdependence may increase.

The analysis of cross sections shows that in adolescence, compared with early maturity, the exchange of thoughts, ideas, conversations about vital events, goals, values is less pronounced, trust in a partner has not yet been formed, there is no experience of cohabiting difficult situations, no existential closeness. Therefore, there is avoidance of closeness, relationships are not yet considered as a significant resource for coping with stress. In addition, there is an imbalance of closeness and autonomy in relationships, as a result of which excessive openness to a partner, self-disclosure on his part, an attempt to closer rapprochement can be perceived as an indicator of potential risk of subjective integrity, personal psychological well-being, personal vulnerability. Partners look at each other more closely.

At the ages from 21 to 25, a person is faced with the task of establishing closeness, overcoming the feeling of loneliness, determining a life partner, and begins to make more flexible, creative, confident efforts to solve this problem. In this regard, we observe the prevalence of indicators of emotional, intellectual, recreational closeness with a partner in comparison with the period of youth and middle maturity. The attitude to avoid closeness

is levelled, self-disclosure and readiness for closer ties and relationships are enhanced. The boundaries of personal space become more permeable to a significant other, the psychological distance is reduced, and attachment is strengthened. Relationships, to a greater extent than in youth and middle adulthood, are perceived as a support and resource for increasing resilience. At the same time, such closeness becomes an indicator of growing dependence, and relationships are more often than in other periods of life perceived as toxic, hindering personal development. There is a growing risk of dissolving in relationships, losing one's identity.

When comparing middle and late adulthood, it is natural that in the period from 26 to 40 years, sexual closeness in relations with a partner prevails. It is at this age that the peak of sexual activity of both men and women is observed, doubt and shame give way to emancipation in the intimate sphere, search and discoveries, and the task of obtaining a new sexual experience is solved. Coping is even more flexible, variable, and contributes to the realization of the adaptive potential of partners. At the same time, relationships to a greater extent than at a more mature age are characterized by ambivalence, there is an effect of "emotional swings": from anger and irritation to surprise and interest. Between the ages of 41 and 65, important indicators of close relationships sag compared to the previous stage, coping becomes more rigid, and the indicator of sexual closeness decreases. This is consistent with a study that found passion and closeness to be negatively associated with relationship duration, and social commitment positively (Lemieux & Hale, 2002).

An analysis of the obtained differences between men and women in different age groups allows us to speak of a gradual levelling of gender differences with age in assessing the parameters of close relationships with a partner. The most striking differences are observed between the ages of 21 and 25, with a predominance of values in the female sample. At this age, women are characterized by an ambivalent perception of the partner and close relationships. On the one hand, the attitude towards a certain distance from the partner remains – it is associated with the existing negative model of the Other and self-centeredness. On the other hand, women are more interested in their partner than men at this age, they believe him, the perception of relationships is different: they more often note that they experience happiness, joy in relationships, do not perceive relationships as predictable, resort to situational coping, which softens negative emotions in difficult situations, and reduces situational anxiety. Of the specific differences at a younger age, one can note the "fearful" and "aloof-avoidant" types of attachment, which also prevail in girls. The beginning of adult life in girls, the need to establish intimate relationships with a partner are often accompanied by a high level of anxiety, which leads, on the one hand, it results in emotional restraint in relationships and a certain degree of detachment from close contacts. On the other hand, it can lead to dependence in relationships.

By middle maturity in women, the "fearful / cautious" type of attachment again prevails compared to men, which may be associated with the passage of a midlife crisis, a decrease in trust in a partner against the background of developing personal complexes. Indeed, as

a number of studies have shown, attachment styles can be specific, depending on the stage and experience of the relationship, the specific situational context, and age, that is, they may show less stability and stability. Some evidence suggests that adults' general attachment style may not always predict their attachment style in specific relationships (Pierce & Lydon, 2001; Ross & Spinner, 2001; Chopik, Edelstein & Fraley, 2013).

It was found that in middle maturity women face manifestations of "physical violence from a partner", which, in turn, reduces a woman's self-esteem, making her vulnerable in a relationship with a partner. This may be a sustainable social practice of gender violence for this age group, the causes of which may lie in gender ideology, in particular generational affiliation. Men, at the same time, are prone to social desirability in assessing closeness with a partner, since recognition, acceptance of existing problems and the absence / loss of closeness in relationships is a powerful stress factor, an alarm signal, an indicator of a violation of a stable, familiar, convenient system of relationships, undermining social status in the eyes of others.

After 40 years, women are less confident in the reliability of a partner, which can be explained by a whole range of reasons – from the stereotype of perceiving a man as "retaining the ability to reproduce and sexual activity for a longer time", "strives to a new life after 40 years and the search for a younger partner" to the emotional stagnation of relationships, the withering sexual function of a woman and developing inferiority complexes.

Conclusion

The focus of the study is the relationship of a person with the significant *Other* in an era of exciting everyday life and unprecedented uncertainty of the future. Natural is the desire of a person at any age to "be in a couple", which gives emotional closeness. However, today the continuum of closeness with *the Other*, belonging to the inner circle, is much longer than it used to be before (Muniruzzaman, 2017). Often, closeness with a partner is perceived as a threat to personal autonomy, and the interests of the group (dyad, family) as an obstacle to personal well-being and success. On the one hand, the strengthening of traditional and family values is being lobbied at the state level as the most important direction in the development of Russian society. On the other hand, experimental forms of close relationships are developing at the level of society, which can be viewed either through the prism of the intensity of the existence of the union (for example, "guest" marriages, "fluid" marriages, involving a constant change of partner), or through the peculiarities of the relationship between partners. It should be emphasized that the systemic changes in the institution of close relationships are closely intertwined with the personal changes of a person at different stages of life, with natural changes in the quality of his relationship with a partner.

In this regard, the authors set the task to comprehend the features of close relations in different age groups at the present stage of development of society.

The results of the study enable us to come to a number of conclusions.

– Age in the period of adulthood predicts a gradual decline in sexual, intellectual, recreational closeness with a partner and an increase in social closeness. This happens against the background of a decrease in libido, the actualization of the self, the launch of separation processes from a partner, a more complete, deeper understanding of oneself.

– There is a specificity of close relationships at different stages of adulthood (from 18 to 65 years). In adolescence, against the background of low trust in a partner and the lack of experience of living together in difficult situations, avoidance of closeness is observed, relationships are not yet considered as a significant resource for overcoming stress. The sensitive period for establishing favourable close relationships is the age from 21 to 25 years: sexual, recreational, intellectual types of closeness with a partner are more pronounced than in other age periods, avoidance of closeness is less pronounced, relationships are characterized by a high degree of involvement, positive emotional colouring. It is in youth that close relationships with a partner are considered as a resource for coping with high uncertainty of the future, with emerging difficulties, increase the stability of the subject in the face of modern challenges and level out the risks associated with dissatisfaction with life. In the period from 26 to 40 years, sexual closeness prevails in relations with a partner; flexible coping contributes to the realization of the adaptive potential of partners. At the same time, relationships to a greater extent than in other age groups are characterized by emotional ambivalence. By the age of 41–65, relationships become more predictable, and sexual closeness levels off. Trust and mutual support come to the fore. A high level of life satisfaction is achieved.

– There are gender differences in the manifestation of the parameters of close relationships, which gradually level out with age. Thus, the most striking differences are observed between the ages of 21 and 25, with a predominance of values in the female sample. Women are characterized by an ambivalent perception of a partner and close relationships proper; exhibit "cautious/fearful" and "withdrawal-avoidant" types of attachment up to and including the period of middle maturity. Men are more prone to social desirability in assessing closeness with a partner, since recognition, acceptance of existing problems and loss of closeness in a relationship is a powerful stressor for them, an alarm signal, an indicator of a violation of a stable, familiar, comfortable system of relationships, undermining the social status in a relationship in eyes of close people.

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Elena Viktorovna Tikhomirova prepared the plan and the text of the paper, reviewed the existing sources on the problem raised in the paper, statistically processed the empirical data and described the results of the research.

Anna Gennadievna Samokhvalova wrote the abstract, key words and general provisions, structured and edited the text of the paper, grounded the research methods provided the theoretical analysis of the problem and summarized the conclusions.

Maria Vyacheslavovna Saporovskaya analysed the sources in the Russian language, collected the empirical data, interpreted the results, prepared the references and summarized the conclusions.

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Conflict of Interest Information

The authors have no conflict of interest to declare.

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Typological Variants of the Development of Children Born After Assisted Reproduction, and Their Family Environment Characteristics

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Abstract

Introduction. Due to the increased number of children born as a result of assisted reproductive technology (ART), there are contradictory data on their health and development. This underlines the need to identify the developmental trajectories of these children and the system of factors that contribute to them, specific for each developmental stage. **Aim**: To identify the variants of physical and psychological development of children born after ART, as well as the characteristics of their family environment during the early preschool age. **Methods**. The participants were 220 families (mothers, fathers and 4-year-old children): 80 families with induced conception (ART), 130 families with natural (spontaneous) conception (NC). Methods were based on the questionnaires used in TEDS and QLSCD, translated into Russian: Parent-Administered and Parent-Reported PARCA; short version of the MacArthur Communicative Development Inventory; assessment of preschool children's behaviour BEH; «Your Child at Home»; «Your Child's Health»; «Scale of Lack of Money for Essentials»; short version of the «Household Food Security Scale»; «Job Satisfaction»; assessment of stress and fatigue; assessment of anxiety; assessment of the relationship with the child»; short version of the Dyadic Adjustment Scale. **Results**. In ART and NC families 3 developmental variants were identified: «Balanced» (ART: 33%, NC: 41%), «Risk of imbalance» (ART: 42%, NC: 19%), «Risk of developmental and behavioural problems» (ART: 24%, NC: 40%). For ART group, these variants were different only in mothers' relationship with the child, for the NC group – in all types of family

characteristics. **Discussion**. In NC families most aspects of family functioning are related to children's behaviour and development, in ART families – only maternal attitude to the child. The results underline the need for individual psychological support and correction.

Keywords

ART, IVF, induced pregnancy, mental development, physical development, preschool age, family environment, family relations, financial situation, parent-child relations

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Introduction

According to the statistical data, there is an increase in the number of children conceived through assisted reproductive technology (ART). Since 1978, more than 10 million children have been born using ART worldwide (ESHRE, 2022). In Russia, the statistics is available for 1995-2020, and during this period more than 333.5 thousand children were born after ART (RAHR, 2020). Currently, there is a great research interest in the development of children conceived through ART, and a large amount of contradictory data on the impact of ART procedures on these children's health and mental development are available. Some researchers argue that there is no direct relationship between the ART procedures and the development of children, and these children are not significantly different from children conceived spontaneously in terms of physical (Malyshkina, Matveeva, Filkina, Ermakova, 2019; Punamäki et al., 2019), cognitive (Farhi et al., 2021), emotional and social development (Pechenina, 2016). Other studies reported an increased risk of prenatal problems (Mikheeva, Penkina, 2014), adverse perinatal outcomes (Qin et al., 2016), delayed physical and mental development (Solovyeva, 2014; Djuwantono, Aviani, Permadi, Achmad, & Halim, 2020) and mental and physical disorders (Barbuscia, Myrskylä, & Goisis, 2019; Rissanen, Gissler, Lehti, & Tiitinen, 2020; Wang, Yu, Chen, Luo, & Mu, 2021). It should be noted that these data are mostly cross-sectional, cover only few developmental stages and do not assess the relationship between the physical and mental development of children conceived through ART. Most research is focused on perinatal outcomes and

early childhood (Iakashvili, Samchuk, 2017; Samoilova et al., 2021), fewer studies describe the preschool, primary school or older children (Farhi et al., 2021).

In order to overcome the contradictions described above and observe the developmental variants and trajectories of children conceived through ART, it is important to identify the factors that contribute to the development children at each developmental stage (Keshishyan, Tsaregorodtsev, Ziborova, 2014). The contribution of psycho-social factors (factors of the family environment) to the development of children has been studied mostly on a sample of children not selected according to the type of conception. Psychological factors included marital relationships (Sychev, Kazantseva, 2017; Garriga & Pennoni, 2022), parental mental states (Rigato et al., 2020; Thiel et al., 2020; Sutin, Strickhouser, Sesker, & Terracciano, 2022), the quality of parent-child relationships and parenting strategies (Golovey, Savenysheva, Engelhardt, 2016; Sethna et al., 2017). As social factors, the financial and economic situation of the family (Cooper & Stewart, 2021), the professional employment of parents and their job satisfaction (Savenysheva, Zapletina, 2019; Cho & Ryu, 2022) were highlighted.

Thus, currently, there is a lack of data on the relationship between family factors and the development of children conceived through ART. ART families are mostly studied during the early stages of children's postnatal development, which does not provide a holistic view on potential risk factors and resources specific to each developmental stage. The typological approach can allow to study the complex system of relationships between various aspects of development (McNamara, Selig & Hawley, 2010) and determine the aims and targets of personalized psychosocial support.

Methods

The aim of the study was to identify the variants of physical and psychological development of children born after ART, as well as the characteristics of their family environment during the early preschool age.

Hypotheses: 1) Based on the characteristics of the mental and physical development of preschool children conceived through ART, typological variants can be identified, that are different from the developmental variants of children conceived spontaneously; 2) Typological variants of the development of children conceived with ART and spontaneously, differ in the characteristics of the family environment.

Participants

The analysis was performed on the data collected when the children were 4 years old as a part of the Prospective Longitudinal Interdisciplinary Study of Child Development (PLIS): 220 families (mother, father and child) participated: 80 families who conceived a child through ART, 130 families who conceived a child spontaneously (natural pregnancy, control group, NC).

Methods

The data were collected using research booklets based om the methods used at the longitudinal studies TEDS (Twins Early Development Study) and QLSCD (Quebec Longitudinal Study of Child Development). The translation was performed according to the International Test Commission (ITC) requirements. Using the quartile values, the levels were determined for each scale ([Q1; Q3]): low level - from the minimum to Q1, average (normative) - from Q1 to Q3, high - from Q3 to the maximum.

Mental and physical development of children:

1) Intellectual development: "Parent-Administered PARCA" and "Parent-reported PARCA" (interactive tasks: generalization skills (α = 0.9, ART: [9; 13]; NC: [10; 14]), hand-eye coordination (α = 0.8, "Draw a figure" ART: [4; 6]; NC: [5; 6]; "Draw a man" ART and NC: [5; 9]), logical reasoning (α = 0 .7, ART: [6; 11]; NC: [6; 10]), receptive vocabulary (α = 0.6, ART and NC: [7; 8]); questionnaire for conceptual knowledge assessment (α = 0 ,7, ART: [10; 13]; NC: [9; 13]); the "Speech" questionnaire (short version of the MacArthur Communicative Development Inventory, adapted by S. Petrill et al., 2004), and questionnaire for parents "What your child can say?" that allowed to assess whether the speech is developed according to the age-appropriate norms (α = 0.7, ART: [16; 19]; NC: [15; 19]);

2) Behaviour and emotional development: "Your child's behaviour" (BEH; Cote et al., 2017) (scales: hyperactivity (α = 0.6; ART and NC: [2.5; 5]), prosocial behaviour (α = 0.7; ART and NC: [5.71; 8.57]), physical aggression (α = 0.7; ART: [1.67; 4.17]; NC: [0.83; 3, 33]), inattention (α = 0.6; ART and NC: [3.33; 5]), "Your child at home" (TEDS) (scales: conduct problems (α = 0.6; ART: [2; 4]; NC: [1; 4]); emotional problems (α = 0.6; ART: [2; 5]; NC: [2; 4.83]); shyness (α = 0.6; ART and NC: [1; 3])

3) Physical development: "Your child's health" (total score for health problems, α = 0.6, ART: [1.75; 5]; NC: [2; 6]); "Your child's nutrition" (total score of feeding difficulties: refusal to eat, poor appetite, etc., α = 0.6, ART: [4; 9]; NC: [5; 8]).

Family environment:

1) Socio-economic characteristics: "Scale of Lack of Money for Essentials" (index of financial satisfaction, α = 0.80; ART and NC: [15; 16]); Scale "Feeling of instability caused by lack of food" (short version of "Household Food Security Scale" (Blumberg et al., 1999) adapted by the QLSCD research group): Financial instability index (α>0.65, ART: [0; 1] ;NC: [0;0.75]); "Job Satisfaction" scale (Job Satisfaction Index, α = 0.87, ART: [11; 16.5]; NC: [10; 16]).

2) Psychological characteristics: Scale "Assessment of stress and fatigue" (QLSCD): Level of stress and fatigue; α = 0.72, ART: mothers: [5.75; 9]; fathers: [6; 8]; NC: mothers: [6; 9]; fathers: [5; 8]); "How You Feel" scale (developed by J. Séguin and M. Freeston for the study of SantéQuébec (1997) (general level of anxiety, α = 0.88–0.91; ART: mothers: [6; 18]; fathers: [2 ; 13]; NC: mothers: [4; 19.5]; fathers: [0; 10.25]); "Your relationship with the child" (QLSCD): 3 scales - "Positive attitude" (joint activities, verbal ways of behaviour

correction, ART: mothers: [12.25; 17]; fathers: [12; 16.25]; NC: mothers: [12; 17]; fathers: [10; 16]), "Coercive attitude" (anger, irritability, physical punishment, ART: mothers: [4; 9]; fathers: [2; 7]; NC: mothers: [4; 9]; fathers: [3; 7]), "Consistent parenting" (execution of the promised punishment in case of misconduct, disobedience of the child, ART: mothers: [9; 14]; fathers: [9; 14,25]; NC: mothers: [11; 15]; fathers: [10; 15]) (α = 0.74–0.75); Scale "Your marital relationship" (short version of the Dyadic Adjustment Scale adapted by Sabourin, Valois, Lussier, 2005): Index of marital relationship, in both groups in mothers and fathers α = 0.69 –0.85; ART: mothers: [20.25; 26]; fathers: [16; 19], NC: mothers: [21; 27]; fathers: [15; 19].

Statistical data analysis was performed in the IBM SPSS Statistics 26: descriptive statistics, internal consistency (α-Cronbach) and normal distribution (Kolmogorov-Smirnov test, for all scales the distribution was non-normal) assessment, non-parametric criteria for comparative analysis (Mann-Whitney test for two groups, The Kruskal–Wallis test for three groups), hierarchical cluster analysis (between-groups linkage method).

Results

In each group (ART, NC) typological variants of children's development were identified based on the characteristics of their mental development, behaviour, emotional development, health, feeding difficulties.

Typological developmental variants of preschool children born after ART

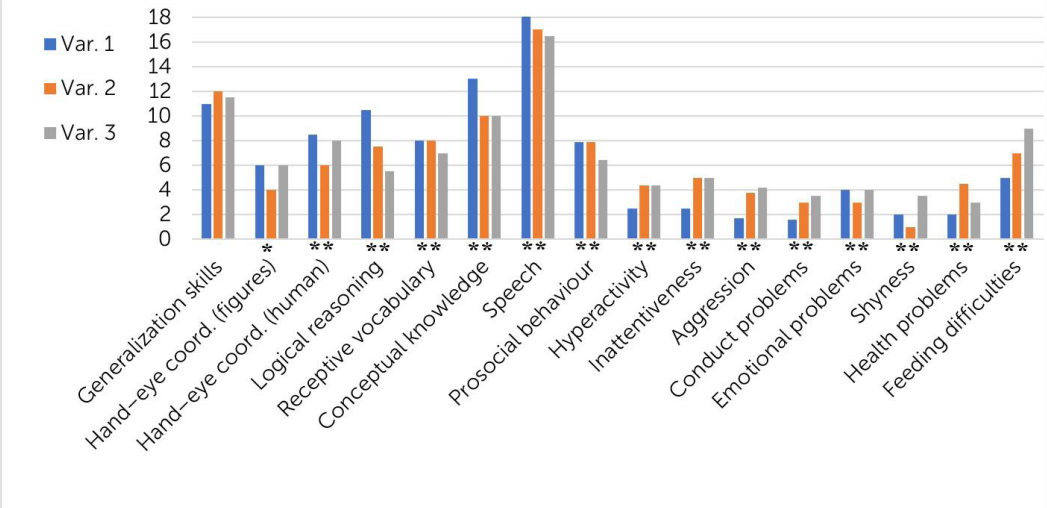
In the ART group, 3 variants of child development were identified (Figure 1). The first included 33% of children, the second - 42%, the third - 24% (values are rounded to the whole numbers). Significant differences between the variants of child development were found for all measures (*p<0.05; **p<0.01), except for the generalization skills: hand-eye coordination ("Draw figures", H = 7.80*; "Draw a human", H = 9.94*), logical reasoning (Puzzles, H = 20.21**), receptive vocabulary ("Looking at the pictures", H = 12.02**); conceptual knowledge (H = 15.26**), speech development (H = 10.13*), prosocial behaviour (H = 10.11*), hyperactivity (H = 18.83**), inattention (H = 8 .71*), physical aggression (H = 10.88*), conduct problems (H = 11.09**), emotional problems (H = 11.99**), shyness (H = 21.13**) , health problems (H = 12.52**), feeding difficulties (H = 11.55**). Effect size of the significant pairwise comparisons (r) was 0.30 to 0.65.

The children of the first typological variant ("Balanced"), compared with the children of the second ("Risk of imbalance") and the third ("Risk of developmental and behaviorral problems") variants, had the highest level of logical reasoning (Me = 10 .5), conceptual knowledge (Me = 13), lowest hyperactivity (Me = 2.5), inattention (Me = 2.5), aggression (Me = 1.7) and conduct problems (Me = 1.58). Compared with the second variant, they had a higher level of hand-eye coordination ("Figures": Me = 6, "Human": Me = 8.5), fewer health problems (Me = 2). Compared with the children of the third variant, they demonstrated a

higher level of logical reasoning (Me = 10.5), speech development (Me = 18.5), prosocial behaviour (Me = 7.86), lower shyness (Me = 2) and feeding difficulties (Me = 5). Conceptual knowledge and hand-eye coordination were at the upper boundary of average group values; hyperactivity and aggression - at the lower; the levels of inattention and conduct problems were below average.

Figure 1

Development and health of preschool children conceived through ART based on their typological variants



Note: *The comparison was conducted between three groups: * p < 0,05; ** p< 0,01*

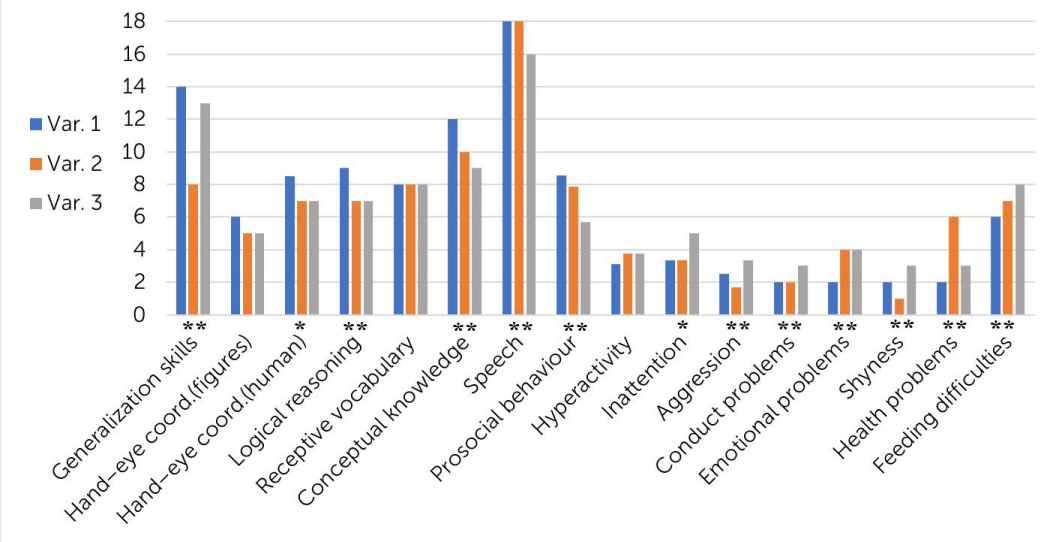
The children of the second typological variant ("Risk of imbalance"), compared with the children of the first and third variants, had the lowest level of hand-eye coordination ("Figures": Me = 4, the lower boundary of average group values) and the highest level of health problems (Me = 4.5), the average level of logical reasoning (Me = 7.5). Compared with the children of the first variant, they completed the "Draw a man" task less successfully (Me = 6), had a lower level of conceptual knowledge (Me = 10, the lower boundary of average group values), higher hyperactivity (Me = 4.48), inattention (Me = 5, upper boundary of average group values), physical aggression (Me = 3.75), conduct problems (Me = 3). Compared with the children of the third variant, they demonstrated a higher level of receptive vocabulary (Me = 8, the upper boundary of average group values), speech development (Me = 17), prosocial behaviour (Me = 7.86), lower emotional problems (Me = 3), shyness (Me = 1, lower boundary of average group values) and feeding difficulties (Me = 7).

The children of the third typological variant ("Risk of developmental and behavioural problems"), compared with children of both variants, had the lowest level of logical reasoning (Me = 5.5, lower than average group values) and receptive vocabulary (Me = 7, lower boundary of average group values), speech development (Me = 16.5), prosocial behaviour (Me = 6.43), higher shyness (Me = 3.5, above average) and feeding difficulties (Me = 9, upper boundary of average group values). Compared with the first variant, they had a lower level of conceptual knowledge (Me = 10, lower boundary of average group values), higher hyperactivity (Me = 4.38), inattention (Me = 5, upper boundary of average group values), aggression (Me = 4, 17, upper boundary of average group values), conduct problems (Me = 3.5). Compared with the second variant, they demonstrated a higher level of hand-eye coordination ("Figures", Me = 6, upper boundary of average group values), higher emotional problems (Me = 4), fewer health problems (Me = 3, low values).

Typological developmental variants of preschool children conceived spontaneously

In the control groups, three typological variants were also identified. 41% of children belonged to the first variant, 19% - to the second, 40% to the third (figure 2).

Figure 2
Development and health of preschool children conceived spontaneously based on their typological variants



Note: *The comparison was conducted between three groups: * p < 0,05; ** p< 0,01*

Significant differences between the variants of children's development were revealed for all measures, except for the task "Draw figures", receptive vocabulary and hyperactivity (* p<0.05; ** p<0.01): generalization skills ("Find a pair", H = 24.76**), hand-eye coordination ("Draw a person", H = 7.33*), logical reasoning ("Puzzles", H = 11.53**), conceptual knowledge (H = 28, 21**), speech development (H=13.26**), prosocial behaviour (H=38.21**), inattention (H=6.44*), physical aggression (H=10.60**), conduct problems (H = 16.59*), emotional problems (H = 17.31**), shyness (H = 26.75**), health problems (H = 12.94**), feeding difficulties (H = 19.80**). Effect size of significant pairwise comparisons (r) was 0.22 to r = 0.61.

The children of the first typological variant ("Balanced"), compared with the children of the second and third variants, had the highest level of logical reasoning (Me = 9), prosocial behaviour (Me = 8.57, upper boundary of average group values), the average level of shyness (Me = 2). They had the lowest level of emotional problems (Me = 2, lower boundary of average group values), health problems (Me = 2, lower boundary of average group values). Compared with the children of the third variant, they demonstrated a higher level of conceptual knowledge (Me = 12) and speech development (Me = 18), lower inattention (Me = 3.33, lower boundary of average group values), aggression (Me = 2.5), conduct problems (Me = 2), feeding difficulties (Me = 6).

The children of the second typological variant ("Risk of imbalance"), compared with the children of the other variants, had lower generalization skills (Me = 8), the lowest level of shyness (Me = 1, the lower boundary of average group values), and the highest level of health problems (Me = 6, upper boundary of average group values), the average level of prosocial behaviour (Me = 7.86). Compared with the children of the first variant, they had lower hand-eye coordination (Me = 7) and logical reasoning (Me = 7), higher emotional problems (Me = 4). Compared with the children of the third variant, they demonstrated higher conceptual knowledge (Me = 10), speech development (Me = 18), lower aggression (Me = 1.67) and conduct problems (Me = 2), lower feeding difficulties (Me = 7).

The children of the third typological variant ("Risk of developmental and behavioural problems"), compared with children of the first and third variants, had the lowest level of conceptual knowledge (Me = 9, lower boundary of average group values), speech development (Me = 16), prosocial behaviour (Me = 5.71, lower boundary of average group values), average level of health problems (Me = 3), higher aggression (Me = 3.33, upper boundary of average group values), conduct problems (Me = 3), shyness (Me = 3 , upper boundary of average group values), feeding difficulties (Me = 8, upper boundary of average group values). Compared with the first option, they had lower level of logical reasoning (Me = 7), higher inattention (Me = 5, upper boundary of average group values) and emotional problems (Me = 4), compared with the second variant - higher generalization skills (Me = 13).

Differences in measures of family environment between the typological variants of children's development

The results of the comparative analysis are presented in Table 1.

Table 1

Differences in social-psychological characteristics of families between the children of three typological variants

Measures	Var.	ART			NC		
		Me	Min-max	Significant differences (r)	Me	Min-max	Significant differences (r)
Index of financial satisfaction	1	16.00	8.00-16.00		16.00	8.00-16.00	
	2	16.00	12.00-16.00		16.00	9.00-16.00	1>3* (0.29)
	3	15.50	8.00-16.00		15.00	10.00-16.00	
Stress and fatigue (M)	1	6.00	2.00-11.00		6.00	3.00-12.00	1<2** (0.39)
	2	8.00	4.00-12.00		8.00	3.00-10.00	
	3	7.00	4.00-10.00		8.00	1.00-12.00	1<3* (0.26)
Stress and fatigue (F)	1	8.00	4.00-11.00		6.00	2.00-12.00	1<2* (0.27)
	2	6.00	1.00-10.00		8.00	3.00-11.00	
	3	6.00	5.00-9.00		8.00	1.00-11.00	1<3* (0.24)
Anxiety (M)	1	11.00	0.00-50.00		8.00	0.00-38.00	1<3** (0.34)
	2	9.50	0.00-54.00		9.00	0.00-41.00	
	3	13.50	0.00-18.00		17.00	0.00-53.00	2<3* (0.25)

Measures	Var.	ART			NC		
		Me	Min-max	Significant differences (r)	Me	Min-max	Significant differences (r)
Anxiety (F)	1	6.00	1.00-28.00		4.00	0.00-26.00	
	2	6.00	0.00-35.00		7.00	0.00-59.00	1<3* (0.25)
	3	4.00	0.00-35.00		7.00	0.00-46.00	
Positive parenting (M)	1	17.00	10.00-20.00	1>3* (0.37)	15.00	10.00-20.00	
	2	15.00	7.00-18.00		16.00	6.00-20.00	
	3	13.00	7.00-19.00		15.00	7.00-20.00	
Coercive parenting (M)	1	4.50	1.00-10.00	1<2** (0.47)	6.00	0.00-13.00	1<3* (0.29)
	2	8.00	4.00-14.00		7.00	1.00-13.00	
	3	5.50	9.00-12.00		8.00	0.00-16.00	
Consistent parenting (M)	1	13.50	6.00-19.00	1>2* (0.31)	13.50	5.00-19.00	
	2	11.00	5.00-17.00		12.00	5.00-17.00	
	3	9.50	6.00-20.00		12.00	5.00-20.00	
Positive parenting (F)	1	13.00	6.00-20.00		14.00	3.00-20.00	1>3* (0.24)
	2	14.00	8.00-18.00		11.50	7.00-18.00	
	3	14.00	9.00-19.00		13.00	5.00-18.00	

Measures	Var.	ART			NC		
		Me	Min-max	Significant differences (r)	Me	Min-max	Significant differences (r)
Marital relations (M)	1	23.00	14.00-31.00		26.00	11.00-31.00	1>2*
	2	23.50	12.00-29.00		23.00	9.00-31.00	(0.26)
	3	23.50	17.00-29.00		24.00	12.00-31.00	1>3* (0.28)
Marital relations (F)	1	17.00	10.00-21.00		18.00	7.00-21.00	1>2* (0.27)
	2	17.00	14.00-21.00		16.50	5.00-21.00	
	3	16.50	12.00-21.00		17.00	9.00-21.00	

Notes: *Me – median. r – effect size; * p<0.05; **p<0.01; M – mother. F – father. Only measures that were significantly different between the groups are presented.*

In the ART group, significant differences between the three variants of child development with an average effect size were observed for 3 characteristics of the maternal attitude to the child: positive, coercive and consistent (адl values were within the normal range). Differences in other maternal and paternal characteristics were non-significant. Mothers of ART children included in the first developmental variant ("Balanced") demonstrated the most favourable attitude towards the child, compared with the mothers of children who belonged to the second ("Risk of imbalance") and third ("Risk of developmental and behavioural problems") variants. Their attitude towards the child was more consistent, with less expression of a coercive attitude, than that of mothers whose children were at risk of imbalance. Compared with mothers of children at risk of developmental and behavioural disorders, their parental attitude was more positive.

In the NC group, the differences were significant for: the index of financial satisfaction, stress and anxiety of mothers and fathers, coercive maternal attitude, positive paternal attitude, index of marital relations measured in mothers and fathers (Table 1). Mothers of children with a "Balanced" developmental variant, compared with the mothers of children with a risk of developmental and behavioural disorders, were more satisfied with their financial situation, showed a less coercive attitude towards the child; both parents

had lower stress and anxiety. Fathers of such children, compared with fathers of children at risk of developmental and behavioural disorders, were more positive towards the child; compared with the fathers of children at risk of imbalance, they were more satisfied with marital relations. Parents of these children had the lowest stress level, and the mothers of these children had the highest level of marital satisfaction, compared with the parents of children belonging to other variants.

Parents of children with the "Risk of imbalance", compared with parents of children with a "Balanced" variant, had a higher stress level, and mothers' anxiety was lower than that of children at risk of developmental and behavioural disorders. Parents were less satisfied with marital relations; father's level of marital satisfaction was at the lower boundary of average values.

Mothers of children at "Risk of developmental and behavioural problems" were characterized by the highest level of anxiety, low satisfaction with the financial situation (at the lower boundary of average values). Parents experienced higher stress than parents of children with a balanced developmental variant, mothers were less satisfied with marital relations and showed a more violent attitude; fathers showed a less positive attitude towards the child and were more anxious.

Discussion

The present study allowed us to identify the typological variants of children conceived through ART and spontaneously, based on their mental and physical development, and to analyze the characteristics of the family environment specific to each variant. These data add to the results of previous comparative studies investigating mental and physical development of children conceived through ART, and provide the insight into the developmental trajectories of children in relation to the factors that contribute to them during early preschool age.

Based on the cluster analysis, 3 typological variants of children's development were identified in both groups. Despite several differences, the general specifics was similar between the groups. However, the proportion of children was different. In the main group, 33% of children belonged to the «Balanced» variant, 42% of children were at risk of the imbalance (high level of health problems, inconsistent cognitive development), and 24% of children had a risk of developmental and behavioural problems (less favorable cognitive development and higher level of behavioural and emotional problems). In the control group, an approximately equal proportion of children belonged to a balanced variant (41%) and a variant with a risk of developmental and behavioural problems (40%). Only 19% could be characterized as children with the risk of imbalance. A relatively high rate of the NC children with «Risk of developmental and behavioural problems» can be explained by the fact that in children of this developmental variant the scores for all scales were within the normal range. In ART children with the risk of developmental and

behavioural disorders, the level of logical reasoning was lower than the average for the sample, therefore, the percentage of children belonging to this variant was low.

This result highlights the need to monitor the development of children conceived through ART, since a significant proportion of them were at risk of imbalance in various aspects of cognitive development, behaviour and physical health. The category with the highest risk was also identified, characterized by the least favorable cognitive development and the most pronounced behavioural and emotional problems. The results may partially explain the contradictory data on the development of children conceived through ART. It should be noted that for most children from all developmental variants, most measures were within the normal range, which allows us to speak about the tendency and a potential target for psychological and pedagogical correction, but not about the pathological development.

For each typological variant, specific characteristics of the family environment were identified. In the control group, the differences were found in all studied areas family process (satisfaction with the financial situation, mental state of parents, attitude towards the child, marital relations). In the main empirical group, differences were observed only in the maternal attitude towards the child, which could be both the cause and a consequence of certain characteristics of the child. Mothers of balanced children of the main empirical group, on average, showed a more positive attitude towards the child, compared with mothers of children of other developmental variants. This manifested in the higher quality and amount of time mothers spent with their children. The maternal attitude to such children was more consistent than the attitude towards the children of other typological variants. On average, mothers of such children created more precise and structured rules, maternal reactions were more predictable. Also, mothers of children with a balanced developmental variant showed less coercive parenting than mothers of children at risk of imbalance or developmental and behavioural disorders.

In families with ART, adverse outcomes of the child were mostly related to the behavioural aspect of parenthood, but not with its emotional aspect and marital well-being. Previously, mothers using ART were showed to have greater involvement in parenting, which may also explain the differences in maternal behaviour associated with variants of child development (Fata, Tokat & Uğur, 2021; Paterlini et al., 2021). The absence of differences in the mental well-being and marital relations of parents can be explained by the high value of a children in such families, which is independent of their behaviour and development (Yakupova, 2015). When development and behaviour of the child differs on average from other children of this age, but is not pathological, the family environment does not actively react to these symptoms. In addition, this may be associated with the suppression of negative emotions (Gameiro et al., 2011). In contrast, the emotional well-being of the parents in the control group was significantly associated with the well-being of their children's cognitive development and behaviour. Parents of children with the most balanced development had the lowest level of stress and anxiety, and the highest quality of marital relations. In contrast to the ART group, there were fewer correlations

with parenting. Mothers' level of positive and consistent parenting did not differ between developmental variants, but, as in the ART group, mothers of children with the risk of developmental and behavioural disorders showed a more coercive attitude towards their children than mothers of children with balanced development. An interesting result is the absence of differences in fathers' scores between variants of children in the ART group, which requires further investigation. This may be related to both the characteristics of ART families and the limitations of the study, since information about the children's behaviour was collected only from mothers.

Conclusion

In both groups, 3 typological variants of the development of children were identified: "Balanced", "Risk of imbalance", "Risk of developmental and behavioural problems". In families with natural conception, most of the family environment characteristics were different between the typological groups. In ART families, the differences were significant only for the maternal behaviour towards the child. The results underline the need for further longitudinal investigation of psycho-social factors of such children's physical and mental development. Also, the data indicate the importance of individual strategies of comprehensive support for ART families aimed at prevention of negative psychological consequences.

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Olga Vladimirovna Terekhina contributed to the research design and implementation of the empirical study, interpretation of the data.

Anna Vladimirovna Silaeva contributed to the research design and implementation of the empirical study, interpretation of the data.

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Executive Functions in People with Different Alcohol Consumption Experiences

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Abstract

Introduction. Executive functions are multidimensional cognitive processes that provide organization and regulation of behavior. Impairments in executive functions are considered to be a risk factor for addiction, including alcohol dependence. However, it is not clear which domains of executive functions are the most vulnerable and how their changes relate to progression to addiction. **Methods**. A total of 244 individuals with different alcohol consumption experiences (78 with safe alcohol consumption and 166 with diagnosed alcohol dependence) participated in this study. All study participants were male and comparable in age and education. Executive functions were investigated with the Go/No-Go task, the Simon Test, the Wisconsin Card Sorting Test, and the Corsi Block-Tapping Test, implemented in a computerized version on the Cognitive Symphony platform (Russia). In participants with alcohol dependence, data on dependence duration, remission duration, and treatment courses were also considered. **Results** of the study showed that participants with alcohol dependence had significantly lower outcomes of executive cognition performance than those who practiced safe alcohol consumption. In particular, alcohol-dependent participants performed worse in cognitive control task ($p = 0.0001$), attention task ($p = 0.026$), and cognitive flexibility task ($p = 0.006$ and $p = 0.040$). Working memory was also found to be vulnerable, with all alcohol-dependents who performed with lower working memory span compared to participants with safe alcohol consumption ($p = 0.044$). Subsequent regression analysis showed that cognitive control errors and cognitive flexibility errors in individuals with alcohol dependence were associated with years of alcohol abuse ($p < 0.01$). In addition, the higher rate of progression to alcohol dependence, the more vulnerable was working memory ($p = 0.002559$). **Discussion**. The study showed that executive cognition vulnerability in people with alcohol dependence was associated with alcohol abuse duration and dependence progression rate. The study

results may contribute to intervention programs that target executive cognitive functions in alcohol addicts and those at high risk for alcohol dependence.

Keywords

executive functions, cognitive control, cognitive flexibility, attention, working memory, alcohol dependence, vulnerability, Cognitive Symphony, Corsi Block Tapping Test, Wisconsin Card Sorting Test

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Introduction

Cognitive functions, especially executive functions – cognitive control, cognitive flexibility, decision making, and working memory – are mainly affected by alcohol consumption (Bourgault, Rubin-Kahana, Hassan, Sanches & Le Foll, 2022). With chronic alcohol consumption, impairments in executive functions and memory loss are observed even after several weeks of alcohol abstinence (Galkin, Peshkovskaya, & Bokhan, 2021; Lees et al., 2020; Ramey & Regier, 2019). Cognitive recovery usually occurs within six months of abstaining from alcohol. However, impaired cognitive control and decision-making may persist for 1 year after ceasing alcohol consumption (Sømhovd, Hagen, Bergly & Arnevik, 2019; Stavro, Pelletier & Potvin, 2013). For alcohol addicts, executive function deficits affect their ability to adapt to the social environment, resulting in behavioral planning and regulation disorders, the inability to reject immediate rewards, and the inability to feel, understand, and regulate emotions (Pepe et al., 2022; Carbia et al., 2021).

Given current Rosstat statistical data, which indicate an increase in alcohol-related mortality in Russia by 6.3 % between 2020 and 2021 and an extraordinary (30 %) increase in death rates due to overdoses of psychoactive substances, and taking into account data on the impact of the COVID-19 pandemic on alcohol consumption worldwide (Peshkovskaya, 2021; American Psychological Association, 2021), the alcohol-related situation and its consequences can be exacerbated during the waves of the pandemic (Cai et al., 2023; Pollard, Tucker & Green, 2020). Since impairment in executive cognitive

functions is an important determinant in the structure of addictive behavior, with a direct impact on the ability to abstain from alcohol consumption and maintain a long-term remission (Elton, Garbutt & Boettiger, 2021; Galkin & Bokhan, 2021), executive function research can provide new data on the specific characteristics of alcohol-associated cognitive changes. Thus, this **study aims** to investigate specific characteristics of executive cognitive functions in subjects with different experiences of alcohol consumption.

Method

A total of 244 subjects with different alcohol consumption experiences participated in the study, including 78 participants with safe alcohol consumption (0-6 points in the AUDIT alcohol dependence screening test; the subjects were not diagnosed with alcohol dependence and were not consulted by a narcologist) and 166 participants diagnosed with alcohol dependence (F10.2 according to ICD-10; the diagnosis was made in the 4th department of the Clinic of the Mental Health Research Institute, Tomsk). All participants in the study were men of similar age and education, which is important in the study of executive cognitive functions (Table 1).

Table 1
Study sample

Parameter	Participants with safe alcohol consumption	Alcohol-dependent participants	p-value
Age	43.72 ± 7.55	44.82 ± 6.89	0.428
Education	secondary vocational education	secondary vocational education	–

We examined executive functions using validated and verified assessment tools which were implemented in computerized versions based on the Cognitive Symphony (Russia) (The Cognitive Symphony is a digital platform developed by Tomsk State University, certificate of state registration No. 2022684316, December 13, 2022) – the global 'gold standard' for assessing cognitive functions:

– A modified version (Ivanitsky, Strelets, Korsakov, 1984); (Slavutskaya, Lebedeva, Karelin, & Omel'chenko, 2020) of the Go/No-Go task (Donders, 1969) was used to assess the function of cognitive control, including the control of response inhibition.
– A modified version (Zvereva, Khromov, Sergienko, & Koval'-Zaitsev, 2017) of the Simon Test, which is a simple non-verbal version of the Stroop interference method (Simon & Wolf, 1963; Hommel, 1993) was used to assess attention.

– A modified version (Polunina & Davydov, 2004) of the Wisconsin Card Sorting Test was used to assess the function of cognitive control and cognitive flexibility (Grant & Berg, 1948; Nyhus & Barcelo, 2009). The Wisconsin Test assesses the ability to maintain and change cognitive attitudes, as well as the ability to use feedback (Peshkovskaya & Myagkov, 2020). The uniqueness of this test is that it enables the assessment of cognitive functions that are least involved in performing general intelligence tests and most prefrontal tests.
– Corsi Block-Tapping Test (Corsi, 1972; Kessels, van Zandvoort, Postman, Kapelle, de Hand, 2000; Galkin et al., 2020; Galkin et al., 2019) was used to assess working memory. In the group of alcohol-dependent subjects, cognitive function data were also supplemented by information on the duration of the disease, the duration of remission, and the number of treatment courses.

Statistical analysis was carried out using STATISTICA 12.0. The differences between groups were evaluated using the Mann-Whitney U test. The contribution of individual factors to the variation of cognitive parameters in alcoholism was assessed using the multiple linear regression method.

The study was approved by the ethics committee of the Mental Health Research Institute, Tomsk National Research Medical Center (TNRMC) of Russian Academy Sciences (RAS) and implemented in accordance with the Russian Federation legislation and international regulations on scientific research involving human subjects, including the Helsinki Declaration. All participants signed a written consent to participate in the study.

Results

An analysis of differences in the parameters of executive functioning of individuals with different alcohol consumption experiences showed that all alcohol-dependent subjects had worse scores in executive cognitive functioning compared to the study participants with safe alcohol consumption. Thus, alcohol-dependent subjects had (a) significantly worse scores in cognitive control associated with a large number of inhibition errors ($p = 0.0001$) associated with impaired inhibition processes and an erroneous response to a red signal (No-Go) in the Go/No-Go Test; (b) attention disorders resulting in switching errors – an indicator of the rigidity of the attentive function when switching between stimuli in the Simon Test ($p = 0.026$); (c) reduction in cognitive flexibility associated with attitude errors – performing sorting in an irrelevant category ($p = 0.006$) and perseverations (direct repetition of previous sorting patterns under changed conditions) in the Wisconsin Card Sorting Test ($p = 0.040$); (d) and lower working memory capacity ($p = 0.044$), which is a measure of the patient's last correct block sequence recall in the Corsi Test, compared to healthy participants (Table 2).

Table 2

Differences in executive functions in subjects with different alcohol consumption experiences, Mann-Whitney U test with continuity correction

Cognitive domain	Indicator	Safe alcohol consumption	Alcohol dependence	p-value
Cognitive control	Inhibitory errors	2.42 ± 1.9	7.14 ± 3.56	0.0001
	Reaction errors	1.04 ± 1.28	2.15 ± 2.3	0.055
Attention	Switching errors	1.44 ± 1.15	7.35 ± 6.99	0.026
Cognitive flexibility	Attitude errors	13.56 ± 4.21	18.94 ± 7.71	0.006
	Perseverations	7.24 ± 3.66	12.0 ± 4.72	0.040
Working memory	Capacity	5.04 ± 1.27	4.2 ± 1.67	0.044

Since alcohol-dependent participants showed significantly lower scores in executive functioning compared to the participants in the study who practiced safe alcohol consumption, multiple regression analysis was performed to determine the contribution of individual parameters to executive functioning in alcohol-dependent participants. The duration of alcohol dependence, the duration of remissions, the number of treatment courses, and the rate of progression to alcohol dependence were assessed (Table 3).

Table 3

Contribution of indicators to the variation in executive function parameters in alcohol-dependent subjects, multiple regression analysis

Parameter	Working memory,	Cognitive control		Attention, switching errors	Cognitive flexibility	
	Capacity	Inhibitory errors	Reaction errors		Perseverations	Attitude errors
	*	**	***	****	*****	******
Duration of alcohol dependence	-0.04	-0.05	**-0.10**	-0.07	-0.01	-0.01
Number of treatment courses	0.04	-0.08	0.02	-0.08	-0.07	-0.07
Duration of last remission	-0.09	-0.05	0.08	-0.10	0.03	0.02
Maximum duration of remission	0.07	0.07	-0.04	0.10	0.01	0.04
Rate of progression to alcohol dependence (progrediency)	-**0.10**	0.02	**0.12**	-0.04	**-0.08**	**-0.10**

Note. *The table shows significant parameters, * Multiple R 0.252, F 2.230, p = 0.002559; ** Multiple R 0.340, F 4.291, p < 0.0000001; *** Multiple R 0.322, F 3.799, p < 0.0000001; **** Multiple R 0.295, F 3.128, p = 0.000015; ***** Multiple R 0.324, F 3.841, p < 0.0000001; ****** Multiple R 0.342, F 4.341, p < 0.0000001.*

Consequently, the decline in cognitive control and cognitive flexibility functions in alcohol-dependent subjects was associated with the duration of alcohol dependence (all $p < 0.01$), and the high rate of progression to alcohol dependence contributes to the vulnerability of working memory ($p = 0.002559$).

Discussion

The study established specific characteristics of executive functioning in subjects with different alcohol consumption experiences, which manifest themselves in the increase in inhibition errors in the implementation of cognitive control functions in the group of alcohol-dependent subjects. The result indicates a lack of inhibition processes in alcohol dependence and the vulnerability of cognitive control in general (Galkin, Bokhan, 2023; Trusova, Berezina, Gvozdetskiy & Klimanova, 2018). At the same time, the study participants with safe alcohol consumption did not show an increase in perseverations (errors associated with the direct repetition of previous patterns under changed conditions) when performing the Wisconsin Card Sorting Test compared to the alcohol-dependent subjects, which indicates impaired cognitive flexibility in alcohol dependence and is obviously associated with the rigidity of cognitive processes observed in addictions (Peshkovskaya, Bokhan, Mandel & Badyrgy, 2022; Spindler et al., 2021).

The vulnerability of attention interference and working memory is also associated with unsafe alcohol consumption impact on executive cognition. At the same time, factors such as alcohol dependence progression rate and dependence duration contributed to executive functions impairments, particularly in working memory, cognitive flexibility, and cognitive control.

Conclusion

The issue of unsafe alcohol consumption is of global social importance as it affects employed and economically active population (Formánek, Krupchanka, Mladá, Winkler & Jones, 2022; Kuznetsova, 2020; Voevodin, Peshkovskaya, Galkin, & Belokrylov, 2020).

The study results showed that vulnerability of executive functions in alcohol-dependent individuals is associated with the duration of alcohol abuse in years and alcohol dependence progression rate. The results obtained provide a basis for preventive and targeted measures aimed at reducing executive cognition vulnerability both in healthy people and in people with problematic alcohol consumption.

Final conclusions

– Performance outcomes in executive functions tasks varied among individuals with different alcohol consumption experiences.

– Executive functions were significantly more vulnerable and impaired in people with alcohol dependence compared to those in people with safe alcohol consumption.
– Cognitive control errors and cognitive flexibility errors were associated with years of alcohol dependence duration in people with diagnosed alcohol dependence.
– The rate of alcohol dependence progression contributed to vulnerability of working memory in people with diagnosed alcohol dependence.

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Students' alienation from learning: can metacognitive regulation and awareness of the meaning of learning help to overcome it?

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Abstract

Introduction. The alienation of students from learning and its consequences are an urgent problem for universities. The study of external and internal factors affecting the state of alienation, including metacognitive and meaning, will be helpful for the creation of prevention and correction programs and reduce the percentage of low academic performance, skipping classes, and deductions. This study is aimed to establish the interrelationships of alienation, metacognitive regulation of activity and the subjectively assessed meaning of learning. Methods. The study involved 209 students aged 17 to 24 years. We used: A test questionnaire "Subjective alienation of educational work", a questionnaire "Metacognitive involvement in activity", and an author's questionnaire to study alienation from education among students of higher educational institutions and its semantic aspects. Results. The analysis showed the presence of negative correlations of the general level of metacognitive regulation of activity with the general indicator of alienation (-0.467, significance at 0.01) and with all scales of the methodology "Subjective alienation of educational work". The level of subjective feeling of fullness of learning with meaning was negatively associated with the general indicator of alienation (-0.564, significance at the level of 0.01) and with all scales of the methodology "Subjective alienation of educational work", and positively associated with the general level of metacognitive regulation of activity (0.471, significance at the level of 0.01). Discussion. The results obtained complement the studies that indicate a significant role of meaning loss, feelings of meaninglessness, the fullness of meaning, and the life meaning of learning in assessing the level of alienation from learning.

The relationships between the level of alienation and the level of metacognitive regulation of activity can serve as a starting point for studying how the management of cognition processes and the student's involvement in the learning process are connected. The practical application of the results indicates the importance of increasing the adaptability of students and the importance of specialized training of students to manage their educational activities to reduce the state of alienation and involve them in the educational process.

Keywords

alienation, alienation from learning, metacognitive regulation, meaning loss, life meaning of learning, metacognitive awareness, meaning fullness, psychology of meaning, education, higher educational institutions

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Introduction

Routinely, the topic of a student's alienation from the learning process appears constantly, but mostly in a practical way: the student does not complete tasks, does not come to classes or does not actively participate in them. Discussion, pronouncing, prevention of the depressive position of the student with teachers or administrative staff is very limited. There are several reasons of this: the feeling of alienation has a cumulative effect and is not so noticeable even to the student himself. According to V. N. Kosyrev, «a student, really staying at the university, makes a psychological escape from it» (Kosyrev, 2011, p. 222).

When studying the problem of alienation from learning, such important questions arise: what factors contribute to the emergence and accumulation of the state of alienation? And conversely, what can help a student to reduce it and return to the educational process? In this study, the emphasis is on studying the interrelationships of the severity of alienation from learning, the level of metacognitive regulation. We have also considered the meaning aspects of the student's involvement in the educational process.

Ideas about alienation from learning

The A. N. Leontiev's theory of consciousness of learning reflects the relationship between the category of meaning and the state of alienation. This theory is the ancestor of modern

Russian semantic didactics, which was further developed within the framework of new didactics (Abakumova, Ermakov, Fomenko, 2014). The central concept of the theory of the consciousness of the learning is the concept of "the meaning of activity". It depends on its presence or absence whether the acquired knowledge and the learning process itself will be integrated into the habitual life of a person or he will be alienated from them (Leontiev, 2007). The personal meaning of educational activity, when realized, has a strong influence on the formation of internal motivation for learning (Ryan, Deci, 2000).

Alienation is associated with the subjective experience of the absence of the meaning of activity – the meaning loss (Osin, 2007). The meaning loss can manifest itself in two forms. The first of them is not the absence of meaning, but rather its lack, the lack of personal resources necessary to achieve the results of activities and problem solving. The second form of meaning loss manifests itself in ambiguity of the activity meaning. In this case, the subject does not understand why he carries out this activity. Education in modern realities under the tyranny of public censure, raising standards and increasing demands on the lives of young people (Phan, Nguyen, Nguyen & Nguyen, 2021) is a continuous process. In this situation, alienation is formed among students, which is associated with such phenomena as powerlessness, anomie, meaning loss, distrust of people, loss of contact with oneself, lack of interest and enthusiasm about work, study and other spheres of life, social isolation, a sense of non-involvement in culture, critical attitude towards society, nihilism (Osin, 2015). At the same time, E. N. Osin himself considers the category of alienation as "a description of the ontological foundations of a life situation, which is subjectively experienced as a meaning loss" (Osin, 2015, p. 81).

The term "alienation" can be revealed through the category of attitude: "By alienation of educational work, we understand a student's attitude to learning in which the products of their activity, they, as well as teachers, administration, other students and social groups as carriers of norms, attitudes and values of the educational activity are represented in his mind by varying degrees of opposition to them, which is expressed in the corresponding experiences of the subject (a sense of isolation, loneliness, rejection) and manifests itself in behaviour contrary to the concepts of closeness, identity, involvement, etc." (Kosyrev, 2011, p. 223).

One of the alienation models, considered by B. Barnhardt and P. Ginns, contains three groups of alienation manifestations: powerlessness, meaninglessness, and self-alienation (Barnhardt, Ginns, 2014). Meaninglessness (Türk, 2014), the perception of the learning process as meaningless, eventually removes the student from the decision-making process in various spheres of life. Powerlessness as one of the manifestations of alienation manifests itself in a sense of inability to influence one's choice, loss of control and, subsequently, avoidance of difficult situations (Rovai & Wighting, 2005), including situations of social interaction.

Alienation can be interpreted as a process in which an individual refuses social interaction and gradually withdraws into them, isolating themself from other people

(Guseva, 2013). Alienation can be considered as a result of alienation, a state of isolation, asociality, conformity, contrasting oneself with others with bitterness and despair. The category of opposition allows us to define alienation as "a state or experience of isolation from a group or activity to which a person should belong or in which he should be involved" (Mann, 2001). S. Mann sees the root of the alienation of educational work in formalism, inequality of teachers and students, in the perception of higher education by society – it, in her opinion, has become a "default requirement" and does not represent any value as a process. The result of the challenges of the new educational environment, inequality in the relationship between teacher and student, and formal approaches applied to the assessment of academic performance (Osin, 2017) is alienation, which is designed to serve as a protective mechanism that allows the student to preserve his identity and, at the same time, not solve the problem of finding the meaning of what is happening (Mann, 2001).

Academic alienation refers to emotional or cognitive separation from various aspects of the educational context, such as the learning process, the university atmosphere, teachers, other students and, in a word, from the desired academic state of the student (Hemmati, Pirniya, 2017).

T. Y. Zelenina (2014) identifies the following reasons for the development of students' alienation from education:

- Need to study an irrelevant information;
- Non-compliance of educational standards and real life;
- Insufficient amount of knowledge;
- The predominance of theory over practice;
- The need to assimilate a large amount of unnecessary information.

Studies of metacognitive regulation under the context of higher education

Metacognitive regulation allows for voluntary or involuntary regulation of intellectual activity based on several abilities of the subject (planning, information and time management, and choice of main ideas) (Samoilichenko, Rozhkova, Tokmakova, 2016; Stephanou & Mpiontini, 2017). The use of metastrategies during the digest of the material – "techniques by which the transformation of knowledge and strategic control of cognitive activity is carried out" (Verbitsky, Kofejnikova, 2017, p. 2), forms the student's awareness of themself as a subject of learning. Assessment of metacognitive skills can be used to predict the success of educational activities (Guseva, Sylka, Denisova, 2022).

E. I. Perikova, V. M. Byzova note that "the analysis of metacognition in foreign studies is devoted to two types of mental activity: metacognitive knowledge (knowledge about one's own cognitive processes) and metacognitive regulation (the ability to control one's cognitive processes), which are often studied within the framework of the generalizing phenomenon of metacognitive involvement (awareness)" (Perikova, Byzova, 2022).

Metacognition is also the ability to use this knowledge to self-regulate one's own learning (Kisac & Budak, 2014; Abdelrahman, 2020).

The importance of metacognition and metacognitive regulation is emphasized by their relation to indicators of abilities, achievements and competencies. Students with high metacognitive skills may achieve greater academic success than students with undisciplined skills (Händel, Artelt & Weinert, 2013). Metacognitive regulation provides conscious regulation through planning, monitoring and implementation of metacognitive knowledge in the learning process (Hartman, 2001).

The study aims to check the relationship between the severity of alienation of university students from learning, the level of metacognitive regulation and recognition of the meaning of learning.

Research hypotheses:

– the level of alienation is probably negatively correlated with the level of metacognitive regulation
– the level of alienation is probably negatively correlated with the subjective level of awareness of the meaning of learning.

Methods

The object of the study was students of higher educational institutions in the number of 209 people the age range was 17–24 years. The respondents are 143 undergraduate students (68.4%) and 66 specialists (31.6%). The tuition profile of respondents is mainly psychological and psychological-pedagogical.

The study was conducted from December 12, 2022, to April 3, 2023, and responses were collected using Google Forms. Respondents took part in the survey voluntarily.

The questionnaire consisting of 16 questions was developed to study various aspects of the alienation from education among students of higher educational institutions. It consists of 3 types of questions: open-ended, multiple-choice questions and scale questions. The questions concerned the extent to which students see the meaning for themselves in attending specialized and non-core subjects, which factors, in their opinion, affect the development of a state of alienation from educational activities (Appendix 1).

The Subjective Alienation of Educational Activity inventory by V. N. Kosyrev was applied to examine the level of alienation from the educational process. The Metacognitive Awareness Inventory authored by Schraw and Dennison, adapted by V. N. Karpov and I. M. Skityaeva (Karpov, Skityaeva, 2005), was used to study the level of development of metacognitive processes. Spearman's correlation coefficient was used to process the data obtained.

Results

Table 1 presents the results of the analysis of respondents' responses to the questionnaire Subjective Alienation of Educational Work.

Table 1

Average values and standard deviations according to the Subjective Alienation of Educational Work questionnaire results in the sample group

Scale	Average score	Standard deviation	Level
Alienation (general level)	143,6	38,5	Pseudo-alienation
Alienation areas			
Educational activity	34,3	10,2	Low
University life	41,2	12	Average
Personal relations	31,2	11,6	Low
Self-relation	36,8	10,3	Average
Types of alienation			
Weakness	34,3	9,9	Low
Powerlessness	31,7	11,2	Low
Nihilism	40,2	11,2	Average
Adventurism	37,2	10,7	Average

There is a primarily low level of alienation by the general indicator and other scales. The scales "university life", "self-attitude", "nihilism", and "adventurism" showed average levels.

The average results of the Metacognitive Awareness Inventory were 225 $\pm$ 39,26 for the sample.

Hypothesis 1 has been confirmed. The correlation analysis results showed the presence of statistically significant negative correlations of the general level of metacognitive regulation of activity with all scales of the Subjective Alienation of Educational Work questionnaire. Detailed data are given in Table 2.

Таблица 2
Correlation coefficients between academic alienation aspects and metacognitive regulation level

Subjective Alienation of Educational Work questionnaire scales	General level of metacognitive reglation
Alienation (general level)	-0,467**
Educational activity	-0,397**
University life	-0,369**
Personal relations	-0,426**
Self-relation	-0,433**
Weakness	-0,425**
Powerlessness	-0,520**
Nihilism	-0,411**
Adventurism	-0,288**

Note: ***- correlation is significant at the level 0,01 (2-sided).*

The results obtained using this methodology indicate that the more actively students manage and control their cognitive processes, the lower their subjective alienation from academic work.

The question "What do you think most influences the development of alienation from the educational process?" was aimed at studying the students' attitudes towards alienation. The statistics of the responses are presented in Table 3.

Table 3
Distribution of respondents' responses about factors influencing the development of alienation

Answer option	The number and percentage of students who chose this option
Misunderstanding of the essence of a tuition type	52 (24,9 %)
The predominance of theory over practice	117 (56 %)
Insufficient knowledge	51 (24,4 %)
The need to assimilate a large amount of unnecessary information	123 (58,9 %)
Need to study an irrelevant information	90 (43,1 %)

Answer option	The number and percentage of students who chose this option
The need for additional learning to master the profession	51 (24,4 %)
Non-compliance of educational standards and real life	112 (53,6 %)

In addition, respondents could give their answers. Among the factors proposed by students and influencing the development of a sense of alienation, it is worth noting the following: "Only the formal attitude of teachers to the learning process, [they] do not see us as personalities, they present material just to check the box, and not because they want to give us something interesting and valuable", "modular system, incompetence of teachers, non-compliance with expectations", "teacher/teachers".

The questions, beginning with the words "How do you think it makes sense for you..." were aimed at determining the level of personal significance of various aspects of the educational process. In this case, we aimed to obtain data on the life meaning of the components of the educational process. The percentage distribution of respondents' responses is shown in Table 4.

Table 4

Distribution of answers concerning the meaning of aspects of the educational process

The percentage of answer options (on a scale from 1 – meaningless to 5 – makes a lot of sense)				
1	2	3	4	5
How do you think it makes sense for you to study specialized disciplines in your major?				
1,9%	3,3%	8,1%	20,6%	66%
How do you think it makes sense for you to study non-core disciplines?				
12%	22,5%	35,4%	23,4%	6,7%
How do you think it makes sense for you to perform practical tasks (reports, practical and laboratory work) in core disciplines?				
1,4%	4,3%	14,4%	31,6%	48,3%
How do you think it makes sense for you to perform practical tasks (reports, practical and laboratory work) in non-core disciplines?				
17,7%	24,4%	31,6%	18,2%	8,1%
How do you think it makes sense for you to attend lectures on core disciplines?				
2,4%	3,8%	11%	23,4%	59,3%

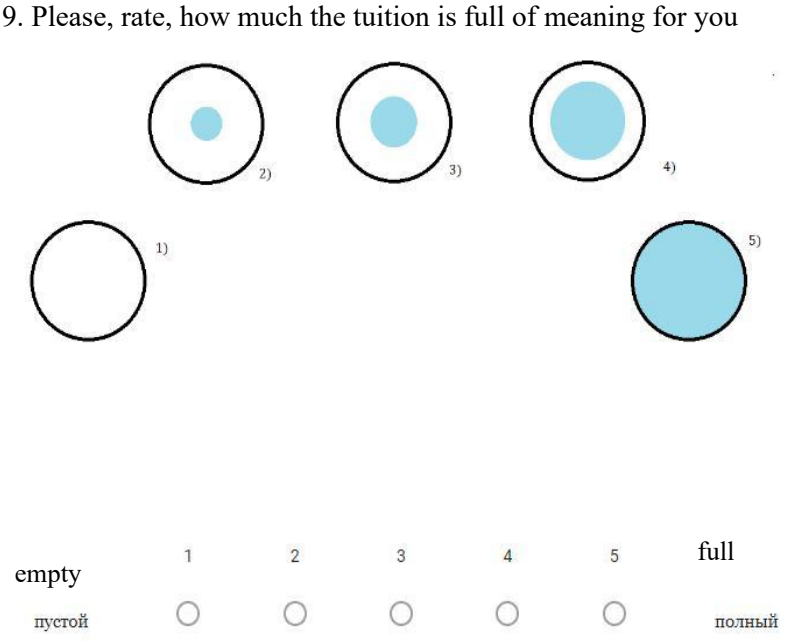
How do you think it makes sense for you to attend lectures in non-core disciplines?				
13,4%	22,5%	19,6%	29,2%	15,3%
If you have a task to write a term paper or a thesis, evaluate how much does it makes sense to you				
4,8%	8,1%	17,2%	32,1%	37,8%

The results show that in all questions about specialized subjects, the answer "5 – makes a lot of sense" takes the first place among other answer options, while in all questions about non-core subjects, it is opposite - only a small part of students see a lot of meaning in these subjects.

Next, the meaning construct "full – empty" was defined in relation to studying at the university. It was done using an image of 5 circles with varying degrees of color saturation (Fig. 1).

Figure 1

A question aimed at identifying the level of the meaning construct "full – empty" in relation to learning



The results were distributed as follows: the figure under No. 1 was chosen by 0.5% of respondents, under No. 2 – 4.8%, under № 3 – 23.4%, under № 4 – 43.1%, under № 5 – 28.2%. This means that most students have a meaning construct "full of meaning" in relation to studying at the university.

To determine the relationship between the expression of the meaning construct "completeness of meaning" with learning, indicators of alienation and the level of metacognitive regulation of activity, a correlation analysis was carried out according to Spearman's coefficient. The results are presented in Table 5.

Table 5

Correlation coefficients between indicators of alienation from the educational process and the level of metacognitive activity regulation

Scales of the "Subjective alienation from academic work" methodology	Level of subjective learning fulfilment with meaning
General alienation rate	-0,564**
Learning	-0,596**
University life	-0,573**
Interpersonal relationships	-0,333**
Self-attitude	-0,450**
Unawareness (vegetativety)	-0,545**
Helplessness	-0,504**
Nihilism	-0,524**
Venture	-0,394**
General level of metacognitive activity regulation	0,471**

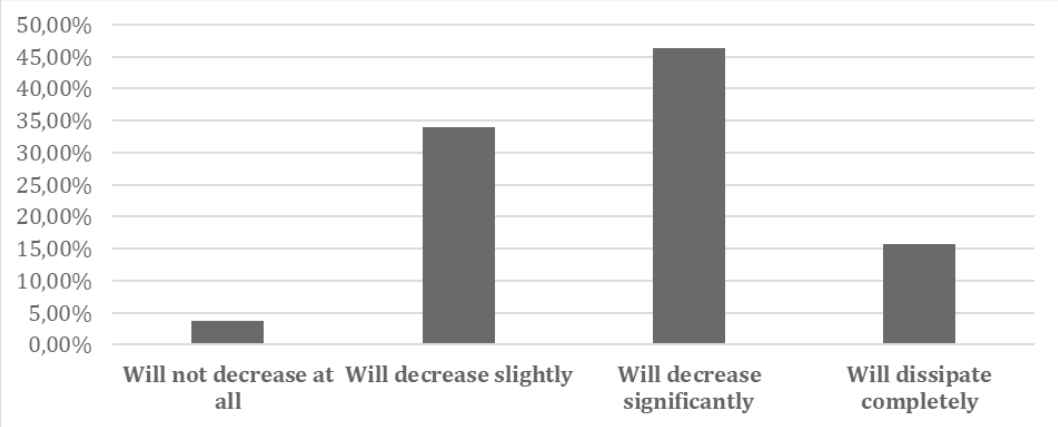
***Note:** **- correlation significance at the 0,01 level (2-tailed).*

The analysis showed the presence of statistically significant negative relationships between subjective learning fulfilment with meaning and all scales of the "Subjective alienation from academic work" methodology. A statistically significant positive relationship was also found with the general level of metacognitive activity regulation. Therefore, Hypothesis 2 was confirmed.

Changes in the meaning of attending classes, depending on the circumstances of hostility toward the teacher and receiving points for work in the classroom, were recorded by the following questionnaire questions. Question No. 11 was formulated as

follows: «Imagine that there is a subject in your schedule for the upcoming semester, the study of which is meaningful and interesting to you. You come to your first lesson in this subject with enthusiasm, but you see repulsive behaviour or ineffective teaching style of the teacher toward students. Evaluate how much the importance of this subject will decrease for you» (Appendix 1). The respondents' answers are presented in Figure 2.

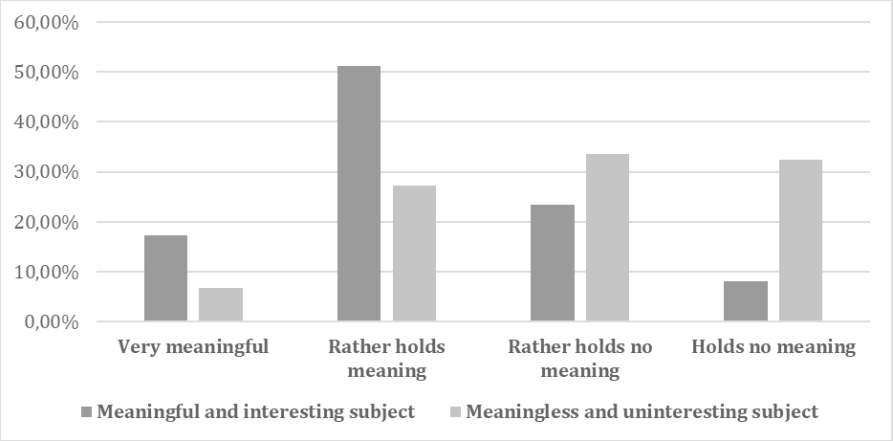
Figure 2
Respondents' answers on the importance decrease of an initially interesting subject for a student



The results obtained clearly show how two strong factors collide: the study of a significant and interesting subject and a negative attitude toward the teacher or their style of teaching. A more important factor is precisely the negative attitude toward the teacher, and not the significance of the subject. Therefore, it can be said that the perception of the teacher's image as repulsive or conducting ineffective classes can serve as one of the reasons for alienation from the educational process.

Questions No 12 and 13 were as follows: «Imagine that a teacher in a meaningful and interesting subject does not give points for participating in practical/seminar classes. Instead, you will receive points for completing other tasks in this subject. Evaluate how much it makes sense for you to prepare and participate in practical/seminar sessions in such a situation», and «Evaluate the same situation, only in the case of insignificant and uninteresting subjects for you personally». A comparison of the answers to these questions is shown in Fig. 3.

Figure 3
Respondents' answers on the meaning of attending classes for which they will not receive points



The results show that the factor of perceiving the lesson as meaningful and interesting is more significant than the reward factor implemented to give meaning to the preparation for it.

Discussion

The results of our study confirm that there is a relationship between the degree to which students define their learning as meaningful and the level of alienation from education. The data complement the notion that understanding the meaning of learning, the presence of meaning connections are key to ensuring the success of the learning process and reducing the level of alienation. Ezhov et al. in a recent study state that the students' professional alienation is associated with the orientations of a person's purpose-in-life identification (awareness of the purpose and meaning of one's vocation) in the educational process at the university (Ezhov et al, 2017). The experience of meaninglessness is a component of alienation from education: "the situation when the student is indifferent to the place in which they finds themselves, consists of such components as helplessness, isolation, meaninglessness" (Caglar, 2013, p. 185).

The decrease in the significance of the class due to repulsive teacher behaviour and ineffective teaching style is consistent with the opinion of Phan, Nguyen, Nguyen & Nguyen (2021). They emphasize the impact of a positive teacher attitude on the success of the educational process, which reflects the need to create a favourable educational environment.

Misunderstanding of the essence of a bachelor's/specialist's degree as a reason for alienation from learning, according to the study results, is significant for 24,9 % of students. Similar data were obtained by T. Yu. Zelenina, who found in her study that students (especially undergraduate students) have little idea of the nature of their chosen form of education (Zelenina, 2014). The perception of bachelor's degree as incomplete

higher education, "undereducation", can negatively affect participation in the educational process.

In our questionnaire, we took as a basis the reasons for students' alienation from education identified by T. Yu. Zelenina. We found that such reasons as the prevalence of theory over practice, the need to assimilate a large amount of unnecessary information, and remoteness of educational standards from real-life experience are indeed significant for more than half of respondents.

The results of alienation from education in students can be quite multifaceted. First, the fact that the student may feel alienated is indicated by their behaviour. It may include violations of institution rules, truancy, ungraded homework assignments, low grades, and isolation from classes (Kumari & Kumar, 2017). The detachment of the student from the educational process, the violation of the sense of belonging and community both with the team and with teachers can provoke social isolation and feelings of loneliness, "withdrawing into oneself" (Rovai & Wighting, 2005). The authors noted (Osin, 2017) the relationship between individual indicators of alienation in adolescents and the frequency of alcohol and marijuana use and suicide attempts. The growing number of the "hidden unemployed" phenomenon, which means university graduates who do not work in their specialty, reflects unrealized intellectual resources (Ezhov et al., 2017). It can also be a consequence of alienation from education.

Osin (2015) identified the areas of work to reduce the alienation level:

– First of all, it is necessary to provide a safe and psychologically comfortable environment for teachers and students;
– Empathy and openness of teachers can also reduce the risk of education alienation education in students;
– It is important to let students feel their involvement not only in the learning process but also in the preceding organization of it, since this reduces the risk of experiencing helplessness, one of the forms of alienation (Osin, 2015).

Work with alienation from education should be carried out comprehensively, considering all manifestations of alienation in university life. The important areas for the prevention of alienation should be work on the impact on the adaptability of first-year students, the formation of their sense of belonging and ontological confidence, the establishment and support of teaching and perception methods aimed at understanding the meaning of their learning at the university (Voronaya & Pronenko, 2023).

A positive relationship between the level of metacognitive self-regulation and the subjective learning fulfilment with meaning confirms the data obtained in our pilot study. In this study, positive relationships were established between pronounce knowledge, procedural knowledge, conditional knowledge, planning, information management strategies, component control, error correction strategy, assessment and the level of learning fulfilment with meaning (Belikova, Pronenko, 2023), which is in line with the data of foreign researchers (Cotterall & Murray, 2009; Händel, Artelt & Weinert, 2013).

Conclusion

Alienation from the educational process has significant and relatively high negative relationships with the level of metacognitive regulation of activity and the level of subjective perception of the learning fulfilment with meaning. At the same time, there is a positive relationship between the level of metacognitive activity regulation and the level of subjective perception of the learning fulfilment with meaning.

Therefore, we can draw the following conclusions:

– Psychological and pedagogical students have a low level of alienation from education. More than half of students are willing to attend practical classes even without external reinforcement in the form of points, if the topics appear interesting to them;

– Students are sensitive to situations in which they encounter repulsive or ineffective teaching styles;

– The learning fulfilment with meaning is inversely related to the expression of alienation from education;

– An increase in the meaningfulness of learning can have a significant impact on the prevention or correction of the alienation state among university students;

– Metacognitive regulation, that is, the ability to manage one's own cognition, is inversely related to the expression of alienation from education. In order to reduce the level of alienation, it is reasonable to carry out special activities aimed at teaching metacognitive self-regulation.

Can metacognitive regulation and awareness of the educational meaning help overcome students' alienation from the academic process? According to our research, they may well have an impact on reducing the level of alienation.

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Appendix 1

Author's questionnaire for the study of alienation from education aspects

1. What do you think influences the development of a sense of alienation from the educational process the most? (You can choose multiple options)

– Misunderstanding of the essence of a bachelor's/specialist's degree;

– Predominance of theory over practice;

– Lack of knowledge;

– The need to assimilate a large amount of unnecessary information;

– Teaching outdated knowledge;

– The need to gain additional knowledge to master the profession;

– Remoteness of educational standards from real-life experience.

2. In your opinion, how much does it make sense for you to study major subjects in your specialty?

3. In your opinion, how much does it make sense for you to study non-major subjects?

4. In your opinion, how much does it make sense for you to perform practical tasks (reports, practical, and laboratory work) in major subjects?

5. In your opinion, how much does it make sense for you to perform practical tasks (reports, practical, and laboratory work) in non-major subjects?

6. In your opinion, how much does it make sense for you to attend lectures in major subjects?

7. In your opinion, how much does it make sense for you to attend lectures in non-major subjects?

8. If you have a task to write a coursework or a thesis, evaluate how much it makes sense for you to complete it.

9. Briefly describe what part of the education is significant to you personally.

10. Evaluate how much your education holds meaning for you personally.

11. Imagine that there is a subject in your schedule for the upcoming semester, the

study of which is meaningful and interesting to you. You come to your first lesson in this subject with enthusiasm, but you see repulsive behaviour or ineffective teaching style of the teacher toward students. Evaluate how much the importance of this subject will decrease for you.

12. Imagine that a teacher in a meaningful and interesting subject does not give points for participating in practical/seminar classes. Instead, you will receive points for completing other tasks in this subject. Evaluate how much it makes sense for you to prepare and participate in practical/seminar sessions in such a situation.

13. Evaluate the same situation, only in the case of insignificant and uninteresting subjects for you personally.

14. What in student life keeps you from withdrawing?

15. What component of your learning activities prevents you from withdrawing?

16. If you answered "nothing" to the previous two questions, then why are you still studying? Give your answer in the format "In order to..."

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Author Contributions

Evgeny Aleksandrovich Pronenko prepared the text, processed the data.

Margarita Evgenievna Belikova selected diagnostic methods, developed the questionnaire.

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Conflict of interest information

The authors have no conflicts of interest to declare.