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Russian Psychological Journal

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

It was founded by the Russian Psychological Society in 2004.

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

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The Contextual Nature of Life Goals: Situational and Individual Psychological Determinants of Goal Setting

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Abstract

Introduction. This study examines the goal- and situation-related determination of human behavior. The concept of the contextual nature of human goals was the basis of research. According to this principle, goals should be considered (1) in a broad life context of opportunities given to individuals by life circumstances, or in terms of limitations related to them; (2) in a time context of individuals' life plans, future, ideas and their success or failure in achieving their goals. **Methods**. A questionnaire form was created in which hypothetically assumed goal setting factors (importance of goals in different spheres of life and satisfaction with their implementation, assessment of the opportunities provided by the situation, etc.) were recorded. Furthermore, the Potential for Self-change questionnaire (V. R. Manukyan, I. R. Murtazina, & N. V. Grishina), the Test of Existential Motivations (A. Längle), and the Zimbardo Time Perspective Inventory (F. Zimbardo) were used. The sample comprised 350 subjects; 84.8 % of respondents aged 17 to 25. Correlation and factor analyses were performed. **Results**. The importance of individual goals was related to the assessment of the possibilities of achieving them in the current life situation, satisfaction with their implementation in major spheres of life, compatibility between achievements and expectations of the past, and willingness to self-change and to change life situation. The major goal setting factor, referred to the 'window of opportunities', integrates an individual's assessment of the extent to which his/her current life situation in various spheres enables him/her to realize himself/herself and his/her capabilities. The 'window of opportunities' is also characterized by significant associations with the need for self-change, the ability to consciously change the self, the

belief in the possibility of changing the self, and fundamental existential motivation aimed at meanings in life. **Discussion**. The results of this study confirm the appropriateness and necessity of context-based studies of human life goals and the heuristic value of this approach.

Keywords

contextual principle, goal setting factors, life goals, life spheres, assessment of opportunities, time perspective

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Introduction

The source of individual activity is one of the fundamental problems of personality psychology. Traditionally, the source of individual activity is described in relation to the proportion of individual psychological and situational determinants of human behavior. Initially, research in this field was aimed at studying strategies for human behavior in certain situations in life and the search for explanation models for individuals' behavior in certain situations in their lives (Heckhausen, 1986; Baumert et al., 2017; Champagne & Pervin, 1987; Fleeson, 2007; Funder, 2008; Parrigon, Woo, Tay, & Wang, 2017).

Along with approaches to studying the process of goal setting and the way goals 'work' in specific situations of human activity (in particular, studies by O. K. Tikhomirov, 1977), they are also considered in a broader life context. The methodological foundations for studying the goal-related determination of human behavior were established by works of S. L. Rubinstein on the determination of the life path of the individual (2003), A. N. Leont'ev on the goals and meanings of activity (1977), N. A. Bernstein on the "model of the necessary future" (1990), I. M. Feigenberg on "probabilistic forecasting" (2011), etc.

The theoretical development of human behavior regulation issues has its own history in Russian and global psychology (Merkur'ev, 2023; Inzlicht, Werner, Briskin, & Roberts,

2021, etc.). Recently, there has been growing interest in psychological science in the study of goals that play an important regulatory role related to the direction of personal activity (DeYoung & Weisberg, 2018; Heller, Perunovic, & Reichman, 2009; Hoyle, 2010; Quirin et al., 2020). Complex systems and cybernetic theories describe goals as conscious or unconscious representations of desired states (DeYoung & Weisberg, 2018; Elliot & Fryer, 2008; Quirin et al., 2020). Researchers found that there were significant differences between the goals aimed at achieving the desired result and the avoidance goals aimed at preventing an undesirable result (Heimpel, Elliot & Wood, 2006). Recent studies have created taxonomies of situations related to goals and motives (Brown, Neel & Sherman, 2015; Rauthmann, 2016; Rauthmann et al., 2014); taxonomies of specific goals were defined (McCabe & Fleeson, 2016); a theoretical method for classifying situations based on the theory of basic motives and goals was proposed (Morse, Neel, Todd & Funder, 2015). The characteristics of situations to be considered when evaluating situations from the perspective of goals are described. In particular, these are (a) the extent to which situations can lead to favorable or unfavorable outcomes; (b) the extent to which they contribute to or hinder the achievement of the desired results; and (c) the amount of effort required to overcome the constraints imposed by situation. Goal-based models also typically contain an expectation construction: a sense of confidence or doubt that an outcome will be achieved successfully (Elliot & Friedman, 2007).

The goals that an individual sets for himself/herself are determined by his/her motivation, value system, and personal characteristics. On the other hand, goals can shape personality and regulate behavior both in the short (Di Sarno, Costantini, Richetin, Preti, & Perugini, 2022) and long term (Heller et al., 2009; Roberts, O'Donnell, & Robins, 2004; Yang, Read, & Miller, 2009).

The most important characteristic of the goal is its contextual nature; it is an integral unit of the 'person-in-situation' description that determines his/her association with the context.

Situations are still poorly studied and are 'elusive' objects of psychological research. The need to take into account situations and contexts in the study of psychological phenomenology is confronted with some methodological difficulties associated with the absence of an appropriate language to describe situations (Rauthmann & Sherman, 2018; Rauthmann, Sherman, & Funder, 2015).

Today, research interest is shifting to the field of exploring a wide range of activities in life contexts – determining life strategies, life choices, building life scenarios, etc. Therefore, the focus is on phenomena such as life plans, life tasks and goals.

The goal- and situation-related determination of human behavior has become the **subject** of our theoretical analysis, the search for methodological solutions that meet modern methodological concepts, and the empirical research study. The starting point for our study is the concept of the contextual nature of human goals, which forms the basis of research objectives and hypotheses. The main **objectives** of the study were

related to (1) theoretical analysis of the goal- and situation-related determination of human behavior and conceptualization of ideas about the contextual nature of goals; (2) the creation of methodological tools to correlate an individual's life goals with his/her assessment of the possibilities and limitations of the life situation, his/her ideas about the future, past experience of successful or unsuccessful realization of life goals; and (3) empirical verification of the proposed conceptualization of the contextual nature of goals.

The empirical study was based on **hypotheses** derived from the notion of the contextual nature of goals. Therefore, we assume that goal setting in different spheres of a person's life is related to his/her assessment of the possibilities or limitations of the life situation, its compliance with his/her expectations and plans in the past, his/her satisfaction with its implementation in these spheres, and readiness for changes to achieve goals.

Methods

The overall aim of the research project, related to the development of theoretical ideas about the contextual nature of goal setting, was to solve theoretical, methodological, and empirical research tasks, including the development of diagnostic tools.

When developing diagnostic tools, we have taken into account the fact that the goals set by individuals in the main spheres of their lives are related to the opportunities to achieve them in specific situations. The experience of success in individual goal-achievement was studied from two perspectives: (1) satisfaction with self-fulfillment in the main spheres of life and (2) compliance between achievements and past expectations. The importance of goals depends on what individuals are ready to do to achieve them, to what extent they are ready to change their life situations or to change themselves.

The parameters for describing goals were specified in terms of the main important spheres of human life identified in previous studies on individual life scenarios and life models. The main spheres included professional and financial ones, the sphere of interpersonal relations and the personal sphere related to an individual's aspirations for self-development, personal growth, etc. (Kostromina, Grishina, Moskvicheva, & Zinovyeva 2021). In accordance with these main spheres of life, individuals' goals were specified in the following formulations: (1) "having a good job, becoming a professional, achieving a high status"; (2) "having financially security, prosperity, high financial status, and living conditions", (3) "having a good family, children, and close friends", (4) "becoming a more harmonious person, expanding individual outlook, engaging in self-education, self-improvement, and self-care".

In a specially designed questionnaire, the following items have been recorded: (1) personal relevance of goals formulated, (2) satisfaction with their implementation in the main spheres of life, (3) compatibility between the expectations of the past and the current

life situation and achievements in certain spheres, (4) assessment of the opportunities that the current life situation provides to achieve these goals, and (5) willingness to change life situation and self-change in order to achieve the goals facing the person. A total of 40 items were included in the questionnaire.

For the online survey on the Google Forms platform, we included the authors' questionnaire, the Potential for Self-change questionnaire (V. R. Manukyan, I. R. Murtazina, & N. V. Grishina), the Zimbardo Time Perspective Inventory (ZTPI), Test of Existential Motivations by A. Längle. With these diagnostic tools, we examined theoretically predictable relationships with the indicators of the questionnaire we developed.

The methodology and justification of the project were approved by the St. Petersburg Psychological Society Ethics Committee (report No. 17 of 09/22/2022).

The empirical study was conducted between October and December 2022. The total sample size was 350 subjects. Young people took part in the survey (84.8 % aged 17 to 25); 63.8 % of subjects studied, 23.6 % – studied and worked; 45.9 % females, and 53.8 % females). We chose the youth sample because the tasks of goal setting and making plans for the future are particularly relevant at the young age.

The data collection was carried out using the Google Forms platform; the average time for completing the survey form was 35 minutes. The statistical processing was performed using the licensed IBM SPSS Statistics 27.0 statistical software package.

Results

The theoretical model of goal setting, according to which goals should be studied in relation to the context of life (the opportunities and limitations of life situations) and the context of time (the past experience and ideas about the future), was confirmed by identifying relationships between the importance of individual goals in different spheres of life and the specified parameters of life and time contexts.

The importance of goals in the professional sphere ("having a good job, becoming a professional, achieving a high status") had significant positive relationships (no significant negative relationships were found in any of the correlation matrices described) with the assessment of opportunities provided by the current life situation to achieve these goals (0.371); with satisfaction with self-actualization in these spheres (0.308); compatibility between the expectations of the past and the current life situation and achievements in this sphere (0.297); and with willingness to self-change in order to achieve goals (0.213) (Fig. 1).

The importance of goals in the sphere of relations ("having a good family, children, and close friends") had significant positive relationships with willingness to change the life situation (0.265) and self-change in order to achieve goals (0.236); with evaluation of opportunities offered by current life situation to achieve these goals (0.157); and with satisfaction with current self-actualization in this sphere (0.138).

Figure 1
*Correlation pleiades in the professional sphere (significant positive relationships ** p < 0.001)*

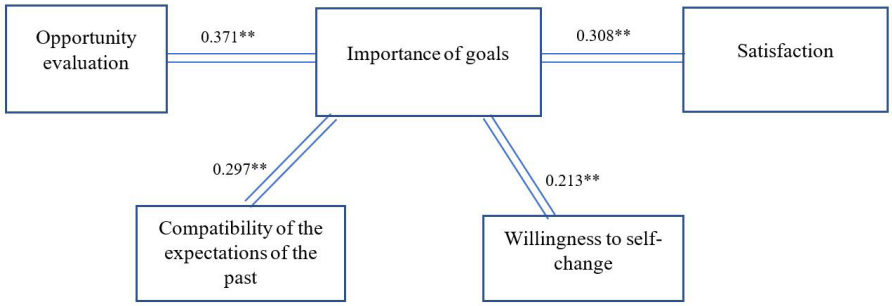
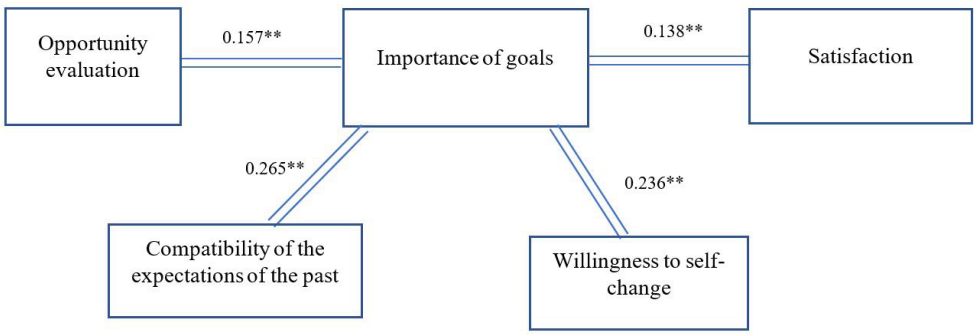


Figure 2
*Correlation pleiades in the sphere of relations (significant positive relationships ** p < 0.001)*

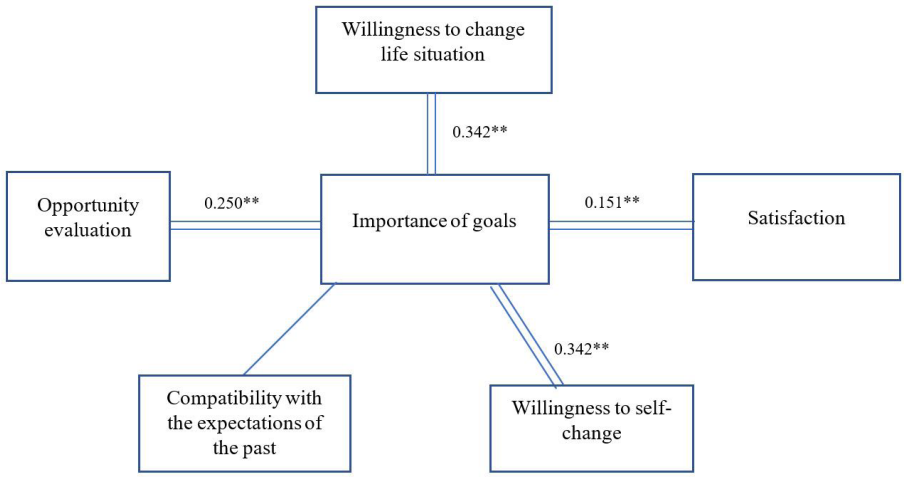


The importance of goals in the sphere of self-development, personal sphere ("becoming a more harmonious person, expanding individual outlook, engaging in self-education, self-improvement, and self-care") had significant positive relationships with willingness to change the life situation (0.342) and self-change in order to achieve

goals (0.342); the assessment of opportunities offered by current life situation to achieve these goals (0.250); satisfaction with current self-actualization in this sphere (0.151); and compatibility between the expectations of the past and the current life situation and achievements in this sphere (0.137).

Figure 3

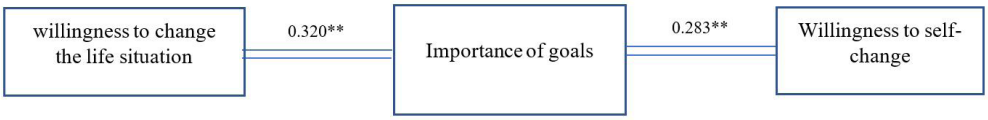
*Correlation pleiades in the sphere of self-development (significant positive relationships *p < 0.01, **p < 0.001)*



The importance of goals in the financial sphere ("having financially security, prosperity, high financial status, and living conditions") had only two significant positive correlations – with willingness to change the life situation (0.320) and self-change in order to achieve goals (0.283).

Figure 4

*Correlation pleiades in the financial sphere (significant positive relationships ** p < 0.001)*



Thus, the correlations between various parameters for assessing goal-related regulation confirmed their significance for its general understanding.

We carried out a factor analysis of the items of the diagnostic tools and variables of the questionnaire developed by us. Following the factor analysis (the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.835, Bartlett's sphericity criterion $p < 0.001$, which indicates the adequacy of factor analysis) using principal components analysis with varimax rotation (the rotation converged in 10 iterations) with Kaiser normalization, 11 factors were obtained that explain 60.9 % variance. The first four factors are quite consistent with each other and their understanding was the basis for data analysis (Table 1). Cronbach's alpha 0.81; 0.756; 0.738; 0.768 respectively. The remaining factors are sufficiently consistent with each other ($\alpha = 0.524$ to $\alpha = 0.666$).

Table 1
Matrix of the components of the first four factors (N = 350)

Items	Factor 1	Factor 2	Factor 3	Factor 4
To what extent do your current professional activities (or studies, if you still study) open opportunities to achieve this goal? (professional sphere)	0.747			
To what extent does your current work (or future work, if you still study) provide opportunities to achieve this goal? (financial sphere)	0.745			
To what extent are you satisfied with your professional activities (work or study), how interesting and promising is it for you?	0.629			
To what extent does your current life situation (free time, necessary funds, etc.) and motivation (self-improvement, organization, etc.) provide opportunities to achieve this goal?	0.529			

Items	Factor 1	Factor 2	Factor 3	Factor 4
To what extent does your current life situation enable you to realize yourself, your potential, and your opportunities?	0.456			
To what extent are you now satisfied with your ability to develop and improve yourself?	0.383			
To what extent does your current life situation correspond to your past expectations and plans? (sphere of relations)		0.833		
To what extent does the person you are today meet your expectations of yourself in the past? (sphere of relations)		0.788		
To what extent are you satisfied with your relations with others today? (sphere of relations)		0.632		
To what extent does your current life situation correspond to your past expectations and plans? (financial sphere)			0.855	
To what extent does the person you are today meet your expectations of yourself in the past? (financial sphere)			0.838	

Items	Factor 1	Factor 2	Factor 3	Factor 4
To what extent are you satisfied with your current financial situation (to what extent can it satisfy your needs)?			0.786	
To what extent does the person you are today meet your expectations of yourself in the past? (professional sphere)				0.736
To what extent does your current life situation correspond to your past expectations and plans? (professional sphere)				0.717
To what extent does the person you are today meet your expectations of yourself in the past? (sphere of self-improvement)				0.510
Expectations and plans of the past in terms of the professional sphere				0.473
Looking back, do you think your professional status is determined by your choices, interests, and personality? (professional sphere)				0.413
Looking back, do you think your financial situation is determined by your choices, interests, and personality?			0.425	
To what extent does your current life situation correspond to your past expectations and plans? (sphere of self-improvement)				0.468

The first factor represents the extent to which a person considers his/her current situation to open opportunities for him/her to achieve goals in a particular sphere of life and can be defined as the ***'window of opportunities***'. Its assessment concerned three of the four spheres of life – professional activity, self-improvement, financial sphere (despite the fact that the questions for each sphere of life were divided into different blocks of the questionnaire). The same factor included the current satisfaction of respondents with the first two spheres, their interest in them and assessment of their prospects for themselves. Therefore, satisfaction with the current situation is linked to a vision of this situation in the future. This factor integrates individuals' assessment of current situations in various spheres, enabling them to realize themselves, their potential, and future opportunities.

The second factor combines the answers to questions related to the sphere of relations, connecting two contexts – the image of the situation and self-image in it: the compatibility between the current situation and the expectations and plans of the past and the compatibility between the self in the present and self-expectations in the past; satisfaction with this situation in the present. In this factor, the influence of the time coordinate was clearly manifested. The assessment of satisfaction with the current situation and with self is closely related to the plans and expectations of the past.

The third factor, in structure, is similar to the previous one, as a specific sphere of life is again a unifying principle – material wealth. Its structure is the compatibility between the current situation and the expectations and plans of the past and the compatibility between what "You are now" and self-expectations in the past. This structure shows that these two components are integrated in individual representations. We can assume that this integration involves an emotional-evaluative component, as this factor also included satisfaction with the financial situation in the present. Compared to the second factor, the respondents perceive the current financial situation as linked to their previous choices and interests.

The fourth factor united the professional sphere and the sphere of self-improvement. The structure of associations in these two spheres repeats the structure of the previous two factors – the correspondence of the current situation in the sphere of profession / self-improvement to the expectations and plans of the past, as well as the correspondence of what "I am now" to self-expectations in the past. This structure shows again the interdependence of these images. In the professional sphere, we added the following judgment: "Looking back, do you think your professional status is determined by your choices, interests, and personality?"

The relationship between identified factors and personality questionnaires data was important for understanding the results obtained.

The use of the Test for Existential Motivations by A. Längle was determined by the theoretical foundations of our study, according to which the understanding of goals requires their consideration in a broad life context that goes beyond the actual life situation, and their association with the general attitude of a person to life. According to A. Längle, the first fundamental existential motivation is associated with the acceptance of the world, trust in it and willingness to find many supports in the world, including spiritual ones. The second fundamental existential motivation is related to the value of life, the third one – to the development of self-worth, self-acceptance, the fourth one – to meanings of activity and creation (Längle, Ukolova, & Shumskii, 2014). Table 2 shows their correlations with the selected factors.

Table 2
Existential motivations, correlations with the questionnaire factors

	Factor 1	Factor 2	Factor 3	Factor 4
EM1	0.370**	0.289**	0.229**	0.205**
EM2	0.315*	0.359**	0.170**	0.215**
EM3	0.264**	0.251**	–	0.174**
EM4	0.461**	0.203**	0.226**	0.333**

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

The first EM, associated with the world acceptance and support, is most pronounced in opportunity evaluation and (factor 1) in the sphere of relations (factor 2). The value of life (EM2) is most closely associated with the sphere of relations (factor 2) and with individual possibilities in it (factor 1). EM3 (individual self-worth) has the lowest correlation with assessments of the current situation, expectations of the past, and other items of

our survey, which may be explained by the youth composition of the sample. Finally, the fourth fundamental motivation, EM4, which, according to A. Längle is related to meanings and, in terms of content, to the value of the future, is expectedly most closely associated with the opportunities assessed by a person (factor 1).

The data obtained show that all factors show significant correlations with individual existential motivations. The third factor related to the financial sphere of life has the lowest associations with them; the first factor, which we designate as the 'window of opportunities', is most associated with them. At the same time, it is this factor that positively correlates with the scales of the Potential for Self-change questionnaire, including the "need for self-change" as a desire for novelty, diversity, and focus on personal growth ("I want to change") ($r = 0.262$, $p < 0.01$); "ability to conscious self-change" – the ability to conscious self-improvement, the ability to systematically bring plans to life ("it is necessary to change") ($r = 0.327$, $p < 0.01$); "believe in the possibility of self-change" – individuals' ideas about the possibility of consciously changing their character and behavior during life ($r = 0.259$, $p < 0.01$); with a general indicator of the potential for self-change $r = 0.320$ ($p < 0.01$). Other factors do not reveal the association between the potential for self-change, or these associations are weak.

The findings obtained emphasize the space-time coordinates for goal setting, including the assessment of the current situation, future planning and the role of expectations of the past. The inclusion of these coordinates in the goal-related study determined the use of the Zimbardo Time Perspective Inventory in our study. Table 3 shows the relationship between the questionnaire scales and the goal setting factors we have identified.

Table 3
Correlations between the Zimbardo Time Perspective Inventory and goal setting factors

Time perspective indicators	Factor 1	Factor 2	Factor 3	Factor 4
"Negative past"	–0.229**	–0.287**	–0.168**	–0.277**
"Hedonistic present"	–0.194**			–0.212**

Time perspective indicators	Factor 1	Factor 2	Factor 3	Factor 4
"Future"	0.194**			0.241**
"Fatalistic present"	–0.259**	–0.140**		–0.257**
"Positive past"	–	0.110*		0.215**

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

The correlation of time perspective components with factor 1 and factor 4 is the most important.

The first of them, 'window of opportunities', implies an active attitude toward time; the present and the future are not perceived fatalistically, while the orientation toward hedonism in the current situation is not accepted. Factor 4 brings us back to the professional sphere and also adds the sphere of self-improvement. This factor, like the first one, has significant positive correlations with the future, negative ones with hedonistic and fatalistic attitudes toward the present. Unlike the first factor, however, in the self-improvement factor, a person relies on a positive past.

With respect to the other results of the study that are not reflected in the data described, we should point out the tendency, as shown in the responses of participants in the study, to evaluate their life situation as a result of their own choices of life, their own contributions (which is consistent with the result of the rejection of fatalist and hedonistic attitudes previously mentioned). At the same time, the respondents' views are typical of all four spheres of life studied and allow us to evaluate them as a general attitude to life.

Another result that enables us to draw a similar conclusion is the willingness indicated by the respondents to self-change to expand the opportunities for progress in all major spheres of life activity: profession, finance, relations, and self-development. However, this willingness to change has not been linked to the willingness to change the situation of life.

Discussion

The empirical research aimed to study individual goals in a life context, in relation to the opportunities and limitations of the current life situation, in a time context, in relation to expectations and plans of the past, their success or failure in implementation.

The starting point of our approach to analyzing goal-related determination is consistent with the ideas of classical Russian science on the determination of human activity, especially the works of N. A. Bernstein and his ideas of a "model of the necessary future" (Bernstein, 1990) and I. M. Feigenberg and the concept of "probabilistic forecasting" (Feigenberg, 2011). The "model of the necessary future" is a model, a project that reflects an individual's future plans and intentions. The concept of "probabilistic forecasting" focuses on the correlation with previous experiences, actions in similar situations. These concepts describe the determination of human activity over a wide range of periods in relation to individual future goals and objectives, and the success of its implementation in the past.

The logical continuation of this statement is the hypothesis of the contextual nature of goal setting and the need to study human goals in spatial and temporal contexts.

The results of empirical research fully confirm the legitimacy of this approach.

Goal setting in the professional sphere and self-development sphere was closely related to the assessment of the possibilities offered by the individual situation in life, satisfaction with self-actualization in these spheres, the willingness to change to achieve individual goals, the compatibility between the current life situation and his/her expectations and plans in the past; in the self-development sphere, the willingness to change the situation in life is added to this (Fig. 1, 3). The structure of factors describing goal setting in the sphere of relations also includes an individual's assessment of opportunities provided by his/her life situation, satisfaction with self-actualization in this sphere, as well as readiness to change the life situation and self-change (Fig. 2). Significant differences relate to the financial sphere associated with financial problems and well-being. Here the importance of the goals set for a person is only associated with the recognition of the need for changes – individual changes and changes in the situation of life (Fig. 4).

The analysis of factors confirmed the importance of a person's abilities in setting and achieving goals. The most important factor that describes the collected empirical data has been described by us as the ***'window of opportunities'*** because it integrates individuals' assessments of their situation in different spheres of life, the assessment of how much it enables them to realize themselves, their capabilities, and their potential.

This factor is the most general as it unites all the main spheres of the situation of life. Another factor combines the professional sphere with the self-improvement sphere and can be called "self-development goals".

The other two factors are organized around different spheres of life – the sphere of relations and the financial sphere.

A deeper understanding of the nature of the selected factors was achieved by studying their relationship with psychological tests that take into account the context of variables. The Test of Existential Motivation by A. Längle describes an individual's existential motivations implemented in a life context. The factors identified in our empirical study found significant associations with existential motivations: the financial sphere is the least associated with them, which is quite understandable; the 'window of opportunities' factor is the most associated. Here, the most obvious is the human desire for creation (EM4), which is meaningful and value-related, and based on accepting the world (EM1). Complementing the understanding of the nature of this factor is its relationship to the scales of the potential for self-changing – the need for self-changing, the ability to change consciously, and the belief in its potential. These data demonstrate the 'inscription' of individual goals in a broad context of life, the context of an individual's relationship with the world.

The inclusion of the Time Perspective Inventory in the study, which takes into account the time context of goal setting, was also justified. A potentially negative role in goal setting – setting goals and striving to achieve them – can be played by hedonistic and fatalistic attitudes; a positive role can be played by orientation toward the future. The experience of the past can have a vague influence: positive experiences can be supportive of an individual's current plans, but neutral or negative assessments of past experiences can stimulate an individual's desire to use them as a resource for further development.

Another confirmation, albeit indirect, of the domination of personal attitudes over situational factors was demonstrated by the fact that the willingness of an individual to self-change in order to expand his/her abilities, as a personal attitude, was a 'cross-cutting' characteristic, which penetrates various spheres of human life, regardless of their characteristics.

We can add that the readiness to self-change was not related to the readiness to change the situation of life. Our respondents distinguished between these two very different types of changes. This result is consistent with our previous studies and confirms their independent representation in study design.

The thesis on the need for contextual study of psychological phenomena as a reaction to limited and inconsistent empirical data obtained as a result of the decontextualized

nature of the research conducted is actively supported by modern personality psychology. Attempts are being made to create research solutions that can take into account the influence of the context in one way or another. Thus, K. Geukes and his colleagues propose an integrated approach to obtaining information about the individual in the context and information about the context itself. The respondent is given a list of situations from which he/she must choose the one that best describes the context in which he/she is currently. Information on a 'contextualized' individual refers to his/her self-assessment, assessment of his/her condition and his/her behavior in a particular context (Geukes et al., 2017). Such research decisions are very typical of foreign personality psychology, and we believe that these efforts are rather 'mechanical' attempts to connect individuals and the context.

At the same time, the idea of an inseparable link between an individual and the space of his/her existence has existed in psychology since K. Lewin's concept of life space and the methodological task he set up to find a language for the general description of an individual and a situation.

Among other human activity regulators, the specific feature of the goal parameter lies in the direct relationship between the goals and the situation, the context in which they are implemented. An individual sets specific tasks or long-term goals within the framework of a specific situation of his/her activity or, more broadly, within the framework of his/her life situation. Consequently, the objectives are related to the possibilities and constraints of the situation in which they must be realized (Argyle, Furnham, & Graham, 1981; Grant & Dweck, 1999; Kruglanski, Chernikova, Rosenzweig, & Kopetz, 2014; Pervin, 1992; Yang, Read, & Miller, 2009, etc.). It is stressed that circumstances not only provide (or do not provide) opportunities to meet human needs and motivations, but that the perception of a situation itself can reflect those motivations (Morse et al., 2015). The opportunities for achieving goals therefore determine the initial decisions of individuals (enter or avoid situations) and the nature of their interaction with the situation (Diekman, Joshi, & Benson-Greenwald, 2020). As has already been noted, the most important feature of the goal is its contextual nature. This explains in large part the intensification of research on the goal concept in modern psychology, in which recent criticisms of research decontextualization and empirical data have become more and more pronounced (Heller, Watson, Komar, Min, & Perunovic, 2007, etc.).

The advantages of the methodological solution we use in empirical research are fundamentally different approaches to applying the contextual principle. It is not only the determination of variations of the observed phenomena depending on a particular context, but also the revelation of the context of the phenomena themselves. Thus, the

demonstration of this principle in the example of goal setting clearly distinguishes our approach to the study of goal setting.

Conclusion

Based on the idea of human personality level structures and the correlation between personality phenomenology and different contexts of life activity (Grishina, Kostromina, & Mironenko, 2018), we proposed the level-based concept of the goal-related regulation of human activity (Grishina, 2023).

The study was based on a goal setting process model, based on the idea of the contextual nature of goals, which means that spatial-temporal characteristics must be taken into account when examining goals. The spatial context means considering specific situations in a broader format of life situations, while the temporal context means taking into account the coordinates of the time perspective of the past, present and future, as well as their role in establishing current objectives and goals in life.

The results confirmed the appropriateness and effectiveness of this method, which enables us to see the complexity of individuals' life goals in relation to their assessments of their real abilities, the level of their satisfaction with current achievements, their compatibility with past expectations, and their willingness to changes to achieve their goals. In this complex process of interaction and mutual influence of various factors, individuals' goals crystallize and direct their vital activity.

The approach we have proposed has a heuristic potential and enables us to view the prospects for further research, particularly the need to deepen and expand the issue in order to find answers to questions that are behind the visions of an individual's life situation, which enables him/her to see new opportunities or limitations that have been found to have a significant impact on individuals' life plans and life goals.

Research limitations

The limitations of the study include the young age of the respondents, and we have deliberately implemented it, as setting life plans and goals is particularly relevant at the age of youth. At the same time, it is clear that the study of goal setting factors in middle- and upper-aged groups can provide different structures of the factors and different impacts on individual goals.

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Marina Olegovna Avanesyan developed the research methodology, analyzed and interpreted the results, and prepared and edited the text of the manuscript.

Makarova Mariya Vladimirovna collected the data, performed statistical data analysis, and edited the text of the manuscript.

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Young People and the Internet: Subjective Factors in Choosing Online Behavior Strategies

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Abstract

Introduction. Technologies and digital communication play a crucial role in everyday life. With the increasing number of people spending a significant amount of time online, the study of subjective factors influencing online behavior strategies becomes highly relevant. The novelty of this research lies in identifying online behavior strategies among young individuals and examining the factor structures of young people with different online behavior strategies. This article presents the results of studying the personality traits of students with various online behavior strategies. **Methods.** Various methods were employed, including theoretical analysis and summarization of research findings on this issue; psychodiagnostic research methods; mathematical and statistical analysis (descriptive statistics, Mann-Whitney U-test, cluster analysis, factor analysis). In the study, 177 students aged 17 to 21 participated. Two groups were distinguished in order to differentiate students based on their online behavior strategies: students with an entertainment-oriented Internet behavior (n = 124) and students with a productive-oriented Internet behavior (n = 53). **Results.** The following results were obtained: among contemporary youth who are active in the online environment, two strategies of online behavior are identified - entertainment-oriented online behavior strategy and productive-oriented strategy. The choice of behavior strategy is related to the respondents' personality traits. Significant differences were found between the groups of students with different online behavior strategies in terms of adaptability, self-acceptance, and autonomy. **Discussion.** The authors examine the personality traits of youth with different online behavior strategies. In conclusion, it is concluded that the factor structures of students with different online behavior strategies differ.

Keywords

online behavior strategies, youth behavior on the internet, online environment, adaptability, psychological well-being, meaning in life orientations, students

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Introduction

The integration of the Internet, virtual space, digital technologies, and the network society into everyday life has marked a shift towards online activity, prompting sociologists and psychologists to contemplate the crisis of reality. In the early 21st century, virtual space was considered a separate dimension that users could enter and exit, as they were confined to desktop computers (Castells, 2004). However, with the development of mobile devices, the digital environment became ubiquitous (Kravchenko, 2019). The blurring of the boundaries between real and virtual spaces is reflected in the paradigms of "synchronization society" (Moiseev, 2014) and "augmented reality" (Diemer, Alpers, Peperkorn, Shiban & Mühlberger, 2015). The digital environment is a sphere of activity based on digital technologies, including software products, information systems, and devices. The digital environment is a component of innovative human work and a part of the social structure of society. Thanks to the unlimited possibilities of the media space, users can choose comfortable roles and online behavior strategies in the face of rapidly growing virtual reality opportunities. Activity on social networks can influence the status and prestige of young people.

The aim of the study is to investigate the subjective factors influencing the choice of online behavior strategies among students. It can be assumed that differences in personality traits will be identified among students employing different online behavior strategies. The research objectives include:

1) Conducting a comparative analysis of the personality traits of students employing different online behavior strategies in the Internet environment;

2) Determining the subjective factors influencing students' choices of online behavior strategies.

Methods

In the study, 177 students from the Don State Technical University participated. The average age of the respondents was 19 years (ranging from 17 to 24 years), and the gender distribution was 15% males and 85% females.

To identify online behavior strategies among college students, we conducted a questionnaire survey.

The following methods were used to assess personality traits:

- Rogers-Diamond Social Psychological Adaptation Diagnostic Method (Osnitsky, 2004);
- Melbourne Decision-Making Questionnaire (adapted by T. V. Kornilova) (Kornilova, 2013);
- Stress Appraisal and Coping Scale (SACS) by S. Hobfoll (Banshchikova, Sokolovsky, Morosanova, 2020);
- Assessment of Nervous-Mental Tension Method (T. A. Nemchin);
- Differential Reflection Type Questionnaire by D. A. Leontiev and E. N. Osin (Leontiev, Osin, 2014);
- Ryff Psychological Well-being Scale (PWB) (adapted by N. N. Lepeshinsky) (Lepeshinsky, 2007);
- Spielberger-Hanin Anxiety Scale (adapted by Batarshev, 2007)).

The study employed both quantitative and qualitative methods for data processing and interpretation, including: cluster analysis; factor analysis (principal component method, varimax rotation with Kaiser normalization); descriptive statistical methods; statistical criterion for detecting differences between groups (Mann-Whitney U-test method).

Results

The survey data underwent cluster analysis, during which groups of students with two distinct online behavior strategies were identified:

- a strategy characterized by entertainment-oriented behavior in the Internet environment;
- a strategy characterized by productive-oriented behavior in the Internet environment.

The first group (entertainment-oriented strategy) included the largest number of

respondents (124 individuals). During the survey, students noted that, in the context of changes in the media landscape due to restrictions imposed on companies providing services for some previously popular social networks within the territory of the Russian Federation, the amount of time spent in the online environment either increased or remained unchanged. Their consumption of media content remained practically unchanged. Respondents indicated that they had no interest in dating websites, live streaming on social networks, earning money through social media and the Internet, or engaging in business-related communication. This group of respondents can be referred to as "***media content consumers***."

The second group (productive-oriented strategy) consisted of 53 respondents. Students in this group have noted that recently, there has been a significant or moderate decrease in the amount of time spent in the online environment. They have significantly reduced their use of social networks for interpersonal and business communication, finding romantic partners, learning and development, gaming activities, publication activity, and online earnings. There has been an increase in information consumption, offline and messenger-based communication. It is worth noting that in the past and present, this group of students has been characterized by their activity in creating media content.

Thus, we have identified two groups of students with different behavior strategies in the online environment. The first group consists of students characterized by a high level of media content consumption but who are not active content creators. The amount of time they spend in the online environment has either remained unchanged or increased. The second group comprises respondents who are both consumers and active creators of media content. In the current circumstances, their time spent in the online environment has decreased, but there has been an increase in communication time through messengers and offline interactions.

During the study of personality traits in groups of students with different online behavior strategies in current conditions, the following differences were identified (Table 1).

Based on the results of the "Social-Psychological Adaptation" and "Psychological Well-being Scale" assessments, respondents with the first strategy (entertainment-oriented) are characterized by immaturity, neurotic deviations, and an inability to make decisions. They exhibit a low degree of social interaction and communication needs, along with emotional ambiguity towards the world and the people, events, objects, and phenomena in it (discomfort, apathy, depression, etc.).

On the other hand, students with the second strategy of online behavior (productive orientation) are characterized by independence, non-conformity, and the ability to resist societal pressures. They autonomously regulate their own behavior, evaluate themselves based on personal criteria, hold a positive self-image, acknowledge and accept various aspects of themselves, including both their positive and negative qualities, and have a positive outlook on their past.

Table 1

Results of a comparative analysis of the personality traits of respondents with different online behavior strategies

(Mann-Whitney U-test)							
	Rogers-Diamond's scales of the social-psychological adaptation diagnosis methodology					Well-being Scale (PWB)	
	Mal-adaptation	Non-acceptance of others	Integral indicator of emotional comfort	Emotional discomfort	Subjugation	Autonomy	Self-acceptance
	M (σ)	M (σ)	M (σ)	M (σ)	M (σ)	M (σ)	M (σ)
Group 1	82,61 (35,5)	18,09 (8,9)	56,90 (19,1)	20,00 (11,7)	18,03 (8,4)	46,39 (22,3)	45,73 (23,9)
Group 2	68,55 (35,5)	15,08 (7,3)	61,64 (19,1)	15,51 (9,6)	15,60 (7,1)	52,23 (21,0)	52,60 (22,7)
U-test	2520,5	2540,0	2627,5	2492,0	2648,5	2679,500	2643,500
p	,01	,01	,03	,01	,04	,05	,04

To explore the structure of personal characteristics in respondents with different online behavior strategies and examine the interrelationships between these traits, a factor analysis was conducted. During the factorization and rotation process, two distinct structures were identified, differing in quantitative and qualitative characteristics.

In a group of students with the first Internet behavior strategy, the factor structure can be characterized as unstable, inconsistent, and incomplete, as indicated by 4 variables (constituting 8.88%) that are excluded from the overall structure. Six variables (13.3%)

exhibit a negative orientation. The structure comprises seven factors, explaining 73.2% of the variance (factor extraction method - principal component analysis, with Varimax rotation and Kaiser normalization, convergence achieved after ten iterations) (see Table 2). The Kaiser-Meyer-Olkin measure of sampling adequacy is 0.812. Commonality analysis revealed the highest values for the following indicators: "Environmental Management" (0.963), "Self-acceptance" (0.961), "Life Goals" (0.956), and "Personal Growth" (0.952).

The first and most informative factor combines indicators characterizing personal immaturity: "Maladjustment," "Integrated Emotional Discomfort Score" (negative orientation), "Integrated Adaptation Score" (negative orientation), "Personal Anxiety Scale," "Emotional Discomfort," "External Control," "Integrated Self-Acceptance Score" (negative orientation), "Self-Rejection," "Integrated Internality Score" (negative orientation), "Situational Anxiety Scale," "Avoidance," "Quasi-Reflection," "Integrated Dominance Aspiration Score" (negative orientation), " Subjugation," and "Integrated Acceptance of Others Score" (negative orientation). This factor can be labeled as "personal immaturity".

For students following the first internet behavior strategy, personal immaturity and neurotic deviations are closely linked to both personal and situational anxiety. They exhibit a low inclination towards interacting with others, engaging in communication, and establishing connections with their surroundings. Furthermore, they express dissatisfaction with their character traits, coupled with a high level of suppression, lethargy, and apathy towards the world, ongoing events, and phenomena. The above-mentioned characteristics are associated with traits such as an inability to take responsibility for events happening around them and in their lives, a tendency to attribute their failures to external circumstances, and a predisposition to adapt to the real or perceived needs and interests of other people. These respondents' thoughts are directed not towards their current life situation but towards past or future potential events.

Six variables exhibit a negative orientation within the structure. Students following the first strategy experience negative emotional states, tend to avoid taking responsibility for events in their lives, and are not inclined to dominate over others.

The second factor encompasses indicators characterizing psychological well-being: "Personal Growth," "Life Goals," "Autonomy," "Environmental Management," "Psychological Well-being," "Self-Acceptance," and "Positive Relationships." These variables are related to the individual's life orientations and form the basis for comprehensive personal development and life functioning.

The third factor combines variables related to the behavioral characteristics of students: "Hyper-vigilance," "Procrastination," "Avoidance," "Cautious Actions," "Introspection," and "Seeking Social Support."

The fourth factor groups the following indicators: "Adaptability," "Systemic Reflection," "Internal Control," "Self-Acceptance," and "Acceptance of Others."

The fifth factor is represented by Manipulative, Aggressive, Antisocial, and Impulsive behaviors.

The sixth factor combines the scales of Dominance, Escapism, and Non-Acceptance of others.

The seventh factor includes the scale of Involvement in social contact, indicating the need of students with the first strategy for receiving support and attention from others.

From the factorial structure of interrelationships, certain indicators such as Emotional Comfort, Nervous-Mental Stress Scale, Assertive Actions, and Vigilance "dropped out". It can be assumed that these indicators are not related to the peculiarities of online behavior among students with the first strategy.

Thus, the factorial structure of the subjective characteristics of students with the first strategy of online behavior is incomplete, inconsistent, and contradictory (Table 2).

Table 2

Rotated matrix of subjective feature components in the group of respondents with the first online behavior strategy

Variables	Component						
	1	2	3	4	5	6	7
Maladaptivity	0,946	-0,058	-0,025	-0,013	-0,007	-0,014	0,009
Integral Indicator of Emotional Comfort	-0,821	0,244	-0,045	0,070	-0,022	-0,199	-0,013
Integral indicator of adaptation	-0,820	0,147	-0,178	0,144	-0,036	0,282	0,069
Personality Anxiety Scale	0,816	-0,103	-0,230	-0,010	0,107	-0,035	-0,117
Emotional Discomfort	0,794	-0,098	0,373	-0,014	0,050	0,182	-0,086
External Control	0,774	-0,009	0,383	-0,089	-0,060	0,341	0,031
Integral Indicator of Self-Acceptance	-0,760	0,085	0,079	0,299	0,112	-0,238	-0,064
Self-Rejection	0,730	-0,046	0,301	-0,124	-0,029	0,087	0,009

Variables	Component						
	1	2	3	4	5	6	7
Integral Indicator of Internality	-0,700	0,173	-0,271	0,179	0,081	-0,326	-0,187
Situational Anxiety Scale	0,674	-0,151	0,037	0,007	0,247	0,089	-0,297
Avoidance	0,592	-0,019	0,266	-0,053	0,288	-0,015	0,381
Quasireflexivity	0,567	0,043	0,204	0,377	0,146	0,106	-0,104
Integral Indicator of Dominance Aspiration	-0,564	0,150	-0,166	0,244	0,229	0,234	-0,470
Subjugation	0,549	-0,016	-0,183	-0,139	-0,178	0,308	0,478
Integral Indicator of Acceptance of Others	-0,508	0,137	-0,147	0,328	-0,046	-0,468	0,349
Emotional Comfort	-0,435	0,031	0,409	0,399	0,048	0,207	0,153
Scale of Nervous-Mental Stress	0,379	-0,052	-0,111	-0,007	0,316	-0,086	-0,144
Assertive Actions	-0,327	0,077	-0,097	0,022	-0,084	0,127	-0,133
Personal Growth	-0,036	0,970	-0,012	0,091	-0,010	0,005	-0,020
Life Goals	-0,131	0,963	0,031	0,103	0,004	0,005	0,018
Autonomy	-0,099	0,956	-0,035	0,051	0,019	0,044	-0,070

Variables	Component						
	1	2	3	4	5	6	7
Environmental Management	-0,201	0,951	0,012	0,083	-0,099	0,019	0,022
Psychological Well-being	-0,048	0,947	-0,111	0,082	0,030	0,001	0,037
Self-Acceptance	-0,244	0,944	0,051	0,084	-0,026	0,025	0,007
Positive Relationships	-0,028	0,910	0,001	0,053	-0,140	-0,059	0,065
Hyper-Vigilance	0,242	-0,052	0,924	-0,061	0,017	0,067	-0,062
Procrastination	0,216	-0,060	0,913	-0,105	0,001	0,103	-0,054
Avoidance	0,245	-0,040	0,885	-0,182	-0,027	0,044	0,006
Cautious Actions	-0,098	-0,003	0,739	0,018	0,304	0,054	0,304
Introspection	0,613	-0,053	0,654	0,047	0,090	0,008	-0,119
Social Support Seeking	-0,073	0,132	0,537	0,002	0,184	-0,009	0,487
Vigilance	0,035	0,027	0,477	0,001	-0,016	-0,015	-0,038
Adaptability	-0,438	0,227	-0,314	0,704	0,088	-0,173	0,081
Systemic Reflection	0,063	0,096	-0,127	0,670	-0,041	0,152	-0,023
Internal Control	-0,050	0,225	-0,310	0,653	-0,002	-0,223	-0,305

Variables	Component						
	1	2	3	4	5	6	7
Self-Acceptance	-0,499	0,105	0,076	0,648	0,110	-0,138	0,041
Acceptance of Others	-0,116	0,079	0,199	0,546	-0,218	-0,209	0,381
Manipulative Actions	0,017	-0,131	0,127	0,063	0,735	0,225	0,143
Aggressive Actions	0,373	0,011	-0,062	0,064	0,719	-0,074	0,074
Antisocial Actions	-0,078	-0,072	0,368	-0,056	0,715	0,011	-0,059
Impulsive Actions	-0,020	0,021	-0,120	-0,127	0,621	0,131	0,465
Dominance	-0,126	0,050	0,255	0,030	0,270	0,805	0,067
Escapism (Avoidance of Problems)	0,469	0,068	-0,185	-0,077	0,016	0,699	0,082
Non-Acceptance of Others	0,528	-0,017	0,317	-0,131	-0,023	0,610	-0,221
Social Engagement	-0,089	0,012	-0,058	0,087	0,255	0,010	0,748
Dispersion (Load)	22,21	14,91	12,30	6,45	6,06	5,93	5,37

In a group of students **with the second behavior strategy on the Internet** under changed conditions, the factor structure can be characterized as incomplete, stable,

and consistent. It includes six factors that explain 79.527% of the variance (factor extraction method: principal component analysis, rotation method: varimax with Kaiser normalization, convergence reached after ten iterations) (Table 3). The Kaiser-Meyer-Olkin measure of sample adequacy is 0.585 (which is a good value for sample adequacy). Commonality analysis showed that the highest values were observed for the indicators of "Environmental Management" (0.957), "Personal Growth" (0.957), and "Integrated Adaptation Index" (0.921). This structure is incomplete, as evidenced by two variables (accounting for 4.44%) that are "outside" the overall structure (Table 3). Variables with negative direction in the structure were not identified.

The key factor includes scales such as "Scale of Personal Anxiety," "Maladaptation," "Introspection," "Emotional Discomfort," "Situation-specific Anxiety Scale," "Hyper-Vigilance," "Self-Rejection," "Rejection of Others," "Avoidance," "External Locus of Control," "Quasi-Reflection," and "Subjugation". The results indicate that the choice of a productive online behavior strategy by young people is associated with increased anxiety, personal immaturity, decision-making difficulties, negative feelings about the current situation, excessive self-criticism, and reflection on the past or future, reluctance to engage with others, dissatisfaction with one's qualities and abilities, external locus of control, and anticipation of adversity and threats. This factor characterizes personal immaturity, the inability to take responsibility for life events, and the inability to adapt flexibly to changing conditions.

The **second factor** includes scales such as "Adaptability," "Integrated Adaptation Index," "Self-Acceptance," "Integrated Self-Acceptance Index," "Integrated Other-Acceptance Index," "Acceptance of Others," "Integrated Emotional Comfort Index," "Integrated Internality Index," "Internal Locus of Control," "Systemic Reflection," "Vigilance," and "Integrated Dominance Orientation Index." The nature of this constellation suggests a connection between the second online behavior strategy and the respondents' ability to adapt to societal demands in line with their needs and goals; adequate self-assessment; a willingness to engage and communicate with others; positive emotional experiences towards their surrounding reality; high internality, meaning the ability to take responsibility for their life; intolerance of uncertainty; rationality; reflexivity; and a drive for leadership.

The third factor includes scales reflecting psychological well-being: "Positive Relationships," "Personal Growth," "Environmental Management," "Life Goals," "Autonomy," "Psychological Well-being," and "Self-Acceptance."

The fourth factor comprises the following scales: "Seeking Social Support," "Engagement in Social Contacts," "Cautious," "Manipulative," "Antisocial," "Assertive," and "Aggressive Actions."

The fifth factor encompasses "Dominance," "Emotional Comfort," and "Escapism."

The sixth factor, contributing to 5.639% of the total variance, includes coping behavior strategies such as "Avoidance" and "Impulsive Actions."

Table 3

Rotated matrix of subjective feature components in the group of respondents with the second online behavior strategy

Variables	Component					
	1	2	3	4	5	6
Personality Anxiety Scale	**0,920**	0,119	0,014	-0,110	-0,027	0,079
Maladaptation	**0,887**	-0,138	-0,104	0,135	0,035	0,210
Introspection	**0,840**	0,009	0,091	0,147	-0,005	0,080
Emotional Discomfort	**0,820**	-0,239	-0,231	0,045	0,320	-0,011
Situational Anxiety Scale	**0,799**	-0,021	0,030	-0,015	-0,080	0,064
Hyper-Vigilance	**0,751**	-0,182	-0,102	-0,070	-0,050	0,176
Self-Rejection	**0,723**	-0,278	-0,102	0,254	0,263	0,038
Rejection of Others	**0,697**	-0,313	-0,304	0,233	-0,069	-0,050
Avoidance	**0,663**	-0,005	0,003	0,144	0,036	0,569
External Control	**0,662**	-0,214	-0,024	0,074	0,600	0,230
Quasi-Reflection	**0,652**	0,247	-0,010	-0,044	0,277	0,295
Subjugation	**0,601**	-0,111	-0,016	-0,141	0,366	0,497
Procrastination	0,493	-0,077	0,088	0,065	0,166	0,455
Nervous-Psychic Strain Scale	0,469	-0,013	0,032	-0,047	-0,052	-0,084
Adaptability	-0,009	**0,888**	0,203	0,113	0,046	-0,002
Integrated Adaptation Index	-0,290	**0,855**	0,301	0,120	0,012	-0,043

Variables	Component					
	1	2	3	4	5	6
Self-Acceptance	-0,149	**0,835**	0,282	0,160	-0,012	0,061
Integrated Self-Acceptance Index	-0,294	**0,833**	0,304	-0,006	-0,041	0,045
Integrated Other-Acceptance Index	-0,198	**0,833**	0,382	-0,067	0,088	0,139
Acceptance of Others	-0,057	**0,787**	0,250	-0,117	0,116	0,242
Integrated Emotional Comfort Index	-0,422	**0,764**	0,342	0,079	0,042	0,113
Integrated Internality Index	-0,200	**0,754**	0,279	0,130	0,013	-0,258
Internal Control	0,278	**0,733**	0,151	0,244	0,320	-0,238
Systemic Reflection	0,325	**0,715**	0,113	0,301	0,047	0,096
Vigilance	0,240	**0,643**	0,138	0,200	-0,295	-0,169
Integrated Dominance Orientation Index	-0,204	**0,612**	0,214	0,365	0,193	-0,369
Positive Relationships	-0,012	0,258	**0,928**	-0,107	-0,044	0,061
Personal Growth	0,004	0,296	**0,916**	0,164	0,011	0,065
Environmental Management	-0,159	0,292	**0,915**	0,086	-0,003	-0,033
Life Goals	-0,028	0,306	**0,892**	0,135	0,029	-0,011

Variables	Component					
	1	2	3	4	5	6
Autonomy	0,056	0,219	**0,887**	0,181	-0,089	-0,159
Psychological Well-being	0,017	0,235	**0,882**	0,096	-0,045	0,007
Self-Acceptance	-0,114	0,327	**0,873**	-0,140	0,026	0,051
Seeking Social Support	-0,115	0,134	0,061	**0,905**	-0,013	0,203
Cautious Actions	0,139	0,095	0,168	**0,862**	0,034	0,142
Manipulative Actions	-0,045	0,034	-0,052	**0,855**	0,020	-0,193
Antisocial Actions	0,182	-0,024	-0,032	**0,828**	0,212	-0,020
Engagement in Social Contacts	0,098	0,293	0,084	**0,821**	0,000	0,293
Assertive Actions	-0,150	0,206	0,211	**0,799**	-0,252	0,047
Aggressive Actions	0,496	0,152	-0,036	**0,637**	0,173	-0,189
Dominance	-0,061	0,138	0,004	0,093	**0,904**	-0,111
Emotional Comfort	-0,070	0,369	0,007	0,027	**0,838**	0,144
Escapism (Avoidance of Problems)	0,393	-0,125	-0,093	-0,007	**0,828**	0,140
Avoidance	0,549	-0,200	-0,039	0,032	-0,047	**0,644**
Impulsive Actions	0,145	0,169	0,005	0,193	0,074	**0,628**
Dispersion (Load)	19,907	19,110	15,032	12,259	7,579	5,639

Discussion

The concept of the "digital turn" (Kravchenko, 2019) emphasizes the impact of digitization on people's leisure time and behavior in the online environment. Most spheres, such as work, education, and leisure, are becoming digital, drawing more and more people

into the online space. The development of smartphone applications, social networks, online games, and live sports event streaming shape digital culture and online behavior. Online behavior of users is generally understood as the consumption of information on the Internet and content production on various new media platforms (Garbuznyak, 2022).

A survey of students revealed that the majority of them are active consumers of media content, and some actively create content. Students are spending more and more time online, primarily playing games and engaging in social networks. However, they are less interested in communicating through messengers, earning money through social networks, or forming romantic relationships online. Using cluster analysis, two groups of students were identified: the first group prefers online communication and content consumption, while the second group tends to create their own content and earn money online. Lately, they have started to engage more in real-life communication and messaging platforms.

The results of the comparative analysis indicate that girls and boys with the first behavioral strategy in the online environment are less adaptive. They experience negative emotions and distress more frequently, exhibit less inclination to engage in direct communication with others, establish fewer interpersonal contacts, tend to perceive others as hostile, and demonstrate compliance and conformity. Students with the second strategy, on the other hand, exhibit a higher degree of self-esteem and self-acceptance, independence, and autonomy.

When comparing the factorial structures, it can be observed that they differ in qualitative characteristics, the number of identified factors, their sequence, completeness, and consistency. The first factor, which we labeled as "Personality Immaturity" in both groups, is consistent; however, the composition varies slightly. In the general factor of the first group, there are significantly more variables, and additionally, there are scales with a negative orientation. In the second factor within the group of students with the first behavioral strategy, a cluster of scales from the "Psychological Well-being Scale" methodology emerged, whereas in the group of students with the second strategy, a cluster was formed demonstrating connections to adaptability, self-acceptance, acceptance of others, internality, reflectiveness, vigilance, and a tendency towards leadership. Differences in the composition of clusters are noted in the fourth factor. Thus, students with the first strategy tend to exhibit non-constructive coping behaviors, while respondents with the second strategy display a complex mix of constructive and destructive coping mechanisms in challenging situations.

According to T. Scholz, there are two main trends in the transformation from analog behavior culture to digital: deterritorialization of space and time and disintermediation (Scholz, Routledge, 2013). K. Spracklen, an expert in internet behavior, believes that the distinctions between reality and simulation are disappearing, giving rise to virtual spaces for work, education, and entertainment. Online activities are interactive, and

social networks contribute to a sense of belonging (Spracklen, 2015). Research results on problematic internet technology usage by individuals indicate the development of maladaptation (Churchill, Clark, Prochaska-Cue, Creswell, 2007). Various types of online behavior have been identified, such as shopping, pornography, surfing, and excessive use of chat and social networks. It has been found that men are more likely to engage in online gaming, while women tend to have problematic online shopping behavior (Ioannidis et al., 2018). People who frequently use the internet may experience depression, anxiety, depersonalization, as well as a desire to cope with negative emotions and a lack of social support (Dolzhenkova, Bortnikova, 2021).

Research in the field of problematic internet usage and its relationship with individual characteristics is increasingly conducted. These studies encompass research on the personality of internet-dependent users, the identification of predictors for the development of internet-dependent behavior (Mehroof, Griffiths, 2010; Dmitriev, 2013; Kolmogortseva, 2017; Hawi, Samaha, 2019), clinical variants of problematic internet use (Petrov, Chernyak, 2020), preferences of internet-dependent respondents (Zykova, 2020), the connection between personality traits and the regulation of online activity among students (Panshina, Sungurova, Karabushchenko, 2021), the association between problematic internet use and mental well-being (Kholmagorova, Gerasimova, 2019), and the psychological characteristics of individuals with problematic and adaptive internet use (Orestova, Filippova, 2022), cultural and historical phenomena on the Internet (Zhuravlev, Zinchenko, Kitova, 2022), cultural mediation of digital generation identity (Shaigerova, Shilko, Vakhantseva, 2022).

In recent years, Russian researchers have shown interest in several aspects of the role of the Internet in shaping the identity and value orientations of young people (Kopteva, 2017; Mayatskaya, 2017; Shumskikh, Gladskikh, Budanova, 2017; Temina, 2017), the spiritual and moral development of youth (Grandova, 2017; Emelyanenko, 2017), and socialization in the online environment (Orlov, Orlova, 2018). All of these studies help to form an understanding of the current changes in the processes of socialization among contemporary youth, which are occurring under the influence of digitization. There is also a concept of cyber-socialization as a new socio-psychological phenomenon (Pleshakov, 2011; Marcinkovskaya, 2012; Martsinkovskaya, 2019).

Conclusion

The behavior of students in the online environment in current conditions is influenced by various subjective factors and has an impact on the future direction of young people's life activities. Studying the characteristics of youth behavior in virtual space in relation to their individual traits allows for the prediction of adaptive capabilities, meaning of life, and behavioral orientations of young people. Analysis of the results allows us to conclude that young people with the second behavioral strategy demonstrate significantly more pronounced adaptive potential and psychological well-being in the current online environment. Moreover, these respondents in the current online environment tend to

satisfy their communication and social interaction needs in face-to-face communication and employ a variety of coping strategies in difficult situations.

The identification of the structural features of students' subjective factors has shown that the factor structures in groups of respondents with different online behavior strategies differ in terms of completeness, consistency, and integration. There is a tendency towards a higher level of formation of factor structures depending on behavior in the online environment under current conditions. The obtained results will enable the implementation of corrective measures with young people aimed at changing their online behavior, developing adaptive potential, fostering adequate behavioral responses, and enhancing their personal characteristics.

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Mental Regulation of Students' Mental States in Everyday and Stressful Learning Situations

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Abstract

Introduction. In modern conditions of life, the problem of regulation of mental states and behavior of the personality is of particular relevance. Today Individual style of behavior self-regulation, or self-regulation of functional states consider existing approaches and concepts as a specific type of personality activity. The central place is occupied by the structures of consciousness: semantic, reflective, representative, etc. in the concept of mental states' regulation developed by the authors. The functional organization of the structures of consciousness is formed in connection with the specifics of complexes consisting of mental structures, mental states and operational means of regulation. **Methods.** 132 students took part in the study (average age – 19 years, second-year students of the Institute of Psychology and Education of the Kazan (Volga Region) Federal University). We studied the intensity of manifestations of mental states and the effectiveness of their self-regulation on the mental structures in everyday (at lectures) and in stressful (at exams) situations of learning activity. Separately, we studied the severity of each component of the mental structure: semantic structures, reflection, self-attitude in the regulatory process. We studied mental structures using standardized methods and specially developed author's questionnaires. **Results.** The situational conditionality of the effectiveness of students' mental states regulation is revealed. In an everyday situation, the key elements of the functional regulatory structure are the reflection of states, the emotional richness of life and the acceptance of people around. In a stressful situation, students' confidence in their abilities, satisfaction with self-realization and a low level of reflection on experience come to the fore. **Discussion.** The results confirm the concept of mental states' regulation, denoting the significant role of the consciousness structures

(reflective, semantic, self-system) in the regulation of mental states of students. The results are also consistent with the studies of other authors who deal with this problem.

Keywords

everyday situation, stressful situation, mental state, mental regulation, regulation efficiency, reflection, self-system, semantic structures

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Introduction

The problem of regulation and self-regulation of states and behavior comes to the fore in modern conditions of life. Research in this area is represented by various approaches and concepts. Attention is focused on the individual characteristics of self-regulation and the analysis of situational factors associated with the conditions of activity in the works of V. I. Morosanova: the "individual style of self-regulation" is being studied, regulatory-personal properties are distinguished that affect the entire system of mental self-regulation (Morosanova, 2012).

In the concept of behavior control E. A. Sergienko (2018) shows the psychological level of behavior regulation, which implements the individual resources of a person's mental organization and provides a balance between internal capabilities and external goals. Control is considered as a single system that includes three subsystems of regulation: cognitive control, emotional regulation, volitional control, the integration of which creates an individual pattern of self-regulation.

A significant contribution is made by the works of L. G. Dikaya (2003) and A. B. Leonova (2007) in a study on the regulation of mental states. According to L. G. Dikaya, mental self-regulation of functional states acts as a specific type of activity of the subject, which is characterized by certain relationships with professional activity, and its development determines the formation of the adaptive properties of the subject and the effectiveness of professional activity. In turn, the structural-integrative approach to self-regulation of functional states by A. B. Leonova are based on the activity paradigm of A. N. Leontiev. It

analyzes self-regulation at the levels of operational and technical support for activities (operations); changes in the target structure of activities (actions); change in the dominant motivational orientation of the subject of labor (activity in general).

In foreign studies, the problem of self-regulation is considered as an ability that develops during exercise or in the process of achieving various life goals (Schmeichel & Baumeister, 2004; Vohs & Heatherton, 2000). As in domestic psychology, the main concepts in regulation are "feedback" and "hierarchy of goals" of the individual, and in addition, much attention is paid to individual differences and social context (Berger, 2011). Models of self-regulation based on the idea that they are nutritional, personal processes, primary determinants of behavior that are associated with attention to oneself and health (De Ridder & de Wit, 2006), self-control skills (Muraven & Slessareva, 2003). The concept of self-regulated learning (Pintrich, 2000), which includes motivational characteristics, setting goals, choosing a learning strategy, and regulating one's own behavior, is also actively manifested (Calkins & Howse, 2004).

The central place is occupied by the structures of consciousness: semantic, reflective, representative, etc. in the concept of the structural and functional organization of the mental regulation of mental states that we are developing. (Prokhorov, 2020, 2021). According to the conceptual model, the totality of the regulatory complex is an integral part of the subjective (mental) experience of a person. Subjective (mental) experience integrates the semantic structures of consciousness (personal meaning, values, semantic attitudes and orientations), mental representations included in the knowledge structure (associative, evaluative, conceptual, figurative characteristics), experiences, reflective structures, processes of understanding. The organization of consciousness structures is formed in connection with the specifics of complexes (blocks) consisting of states, means of regulation and mental structures that are formed in the range of current time and in conditions of repetitive situations of life activity.

An analysis of research in the field of mental mechanisms of self-regulation shows that only a few works are a study of the contribution of consciousness structures to the regulation of mental states. Let us look at them in sequence.

The semantic system of consciousness is a link that mediates the influence of various factors of the subject's life. It is a "perceived determinant" of the mental state, through which any influence on the personality is refracted (Alekseeva, 2006). The specificity of the semantic self-regulation of the individual is determined by emotional discomfort, subjective distress, adaptability, conscious activity planning, which affects professional health (Ryabova, 2015). In the work of N. I. Naenko (1976) shows that the different personal meaning of the performed activity causes different forms of mental tension. M. V. Ermolaeva (1984) found the dependence of changes in the emotional side of functional states on semantic characteristics when the motive of activity and the conditions for its course change.

The involvement of reflexive mechanisms is determined by the goal of regulation – the need to change the mental state as inappropriate for the situation and conditions of life (Golitsyn, 1987). There is an assessment, awareness and comparison of the current state with the desired one due to reflection and, further, if necessary, the subject makes a correction to the methods and techniques of regulation used. It is noted that the need to change the mental state and the process of self-knowledge by the subject of states is realized through reflection (Vasilevskaya, 2017). M. G. Yusupov (2014) found that reflection affects the processes of information processing, performing metacognitive actions in the process of regulating cognitive processes. As L. A. Savinkina (2000) notes, the reflexive self-regulation of a person's mental states is a system of influences on the mental state, the peculiarity of which is its awareness, verbalization and systemic nature.

The relationship between mental states and the system of the Self is studied separately. Research is focused in the field of medicine, where the role of the self-system in the treatment of depression is shown (Strauman & Eddington, 2017). The connection was determined between the adequacy of self-esteem and the experience of loneliness in adolescents (Koshkarov, Borodina & Kadetova, 2013). A positive self-attitude counteracts the development of professional burnout (Vodopyanova & Gusteleva, 2010). In our study, it was revealed that with an increase in the tension of the situation from lecture to exam, the role of the components of self-attitude in the regulation of both individual substructures and the mental states of students as a whole also increases.

The purpose of the study: to reveal the influence of mental structures on the effectiveness of the applied methods of regulation of mental states in everyday and stressful situations of educational activity.

Research objectives:

1. To identify mental states that are characteristic of students with different efficiency of self-regulation in everyday and stressful situations of educational activity. Consider the features of the selected states, their intensity, modality, sign.
2. Consider the typology of self-regulation of the mental states of students with high efficiency of self-regulation in situations of activity different in intensity.
3. Establish the role of each of the mental structures (semantic, reflexive, the system I) in the effectiveness of self-regulation of the mental states of students in everyday and stressful learning situations.

Methods

132 people took part in the study (all are 2nd year students of the Institute of Psychology and Education of Kazan Federal University, studying in the areas of "Psychology" and "Clinical Psychology"). The average age of the respondents was 19 years old. Studies of the intensity of manifestation of each substructure of mental states and the effectiveness of their self-regulation were carried out in everyday (at lectures) and in stressful (at exams)

situations of educational activity. The severity of each component of the mental structure was studied separately: reflection, meanings, self-attitude.

The following methods were used in the research process:

1. Questionnaire "The effectiveness of self-regulation of mental states" of A. N. Nazarov, A.O. Prokhorov (2018).

2. Methodology "Relief of the mental states of the individual (short version)" (Prokhorov & Yusupov, 2011), reflecting the intensity of manifestation of the main components of the mental state: cognitive processes, behavior, feelings and somatic reactions.

3. Methodology for the study of self-attitude of S. R. Pantileev (MIS) (1993), including 9 main scales: closeness, self-confidence, self-guidance, reflected self-attitude, self-worth, self-acceptance, self-attachment, internal conflict, self-accusation.

4. Questionnaire of reflexivity of A. V. Karpov and I. M. Skityaeva (2005). Allows you to measure the overall level of development of reflexivity, as well as the level of reflection in different times: retrospective, current and prospective.

5. Methods for diagnosing reflexive processes: recognition, awareness and identification of A. O. Prokhorov and A. V. Chernov (2019). It is aimed at diagnosing the reflection of the image of the mental state.

6. Methodology "Typology of self-regulation of mental states" of A. O. Prokhorov and A. N. Nazarov (2019). It is used to identify preferred ways of self-regulation and includes 8 types of self-regulation states.

7. Test of meaningful life orientations (SJO) of D. A. Leontiev (2000). It includes a general indicator of meaningfulness of life, as well as five subscales (goals in life, the process of life, the result of life, the locus of self-control and the locus of control - life).

8. Methods of self-assessment of the level of ontogenetic reflection (Fetiskin, Kozlov & Manuilov, 2002).

9. Questionnaire "Style of self-regulation of behavior" of V. I. Morosanova (2001).

In the course of the study, the following were used: analysis of mean values, frequency analysis of data, Student's T-test for independent samples, correlation analysis by the Spearman method. Further, based on the results of the analysis of the interrelations of indicators, the structure organization index (SSI) was calculated (according to A. V. Karpov), where 1 point was assigned to connections at the level of statistical significance $p < 0.05$, $p < 0.01$ – 2 points and $p < 0.001$ – 3 points. To analyze the obtained data, we used the methods of mathematical and statistical analysis contained in the standard SPSS 23.0 software package.

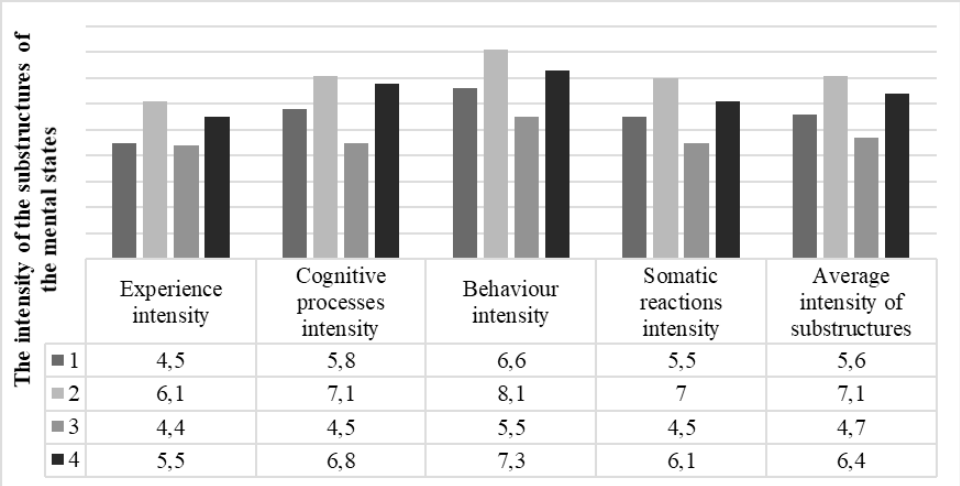
Results

During the study, the respondents indicated their current mental state in the course of everyday (lecture) and stressful learning situations (exam). During the lecture, students with a high level of efficiency of self-regulation experience mainly states of calm, cheerfulness – 48%, or cognitive (interest, inspiration, concentration) states (42% of respondents). Only 10% of the respondents had low-intensity states (fatigue, boredom, lethargy). At the same time, students assigned to the low-performance group showed other characteristics: 33% of the respondents experienced low-intensity states (boredom, lethargy, etc.), 31% experienced states of medium intensity (calmness, cheerfulness), and only 36% noted the presence of positive cognitive states. Thus, students with high efficiency of self-regulation are dominated by positive states that contribute to productive learning activities, while low-effective students have a significant proportion of states that prevent the successful mastering of educational material.

In the process of passing the semester exam, students mainly experience states of excitement, anxiety, and tension. In this case, both groups of subjects designate the experienced states, overall, in the same way, however, the intensity of these states and the activity of individual substructures of the states differ significantly. For a visual illustration of this pattern, let us turn to Figure 1.

Figure 1

The intensity of the mental states' substructures of students with different level of their self-regulation effectiveness in everyday and stressful learning situations



	Experience intensity	Cognitive processes intensity	Behaviour intensity	Somatic reactions intensity	Average intensity of substructures
1	4,5	5,8	6,6	5,5	5,6
2	6,1	7,1	8,1	7	7,1
3	4,4	4,5	5,5	4,5	4,7
4	5,5	6,8	7,3	6,1	6,4

Note. *Legend: 1 – students with low efficiency of self-regulation of states in everyday learning situation, 2 – students with high efficiency of self-regulation of states in everyday learning situation, 3 – students with low efficiency of self-regulation of states in a stressful learning situation, 4 – students with high efficiency of self-regulation of states in stressful learning situations.*

Figure 1 shows that students with a high level of subjective effectiveness of self-regulation of mental states demonstrate a higher activity of all substructures of mental states. Significant differences in the groups for all studied indicators were found both in everyday and stressful learning situations. Regardless of the situations of learning activity and the level of effectiveness of self-regulation, the indicators of behavior have the highest activity, and the least - indicators of the activity of experience. An interesting fact: students with high efficiency of self-regulation in the exam show a higher intensity of all substructures of mental states than students with low efficiency of self-regulation in lectures, which indicates the importance of effective regulation of states in the course of learning activities.

Let us consider the differences in the regulatory properties of the personality, as well as in the methods of self-regulation of states used by respondents with different levels of self-regulation efficiency in everyday and stressful situations of educational activity (Table 1).

Table 1

Differences in the ways of self-regulation and regulatory properties of personality among students with different efficiency of self-regulation *of states*

Everyday learning situation			
Methods of self-regulation and regulatory qualities	*Low efficiency of self-regulation of states*	*Significance of differences*	*High efficiency of state self-regulation*
Self-hypnosis / self-orders	10,5	0,045	11,9
Mute/switch	10,8	0,018	12,8
Modeling	4,6	0,003	5,7
Flexibility	5,8	0,005	6,7
General level of self-regulation	28,4	0,004	31,3

Stressful learning situation			
Actualization of positive images and memories	10,1	0,050	11,9
Mute/switch	11,3	0,037	13,2
Modeling	4,8	0,013	5,7
Flexibility	5,8	0,001	6,8
General level of self-regulation	28,9	0,030	31,1

We compared the indicators of the personality regulatory properties and the operational means of self-regulation among students. It was revealed that, regardless of the intensity of the educational activity situations, students with a high efficiency of self-regulation of states are characterized by a greater severity of the regulatory property of flexibility. Similar patterns identified for the general level of students' self-regulation. Apparently, it is the formation of an individual system of conscious self-regulation and flexibility, as the ability to rebuild one's own system of self-regulation, that act as the most important determinants of effective self-regulation of states. In addition, students with high efficiency of self-regulation demonstrate a higher ability to identify significant conditions for achieving the goal (modeling), and more often use muting (switching) as an operational means of self-regulation of negative mental states. We also note that in a stressful situation of an exam, people with high efficiency of self-regulation are characterized by a more frequent use of such a method as updating positive images and memories, while in an everyday situation such respondents often resort to self-hypnosis and self-orders.

Next, a correlation analysis of the data was carried out in order to identify the relationship between the applied methods of self-regulation and mental structures (reflexive, semantic, self-relationship) in different learning situations with students with different efficiency of self-regulation of states. In each selected group and in each individual form of education, the structure organization index (IOS) was calculated, which is the result of calculating the number and strength of correlations. IOS allows us to draw conclusions about the general structure of relationships, as well as highlight the system-forming (leading) elements in each structure. Table 2 shows the structure organization indices for different ways of self-regulation of states in stressful and everyday learning situations. We note a greater number of significant relationships for the group of students with low efficiency of self-regulation. The latter testifies to the significant contribution of mental structures to the regulation of states and the low efficiency of the use of

operational regulatory tools in educational activities. It is also worth noting a significant number of negative relationships in the case of low efficiency of self-regulation, which is an indicator of the disintegration of the regulatory structure.

Table 2

Indices of the organization of structures (IOS) of the relationship between the methods of mental states' self-regulation and mental characteristics (reflection, self-attitude and meaning-life orientations) in learning situations of different intensity

Methods of self-regulation / effectiveness of self-regulation of states	Low self-regulation efficiency	High self-regulation efficiency
Everyday learning situation		
Passive rest	7	2
Actualization of positive images	7	8
Self-hypnosis / self-orders	7	**13**
Active discharge	**19**	2
Reflection / reasoning	12	5
Mute/switch	8	0
Communication	14	6
Passive discharging	8	3
Stressful learning situation		
Passive rest	7	0
Actualization of positive images	10	6
Self-hypnosis / self-orders	7	**17**
Active discharge	10	9
Reflection / reasoning	12	6
Mute/switch	5	2
Communication	**13**	2
Passive discharging	6	0

In Table 2, in the everyday situation of learning, the leading structure of self-regulation methods associated with mental structures is active discharge (IOS = 19), means of communication (IOS = 14) and reasoning (IOS = 12). At the same time, for persons with a high efficiency of self-regulation, such a structure is self-hypnosis and self-orders (IOS = 13) and the actualization of positive images (IOS = 8). In a stressful situation of an exam, in persons with high efficiency of self-regulation, self-suggestion / self-order is still the leading method (IOS = 17), the role of active discharge increases (IOS = 9). At the same time, for students with low efficiency of self-regulation during the exam, communication becomes the leading method of regulation (IOS=13). It is noteworthy that active relaxation, being unproductive in everyday learning situations, acts as a system-forming element during a stressful exam situation.

Let us turn to the results of studying the connection between mental structures and the revealed methods of self-regulation of mental states in students with high and low efficiency of self-regulation in learning situations of different intensity (Table 3). High self-confidence acts as a leading structure of the self-system in everyday and stressful learning situations in individuals with low self-regulation efficiency. Among the reflexive processes, the greatest connections between the methods of self-regulation have been established with the level of socio-reflection, which is aimed at reflecting others and does not contribute to the choice of optimal methods for regulating the states of students. In addition, in a stressful situation, the general level of reflexivity also has a significant impact on the choice of methods of self-regulation. Among the semantic structures, the highest IOS of the effectiveness of life should be singled out, which reflects the assessment of the passed segment of life, that is, the feeling of how meaningful they lived part of life was.

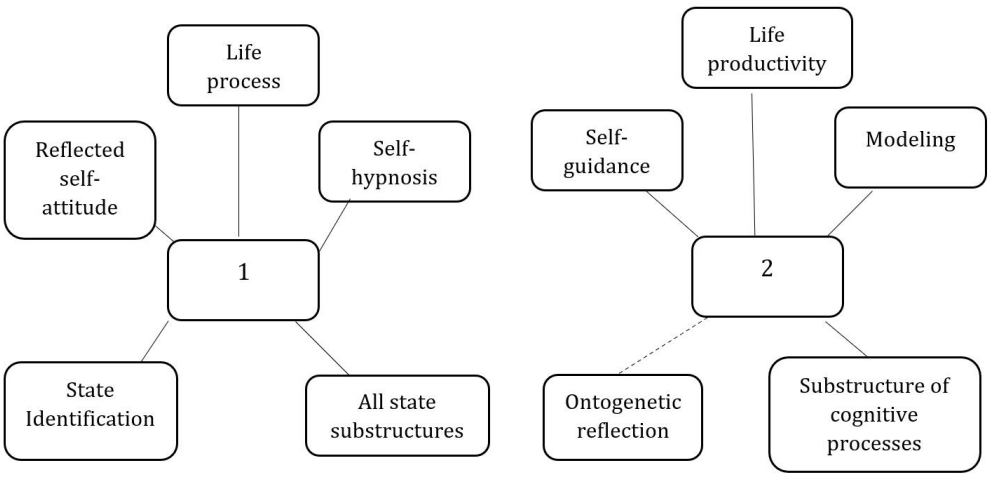
In persons with high efficiency of self-regulation of states, in contrast to students with low efficiency, the presence in the life of the subject of goals in the future comes to the fore, which makes life meaningful. Among the reflexive structures, the largest number of interconnections of self-regulation methods can be identified with perspective reflection, which is associated with the ability to analyze upcoming activities, behavior, and the ability to plan. These components of the mental structure are equally significant for "highly effective students" in both everyday and stressful learning situations. However, in an everyday situation, in addition to the noted structures, the ability to understand one's own states and experiences (self-reflection) also plays a significant role. As for the components of self-attitude, there are differences in the number of connections with methods of self-regulation depending on the level of training tension. In an everyday situation, self-guidance, which reflects the internal locus of control, has the greatest weight, while in a tense situation, the level of internal conflict of the subject is more important. The more often the student resorts to effective methods of self-regulation of states.

Table 3
Leading substructures of the mental states' regulation of students with low and high efficiency of self-regulation in everyday and stressful learning situations

	The tension of learning	*Operational means of self-regulation*	*The structure of self-attitude*	*Reflective structure*	*Semantic structure*
High efficiency of mental states self-regulation	*Everyday situation*	Self-hypnosis / self-orders; Activation of positive images	Self-guidance	Self-reflection	Goals in life
	Stressful situation	Self-hypnosis - self-orders; Active discharge	Low internal conflict	Perspec-tive reflection	Goals in life
Low efficiency of mental states self-regulation	*Everyday situation*	Active discharge; commu-nication	Self confidence	Socio-reflection	Life productivity
	Stressful situation	Commu-nication; meditation	Self confidence	Socio-reflection	Life productivity

Let us consider the operational means of self-regulation of the structures of consciousness (reflection, meaning-life orientations, self-relationships) and substructures of mental states associated with the effectiveness of self-regulation of states in everyday and stressful learning situations. Figure 2 shows the structures that have the strongest relationship with the overall effectiveness of self-regulation of students' states.

Figure 2
Indicators of mental regulation that determine the effectiveness of self-regulation of students' mental states in everyday and stressful situations



Note. *Legend: 1 – the effectiveness of self-regulation of mental states in everyday situations; 2 – the effectiveness of self-regulation of mental states in a tense situation. The solid line indicates the direct relationship; the dotted line indicates the reverse.*

In an everyday learning situation, the effectiveness of self-regulation is associated with each of the components of the mental structure. The strongest connections were established with indicators of reflected self-attitude (r=0.396 at p<0.001), which indicates that self-perception has a positive effect on self-regulation of states, and as a result, on the productivity of students' educational activities. Important for effective self-regulation is the student's ability to identify his state, to be aware of his own experiences (r = 0.352 at p <0.001). In addition, we note that the interest and emotional saturation of students' lives play a significant role here (r = 0.187 at p <0.05): high meaningfulness of life contributes to effective regulation of states in everyday situations of activity. Among the operational means of self-regulation, the key is the use of self-hypnosis and self-orders by students (r = 0.266 at p <0.01), and among the structures of the mental state, the most significant relationships were established with average values (r = 0.303 at p <0.01). The latter indicates that the high efficiency of self-regulation in a lecture situation significantly affects all components of mental states.

Let us turn to the consideration of the structure of relationships between the effectiveness of self-regulation of mental states and mental components in a tense

situation of the exam. In contrast to the everyday form of education in this case, the structure of relationships is different. Self-attitude in the structure is represented by the indicator of self-guidance ($r = 0.353$ at $p < 0.001$), reflecting students' confidence in their abilities, their independence. At the exam, the indicator of life effectiveness comes to the fore ($r = 0.276$ at $p < 0.01$), therefore, the effectiveness of students' self-regulation depends on satisfaction with self-realization, meaningfulness of the lived segment of life. We also note the importance of reflection of experience in the effectiveness of self-regulation of states ($r = -0.245$ at $p < 0.01$). It is noteworthy that the high severity of this type of reflection negatively affects the self-regulation of states, which, apparently, is associated with the "self-digging" and "looping" of students on the negative experience of passing the exam. Among the regulatory structures, the development of modeling processes among students is of great importance ($r=0.296$ at $p<0.001$), i.e. the ability to highlight the essential conditions for achieving the goal, their awareness and adequacy. We also note a significant relationship between the effectiveness of self-regulation of states and the substructure of cognitive processes ($r=0.503$ at $p<0.001$), since the result in a tense exam situation largely depends on their activity.

Discussion

The results reflect the influence of mental regulation of mental states and confirm the significant role of the structures of consciousness (reflexive, semantic, the self-system) in the regulation of students' mental states (Prokhorov, 2021). In addition, the identified patterns are combined with earlier studies (Prokhorov and Chernov, 2016), where it was shown that the intensity of the form of education is a significant factor in the reflexive regulation of mental states. The results of the study are also consistent with the works of M.I. Kartasheva (2022), which shows the role of the self- system in the structure of mental regulation of the mental states of students' learning activities. The situational determination of the actualization of semantic structures in the regulation of states was also revealed in the works of E.M. Alekseeva (2006).

Conclusion

The nature of the relationship between mental structures, operational means of self-regulation, substructures of mental states and the effectiveness of self-regulation of states depends on the intensity of learning situations.

1. Mental states characteristic of students with different efficiency of self-regulation in different training situations were revealed. In a everyday situation, students with high efficiency of self-regulation mainly experience conditions that contribute to productive learning activities (interest, concentration), while students with low

efficiency of self-regulation often experience conditions that prevent the successful mastering of educational material (fatigue, boredom). In a stressful learning situation, students of both groups designate the experienced states in general in the same way (excitement, anxiety), however, persons with high efficiency of self-regulation on the exam show a higher intensity of all substructures of mental states.

2. A typology of self-regulation of mental states of students with high and low efficiency of self-regulation has been established. In a tense exam situation, people with high efficiency of self-regulation are characterized by frequent use of actualization of positive images and memories, while in everyday situations such respondents often resort to self-hypnosis and self-orders than students with low efficiency of self-regulation of states. These methods of self-regulation are leading in connection with mental structures (semantic, reflexive, the system of the Self) in both learning situations.

3. The leading mental structures that determine the effectiveness of self-regulation of mental states in training situations of various tensions have been discovered. In an everyday situation, the high efficiency of self-regulation of students' states is associated with self-guidance, self-reflection and the presence of goals in life. For students with low efficiency of self-regulation, the leading substructures are self-confidence, socio-reflection and life effectiveness. In a stressful situation of learning, the high efficiency of self-regulation of states is associated with the presence of significant goals in life, reflection of the future, and a low level of internal conflict. The low efficiency of self-regulation in this situation is determined by the same mental structures as in the everyday situation.

4. In an everyday situation, in general, the effectiveness of self-regulation is associated with each substructure of states, and suggestion is the leading method of self-regulation. Such structures of consciousness as the meaningfulness of the life process, reflection of one's own state and reflected self-relationship are of high importance. In a stressful exam situation, the structure of relationships takes on a different form: the substructure of the cognitive processes of mental states comes to the fore, and the regulatory process of modeling the situation becomes the leading one. The leading mental structures are represented by a high level of students' self-confidence, satisfaction with self-realization and low rates of reflection of experience.

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Personal Emotional Health: A Method for Measuring Difficulties in Emotional Self-Reflection

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Abstract

Introduction. This article introduces a new instrument aimed at addressing various synthetically integrated process formations and their effects that underlie the challenges of personal reflection on emotions as an intrapersonal predictor of emotional health development. The research objective was to develop and validate a diagnostic methodology for assessing difficulties in personal emotional reflection (DPER). **Methods.** The study involved 1688 participants (62.26% female, 37.74% male) aged 15 to 60 years. The development of DPER methodology statements was based on an author's model of research tools, presented by three components that encompass seven parameters (scales). Unformed abilities to understand and express one's emotions (difficulties in recognising one's own feelings, difficulties in expressing emotions); susceptibility to emotional stress (inability to endure (tolerate) emotions; tendency to use physiologically oriented defenses); psychological mechanisms hindering effective emotional reflection (prohibitions on emotions; suppression of emotions; avoidance of emotions). Convergent validity of the methodology was tested using: The Emotional Regulation Questionnaire (Gross, 2003), the Diagnostic Methodology for the Value and Self-efficacy of Emotional Control (Mauss, 2010), the Emotional Intelligence Test (Lyusin, 2006), and The Brief Five-factor Personality Questionnaire (Gosling, Rentfrow & Swann, 2003). Statistical data analysis included the calculation of Cronbach's alpha coefficient, Kaiser-Meyer-Olkin criterion, Bartlett's sphericity coefficient, Pearson's criterion; exploratory factor analysis was conducted. **Results.** A sufficient level of reliability of the correlation

matrix characterising the questionnaire's structure and internal consistency of its scales was determined. The grouping of scales into factors corresponds to the proposed model of the research tool: a three-component structure (66.85% explained variance) encompassing seven parameters (scales) (62.15% explained variance). Convergent validity of six questionnaire scales was confirmed. **Discussion.** The DPER methodology is an independent, reliable, and valid instrument, allowing for the measurement of the degree of difficulties in personal emotional reflection over a relatively short period and making a probabilistic forecast for the development of emotional health conditions.

Keywords

emotional self-reflection, emotional health, emotional competencies, emotion regulation, methodology, reliability, validity

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Introduction

The development of a measuring tool that allows obtaining data on psychological (personal) predispositions of negative shifts in a person's emotional life is necessary for solving prognostic tasks of monitoring the states of emotional health of a person and determining the direction of psychological prevention measures, as well as supportive, retraining and personal-reconstructive psychological intervention.

The loss of reflexive contact with one's mental states and, accordingly, the ability not only to understand, but also to manage them, has negative consequences for emotional health. They are confirmed by relevant studies of alexithymia, emotional burnout, neurotic disorders, and destructive forms of emotional response (Brel, 2012; Sheinina, Tretiakova, 2016; Iskusnykh, 2015; Yutkina, 2017; Garanyan, Kholmogorova, 2017; Lyusin, Ovsyannikova, 2013; Sysoeva, 2009, 2013; Pryakhina, 2017; Belasheva et al, 2018; Rottenberg, 2005; Direnfeld & Roberts, 2006; Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg & Van Ijzendoorn, 2007; Derryberry & Reed, 2002; Gross & John, 2003; Gross & Jazaieri, 2014; Gratz & Roemer, 2004; Lis, Greenfield, Henry, Guilé & Dougherty, 2007; Gard et al, 2007; Campbell-Sills & Barlow, 2007; Padun, 2015; Ermakov et al, 2022). Due to the personal reflection of emotions, which implies the activity of the individual compared to the state of passive embracing of emotions (Bashanaeva & Shumilkina, 2016), there is not only an awareness of current emotions, but also an understanding of the reasons for their occurrence, their direction, and the identification of strategies for their transformation.

Personal reflection of emotions occupies a central place in self-regulation of human emotional states (Prokhorov, Chernov, 2012), is a "key" to the awareness of one's own life, a condition for the development of personality, its integration into society, preservation of mental (Ingram, 1990) and psychological health in general.

Difficulties of personal reflection of emotions are formed under the influence of various factors. These include psychotraumatic experience, peculiarities of family upbringing, internalised socio-cultural attitudes, crisis response, and specific individual personality. The resultant effects of difficulties in personal reflection of emotions are emotional tension; disturbance of the balance of positive and negative affects due to the accumulation of negative emotions; excessive regulation of emotions at the physiological level (somatisation), individual vulnerability to emotional disorders, the appearance of neurotic symptoms; a decrease in the trustworthiness of interpersonal relations and an increase in the deficit of social ties; the experience of subjective disadvantage. These effects are in fact manifestations of emotional ill-health, and the very difficulties of personal reflection of emotions are its intrapersonal predictors.

The purpose of our work is to develop a Russian-language methodology to investigate the difficulties of personal reflection of emotions. The development should be carried out in accordance with the following requirements:

1. The methodology should cover the most frequently encountered difficulties in personal reflection of emotions and have a clear conceptual structure;
2. The results of the methodology should reflect the indicators of the degree of expression of this or that difficulty of personal reflection of emotions, the total indicators of unformedness of the corresponding abilities and the degree of expression of psychological mechanisms that block effective reflection of emotions, as well as the total indicators that make it possible to make a probabilistic forecast of the development of states of emotional ill-health;
3. The methodology should be user-friendly both for respondents (containing a reasonable amount of stimulus material presented in the form of a convenient registration and questionnaire) and for the researcher (the data recorded in the registration and questionnaire can be computer-processed).

The theoretical basis for the development of the methodology for diagnosing difficulties in personal reflection of emotions (DPRE) was the ideas, concepts, and models of reflexive processes (Karpov, 2001) and health-improving (sanogenic) reflection (Orlov, 2006); procedural emotional regulation (Gross, 2014) and its dysfunctional strategies (Werner & Gross, 2010; Gross & Jazaieri, 2014; Sheppes, Suri & Gross, 2015; Aldao, Nolen-Hoeksema & Schweizer, 2010; Padun, 2015); the multilevel structure of the emotional regulation system and its disorders (Lebedinsky & Bardyshevskaya, 2006); emotional intelligence (Lucin, 2006; Zeidner & Olnick-Shemesh, 2010); the influence of emotional properties and personality states on the processes of processing emotional information (Lyusin & Ovsyannikova, 2013; Sysoeva, 2013; Pryakhina, 2017; Austin, 2004; Rusting,

1998; Segerstrom, 2001; Bar-Haim et al., 2007); multifactoriality of emotional disorders (Kholmogorova & Garanyan, 2006); alexithymia symptom complex, including difficulties in identifying and describing feelings (Sifneos, Apfel-Savitz & Frankel, 1977; Taylor & Bagby, 2021; Provotorov, Kravchenko, Budnevsky, Grekova, 1998; Iskusnykh, 2015; Yutkina, 2017; Solozhenkin & Guzova, 1992; Brel, 2012); defence mechanisms as processes of intrapsychic adaptation of personality in conditions of traumatic emotional tension (Bond, 1992; Pantileev, Zhilina, 2009; Plutchik, Kellerman & Conte, 1979; Romanova, Grebennikov, 1996); emotional stability as the ability to withstand emotions of different degrees of intensity, sign and modus (Vasilyeva, Filatov, 2018; Dubrovina, 2015; Sirotin, 2018).

The analysis of the indicated concepts and representations allows us to consider the difficulties of personal reflection of emotions as characteristics of properties and states of the system of emotional, cognitive and personal process formations and their resultant effects, functioning in dynamic unity on the basis of nonlinear complex mutual influence and presented at different levels of individuality, reducing the awareness and adequacy of experiences and behaviour under the influence of subjectively emotionogenic information.

Table 1 shows the constructs of process means related to personal reflection of emotions (temperament, defence mechanisms and coping, cognitive processing of emotional information, emotion regulation, emotional competences), which are united into three groups differing by factors of determination, by their significance for the subject's social adaptation, and by the underlying processes.

Table 1
Constructs of process means related to personal reflection of emotions

Group	Construct	Processes and components
Emotional tolerance	temperament	A set of dynamic features of mental activity and behaviour (activity, pace, rhythm, intensity, emotionality, etc.) that have a connection with the world of internal representations (thoughts, affects, memories, etc.).
Automated protections	defence mechanisms and coping	Constructs describing the ways of consciousness work that modulate unwanted discharges of affects in situations of conflict, stress, and trauma. They are based on perceptual, intellectual and motor mechanisms that provide a consistent processing of the image of the real situation to reduce traumatic emotional tension

Group	Construct	Processes and components
Awareness and regulation of emotions	cognitive processing of emotional information	Operation of individual system modules of cognitive processing of information, which are part of the system of downward processing of information determined by individual characteristics of the subject, and the system of upward processing of information determined by the information coming to the inputs of the cognitive system
	emotional regulation	An automated monitoring process consisting of two main components: a control process focused on comparing the individual's current state with the desired state, and an operational process focused on reducing the discrepancy between the individual's current state and the desired state
	emotional competences	A system of acquired procedural skills, which are essentially operations outside the realm of awareness, and declarative skills acquired through life experience and learning to which the individual has conscious access, can demonstrate and verbally describe

Based on the constructs of process tools we have developed a model of the research toolkit, including seven parameters (scales): difficulties in understanding one's own feelings; difficulties in expressing emotions; inability to withstand (tolerate) emotions; tendency to use physiologically oriented defences; prohibitions on emotions; suppression of emotions; avoidance of emotions. The parameters are united in three components: unformed abilities to understand and express their emotions; instability to emotional stresses; psychological mechanisms preventing effective reflection of emotions (table 2).

The allocation of parameters (scales) is also justified by the data of counselling psychological work within the framework of different psychotherapeutic approaches. Most approaches assume that reflexive working through complex emotional experience and its factors is necessary to eliminate the symptoms that motivate clients to go to psychotherapy. Strategies for working with emotions in different psychotherapeutic approaches have common features and aim to: the client's awareness of the presence of the emotion and contact with it until the moment of transformation, on tolerance of emotions, on the ability to express emotions, on overcoming psychological (suppression, avoidance, prohibition) and physiologically oriented defences against emotions that make it difficult both to fully form and live emotions and to withstand (tolerate) emotions (Jung, 1960; Stolorow, Brandchaft, Atwood, 1995; Laplance & Pontalis, 1998; Dayananda, 2002; Selvam, 2019).

Table 2
Model of the research toolkit of difficulties of personal reflection of emotions

Components	Incomplete ability to understand and express emotions	Emotional stress	Psychological mechanisms that hinder effective reflection of emotions
parameters	difficulties in recognising their own feelings	Inability to withstand (tolerate) emotions	Emotional prohibition
			emotional suppression
	emotional difficulties	a tendency to use physiologically oriented defences	emotional avoidance

Description of the parameters (scales) of the DPER questionnaire:

- DUOF scale (*difficulties in understanding one's feelings*): difficulties in recognising and describing one's feelings and emotions and understanding their impact on behaviour and activities;
- DEE scale (*difficulties in expressing emotions*): inability to give emotions an adequate outlet and to express emotions in a form understandable to others on the basis of a "vocabulary" of emotions;
- ITE scale (*inability to withstand (*tolerate*) emotions*): low tolerance to intense polar emotions, inability to stay in an emotion until the moment of its transformation, rapid fatigue in emotionogenic situations;
- TUPOD scale (*tendency of using physiologically oriented defences*): tendency to relieve emotional tension with medications or other substances (alcohol, nicotine), physical activity, breathing exercises, food; the presence of pronounced physiological defences against emotions reduces the ability to withstand intense polar emotions and to be in conscious contact with one's own emotions;
- PE scale (*prohibitions on emotions*): negative attitude to emotions, prohibition on their open manifestation;
- SE scale (*suppression of emotions*): inhibition of experiences and external manifestations of feelings and emotions;
- EA scale (emotional avoidance): avoidance of emotions and situations provoking them.

Since the components and parameters of the research toolkit reflect the difficulties of personal reflection of emotions, based on different process formations realised both in the conscious and unconscious fields, the approaches to their measurement may differ. Nevertheless, as the analysis shows, in diagnostics of all the process formations described in the model of the research toolkit along with other methods, questionnaires based on self-reporting of test persons are used (questionnaires of emotional intelligence, emotional regulation, expression of defence mechanisms, personality questionnaires). Therefore, in our opinion, the questionnaire is the most satisfactory for the tasks of complex measurement of difficulties of personal reflexion of emotions.

Methods

Description of the methodology for measuring difficulties of personal reflection of emotions

In order to create the questionnaire "Difficulties of Personal Reflection of Emotions" (DPRE), statements were developed to measure the relevant parameters presented in Table 2. The development of the questionnaire statements aimed at measuring the degree of representation of psychological mechanisms that hinder effective reflection of emotions, which are most often not realised by a person, was based on Bond's (1992) ideas that a person can find with a sufficient degree of accuracy an explanation for his/her behaviour after a certain time after an event, even if at the time of this event his/her behaviour was not conscious; people often notice manifestations of protective behaviour in other people (Tunick, 2010).

The principles on which the statements of the DPER questionnaire were selected:

1. Statements revealing an individually characteristic style of behaviour related to personal reflection of emotions, which a person can identify independently (for example, the statement "I find it difficult to express my emotions and feelings in words", related to the ability to express emotions, or the statement "Physical (or breathing) exercises help me cope with emotions", related to the ability to tolerate (withstand) emotions);
2. Statements built on the identification of difficulties in personal reflection of emotions through the description of a person's behaviour by others (for example, the statement "People around me consider me to be an emotionally reserved person" related to the ability to express emotions);
3. Statements in the form of imperative utterances reflecting human attitudes towards emotions (e.g., the statement "An adult should be restrained in showing emotions" associated with prohibitions on emotions).

About 10% of the questionnaire statements were borrowed from other standardised methods aimed at diagnosing different definitions of personal reflection of emotions: for

example, the statement "I can recognise most of my feelings" from the emotional skills and competencies questionnaire of Avsec et al. (2020); the statement "An adult should be restrained in showing emotions" corresponds closely with the statement "Adults should be restrained in showing their feelings" of the questionnaire "The prohibition to express feelings" by V. K. Zaretsky, A. B. Kholmogorova, and N. G. Garanyan (2006).

The questionnaire statements were subjected to *expert evaluation* for their compliance with the parameters reflecting the difficulties of personal reflection of emotions. Six experts (one doctor of psychological sciences, 5 candidates of psychological sciences, one of whom is a specialist in profiling, one in body-oriented psychotherapy, and one in pathopsychological and neuropsychological diagnostics) took part in the examination and were asked to evaluate the statements from the questionnaire on a four-point scale (0 – does not correspond, 1 – rather does not correspond, 2 – rather corresponds, 3 – fully corresponds). Based on the results of the expert group's work, an average score was obtained for each statement, which was taken into account when selecting them for the final version of the questionnaire: the questionnaire included statements whose independent assessments by experts were consistent, with an average score of at least 2.6. There were 32 statements in the original version of the questionnaire. Four statements were deleted.

The developed questionnaire is a closed-ended questionnaire and contains 28 statements (Table 9). Four judgements (statements) are provided for each of the seven dimensions. Verbal responses are based on a set of judgements (statements) about the presence and degree of expression of the studied attribute using the scale "agree" – "rather agree" – "rather disagree" – "disagree". The subject's answers are reduced to marking the required option with simple symbols (cross, circle, etc.) in the questionnaire.

For scoring, keys are used, according to which the items (statements) of the questionnaire refer to a certain scale (parameter). The questionnaire has direct (89.3%) and reverse (10.7%) items. All items referring to a certain scale are equivalent. Subjects' responses are coded according to the following scheme:

- for statements with a direct key: "agree" – 4, "rather agree" – 3, "rather disagree" – 2, "disagree" – 1;
- for reverse–key statements: "agree" – 1, "rather agree" – 2, "rather disagree" – 3, "disagree" – 4.

Scale values are obtained by simply summing up the corresponding scores.

Sample description

The study of validity and reliability of the DPER methodology was conducted on a sample of 1688 respondents (teachers and students of 10–11 grades of schools in Stavropol Krai, students, undergraduates and teachers of higher education institutions of the Russian Federation (Stavropol, Rostov-on-Don, Kursk, St. Petersburg, Moscow), employees of

organisations, banks, law enforcement agencies, rescuers, doctors. Table 3 presents gender and age indicators of the sample.

Table 3
Gender and age indicators of the sample

Gender	Female		Male
Packs	1051		637
Age*	Adolescence and young adulthood (15–19 years)	Early adulthood (20–39 years old)	Middle adulthood (40–60 years old).
Packs	737	823	128

Note. ** Division of the sample into age groups was carried out in accordance with the classification of Rean (2013)*

Psychodiagnostic techniques to assess the convergent validity of the DPER questionnaire

Convergent validity (the main component of construct validity) of the DPER questionnaire was assessed using the scales of the following psychodiagnostic techniques that study, based on theoretical assumptions, similar phenomena:

1. *Emotion Regulation Questionnaire* (ERQ) (Gross & John, 2003), adapted from Pankratova (2017), aimed at diagnosing two emotion regulation strategies: cognitive reappraisal (cognitive reappraisal) and expressive suppression (expressive suppression); it consists of 10 statements assessed on a seven-point scale; the "expressive suppression" scale of the questionnaire reveals a regulatory strategy oriented towards restraining external manifestations of an already emerged emotional reaction and theoretically partially correlates with the "emotion suppression" scale of the DPER questionnaire;
2. *Emotion Control Values (ECV)* questionnaire (Mauss, Butler, Roberts & Chu, 2010), adapted from Pankratova (2015): it consists of 15 statements on which respondents need to indicate their degree of agreement; two scales of the questionnaire presumably partially correlate with the "difficulty in realising one's own feelings" scale of the DPER questionnaire;
3. Lucin's *Emotional Intelligence Test (EmInt) (*2006) is a questionnaire-based psychodiagnostic technique consisting of 46 statements that assesses emotional intelligence on four scales and five subscales; the scale "intrapersonal emotional intelligence" and its constituent subscales ("understanding one's emotions", "managing one's emotions") can theoretically correlate with the group of scales

included in the complex indicator "lack of ability to understand and express one's emotions" ("difficulty in understanding one's own feelings", "difficulty in expressing emotions") and the indicator "instability to emotional stress" ("tendency to use physiologically oriented defences", "inability to withstand (tolerate) emotions") of the DPER questionnaire;

4. *Short Five-Factor Personality Inventory (TIPI-RU)* (Gosling, Rentfrow & Swann, 2003), adapted from Sergeeva, Kirillov & Dzhumagulova (2016), consisting of 10 statements (personality traits) rated by respondents on a seven-point scale; the scales could theoretically correlate with those of the DPER questionnaire due to the predominantly personal nature of difficulties in reflecting emotions.

Methods of data analysis

Statistical processing of the data obtained in the study was carried out using the software SPSS 27.0; Cronbach's α coefficients, Kaiser-Meyer-Olkin (KMO) criterion, Bartlett's coefficient of sphericity, Pearson's criterion, Kraskall-Wallis test, t-test for independent samples, Chi-square, z-transformation; descriptive statistics were calculated; exploratory factor analysis was performed (based on the use of principal component method, Varimax rotation with Kaiser normalisation). Statistical validity was considered at a significance level of $p < 0.05$.

Results

The validity and reliability of the DPER methodology was investigated in several stages.

The first step was to assess the sampling quality and internal consistency of the seven-scale structure of the DPER questionnaire.

The Shapiro-Wilk and Kolmogorov-Smirnov criteria were used to assess the initial sample for conformity to normal distribution (Table 4). The results show that all scales of the DPER questionnaire conform to normal distribution.

Table 4
Conformity of the sample to normality of distribution on the scales of the DPER questionnaire

Scale	Criterion Shapiro-Wilk	Kolmogorov-Smirnov criterion
Suppression of Emotions (SE)	0,9706***	0,1191***
Emotional avoidance (EA)	0,9872***	0,0919***
Difficulties in recognising one's own feelings (DUOF)	0,9569***	0,1412***

Scale	Criterion Shapiro-Wilk	Kolmogorov-Smirnov criterion
Tendency to use physiologically oriented defenses (TUPOD)	0,9623***	0,1224***
Inability to withstand (tolerate) emotion (ITE)	0,9706***	0,1190***
Difficulty in expressing emotions (DEE)	0,9872***	0,0919***
Emotional prohibition (PE)	0,9685***	0,1085***

***Note**. Level of significance * 0.05 < p < 0.10; ** 0.01 < p < 0.05; *** p < 0.01*

To assess the internal consistency of the scales of the DPER questionnaire, the values of Pearson's paired correlation coefficients were determined (Table 5). The values of paired correlation coefficients for all scales do not exceed 0.7 at the significance level of $p < 0.05$. This allows us to conclude that there is no collinearity and close relationship between the scales and, as a consequence, that there is no need to reduce the dimensionality or eliminate the scales.

Table 5

Matrix of paired correlation coefficients between scales of the DPER questionnaire*

Scale	Having served emotional behaviour	Emotional avoidance	Difficulties realise proprietorships feelings	A tendency to use physiological centred defences	Inability endurance emote	Difficulties in expressing emotions	Emotional prohibition
Suppression of emotions	1,000	0,507	0,269	0,168	0,227	0,437	0,543
Emotional avoidance	0,507	1,000	0,158	0,212	0,262	0,347	0,400

Scale	Having served emotional behaviour	Emotional avoidance	Difficulties realise proprietorships feelings	A tendency to use physiological centred defences	Inability endurance emote	Difficulties in expressing emotions	Emotional prohibition
Difficulty recognising your own feelings	0,269	0,157	1,000	0,162	0,241	0,386	0,273
Tendency to use physiologically oriented defences	0,168	0,212	0,162	1,000	0,233	0,247	0,209
Inability to withstand (tolerate) emotions	0,227	0,262	0,241	0,233	1,000	0,269	0,262
Difficulties in expressing emotions	0,437	0,347	0,386	0,247	0,269	1,000	0,358
Emotional prohibition	0,543	0,400	0,2737	0,209	0,262	0,358	1,000

Note. ** Significance level of correlations $p < 0.05$.*

The adequacy of the sample and internal consistency of the questionnaire structure are also confirmed by the value of the Kaiser-Meyer-Olkin (KMO) criterion, which exceeds 0.7 (calculated value 0.812), and the value of the Bartlett's sphericity coefficient (Chi-square value is 1746.42, which corresponds to the level of statistical significance 0.001) (Table 6).

Table 6
Estimated sampling adequacy coefficients

Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy.		0,812
Bartlett's sphericity criterion	Approximate Chi-square	1746,421
	Significance	0,000

The obtained results confirm a sufficient level of reliability of the correlation matrix characterising the structure of the questionnaire.

The Cronbach's α measure of *internal consistency* showed the following: on five scales (emotional avoidance (EA), difficulties in being aware of one's own feelings (DUOF), tendency to use physiologically oriented defences (TUPOD), inability to withstand (tolerate) emotions (ITE), difficulties in expressing emotions (DEE)) the value of Cronbach's α exceeds 0.7; for two scales (suppression of emotions (SE) and prohibition on emotions (PE)) the value of Cronbach's α is within acceptable limits (exceeds 0.65); the total value of Cronbach's α is 0.749 (Table 7). This allows us to conclude that the level of internal consistency of the DPER questionnaire scales is satisfactory.

Table 7
*Psychometric characteristics of the DPER * questionnaire scales*

Scale	Under-whel-med emo-tio-nality	Avoid emotio-nality	Difficul-ties in realising one's own feelings	The ten-dency to use physio-logical centred defences	Inability to with stand (tolerate) emotions	Difficul-ties in expres-sing emo-tions	Emo-tional prohi-bition
Cron-bach's α	0,689	0,711	0,736	0,752	0,737	0,701	0,698

Note. **Final calculations for the questionnaire: Cronbach's α = 0.749407; standardised α = 0.744315; mean inter-item correlation = -0.298058*

The application of exploratory factor analysis to the 28 statements of the DPER questionnaire allowed us to reproduce the structure of the 7 scales and to determine the significance of the contribution of each statement to the corresponding scale. The seven-factor solution explains 62.15% of the explained variance: the first factor covers 17.9% of the variance, the second – 14.9%, the third – 8.8%, the fourth – 6.51%, the fifth – 5.24%, the sixth – 4.64%, the seventh – 4.16%. The appropriateness of the seven-factor solution is also confirmed by the values of the Kaiser-Meyer-Olkin criterion (KMO) (exceeding 0.7) and Bartlett's sphericity coefficient (statistically significant at the 0.001 level) (Table 8).

Table 8
Estimated sample adequacy coefficients for the seven-factor solution

Kaiser-Meyer-Olkin measure of sampling adequacy (KMO)		,859
Bartlett's sphericity criterion	Approximate Chi-square	8955,511
	st.st.	378
	Significance	,000

Table 9 presents the values of the exploratory factor analysis coefficients (principal component analysis followed by Varimax rotation with Kaiser normalisation) showing with what weight the scale is included in a factor.

Table 9
Results of exploratory factor analysis of the DPER questionnaire statements. Inverted component matrix

Questionnaire statements	Key	Component						
		1	2	3	4	5	6	7
I can recognise most of my feelings	DUOF	-,195	**,643**	**,418**	,031	,020	,053	-,107
I don't know how to let my emotions out	DEE	,207	**,427**	**,501**	-,061	-,013	-,036	-,080
I can experience very strong emotions	ITE	,110	,237	,034	,034	**,630**	-,074	,044

Questionnaire statements	Key	Component						
		1	2	3	4	5	6	7
An adult should be restrained in showing emotions	PE	**,637**	-,187	-,172	,237	,067	-,053	-,083
I make sure I don't outwardly show my emotions	SE	**,425**	,112	,205	**,430**	-,067	-,153	-,026
In a stressful situation, I start thinking about something else	EA	,187	,206	,234	-,016	,044	-,092	**,643**
Emotional distress affects my physical well-being	ITE	-,037	,073	,240	-,076	**,687**	,068	,213
I use medication to deal with my emotions	TUPOD	,073	,265	,197	,031	-,241	**,527**	,153
It's hard for me to describe the emotions I'm feeling right now	DUOF	,086	**,632**	**,437**	,044	-,163	,258	,100
People around me think I'm an emotionally reserved person.	DEE	,308	,314	**,552**	,209	,112	-,274	-,071

Questionnaire statements	Key	Component						
		1	2	3	4	5	6	7
I can't keep worrying about something for too long.	ITE	,067	-,141	-,061	,159	**,442**	,036	,269
Openly rejoicing and laughing in public is bad form	PE	**,613**	,143	,192	-,043	,111	,295	,199
When I'm happy, I try to keep my cool.	SE	**,454**	,174	,273	**,492**	,112	-,062	,092
I try to avoid conflict situations and conflicted people	EA	,112	,070	,168	**,401**	-,095	-,354	**,407**
The best way for me to relieve emotional stress is with alcohol (or smoking)	TUPOD	,086	,199	,115	,088	-,062	**,671**	-,056
For me, good food is the best cure for stress	TUPOD	-,037	,151	,054	,094	-,079	**,494**	,068
Often I don't feel anything	DUOF	,189	**,554**	**,421**	,162	,134	,200	,050

Questionnaire statements	Key	Component						
		1	2	3	4	5	6	7
I find it difficult to express my emotions and feelings in words	DEE	,155	**,417**	**,717**	,032	-,121	,035	-,001
Emotional people don't inspire respect.	SE	**,552**	,036	,114	,050	,117	,325	,164
I try to suppress negative emotions.	SE	,214	,165	,181	**,699**	,071	,012	,048
I try to avoid strong positive emotions (joy, jubilation)	EA	**,462**	,284	,212	,039	,062	,334	**,473**
I find physical (or breathing) exercises help me deal with my emotions	TUPOD	-,024	-,062	-,219	,152	-,086	**,384**	,368
In a stressful situation, I feel nothing but fatigue.	ITE	,106	,404	,342	,057	**,503**	,136	,344

Questionnaire statements	Key	Component						
		1	2	3	4	5	6	7
Emotions influence my behaviour and activities	DUOF	,137	**,524**	,387	-,101	**,440**	-,007	-,029
People around me don't realise what I'm really going through	DEE	,177	**,412**	**,429**	,197	-,340	,007	,035
Emotions get in the way of business and make communication difficult	PE	**,513**	,206	,171	,251	-,219	,146	,044
I suppress fear, anxiety, anger and aggression through willpower	SE	,159	,013	,050	**,728**	,025	,137	,011
I try to avoid negative emotions and situations that provoke them	EA	,100	-,011	-,026	**,410**	-,055	-,208	**,413**

Note. *Method of factor extraction: Principal component method. Rotation method: Varimax with Kaiser normalisation. Rotation converged in 8 iterations. The factor loadings of the items that were included in the factor are in bold type.*

The first factor combines the 4 items we developed for the Prohibition on *Emotion* (PE) scale; it also includes statements theoretically related to the Emotional Suppression (SE) and Emotional Avoidance (EA) scales.

The *second factor* with high weights included 4 statements reflecting *difficulties in recognising one's own feelings* (DUOF) and with weights greater than 0.4 statements relating to the scales "difficulty in expressing emotions" (DEE) and "inability to withstand (tolerate) emotions" (ITE);

The third factor includes all statements characterising *difficulties in expressing emotions (DEE);* some contribution is made by statements developed for the Difficulties in Being Aware of One's Own Feelings (DUOF) scale.

The *fourth factor* encompasses 4 statements theoretically related to the *emotional suppression* (SE) scale, and with lower weights (but greater than 0.4) statements reflecting emotional avoidance (EA) tendencies.

The fifth factor includes 4 statements hypothesised to be related to the *Inability to Endure (Tolerate) Emotions (*ITE) scale and 1 statement related to the Difficulties in Being Aware of One's Own Feelings (DUOF) scale.

The *sixth factor* with the highest weights included statements reflecting the *propensity to use physiologically oriented defences* (TUPOD).

The seventh factor combines 4 statements characterising the *emotion avoidance* (EA) tendency.

Thus, each questionnaire statement makes the most weighty and statistically significant contribution to the scale to which it was theoretically assigned (see key, Table 9).

There are "intercepts" on statements between different factors. The most significant ones are between the 2nd factor ("difficulties in understanding my own feelings" (DUOF)) and the 3rd factor ("difficulties in expressing emotions" (DEE)): "People around me don't understand what I'm really experiencing" (DEE), "Often I don't feel anything" (DUOF), "I don't know how to give an outlet to my emotions" (DEE); between the 1st factor ("prohibition on emotions" (PE)) and the 4th factor ("suppression of emotions" (SE)): "When I am happy, I try to keep myself in control" (PE), "I make sure I don't outwardly show my emotions" (DEE); between factor 1 ("prohibition on emotions" (PE)) and factor 7 ("emotion avoidance " (EA)): "I try to avoid strong positive emotions" (EA)); between factor 4 ("suppression of emotions" (PE)) and factor 7 ("emotional avoidance" (EA)): "I try to avoid negative emotions and situations provoking them" (EA). The contributions of the DPER questionnaire statements to the non-key matched scales are less significant than to the key matched scales. Nevertheless, they testify to the "determinational" closeness of the defence mechanisms of avoidance, prohibition and suppression, as well as difficulties in realising and expressing emotions.

Thus, the values of all statistical characteristics of the structure of the DPER questionnaire and the consistency of its scales confirm its seven-factor structure and

the validity of including the questionnaire statements in the corresponding scales, and the obtained "intercepts" of the statements between the scales additionally testify to the closeness of the phenomena described by the scales in accordance with the structural model of difficulties in personal reflection of emotions that we have proposed.

At the second stage, an exploratory factor analysis using the principal component analysis (PCA) method was conducted to ***test our proposed three-component theoretical structural model of difficulties in personal reflection of emotions***. A three-factor solution explained 66.85% of the explained variance (the first factor covered 40.3% of the variance, the second 14.0%, and the third 12.6%). Consequently, it is reasonable to combine the seven scales of the DPER questionnaire into three factors. This is confirmed by the values of the Kaiser-Meyer-Olkin criterion (KMO) (exceeding 0.7) and Bartlett's sphericity coefficient (statistically significant at the 0.001 level) for the three-factor solution (Table 10).

Table 10
Estimated sample adequacy coefficients for the three-factor solution

Kaiser-Meyer-Olkin measure of sampling adequacy (KMO)		,799
Bartlett's sphericity criterion	Approximate Chi-square	2247,588
	st.st.	21
	Significance	,000

In order to assign each of the DPER questionnaire scales to one of the three factors, we determined the values of the exploratory factor analysis coefficients (principal component analysis followed by Varimax rotation with Kaiser normalisation), showing with what weight the scale is included in one or another factor (Table 11).

Table 11
*Rotated component matrix**

Scale	Component		
	1	2	3
Suppression of Emotions (SE)	0,829	0,227	0,030
Emotional avoidance (EA)	0,785	-0,037	0,223

Scale	Component		
	1	2	3
Difficulties in recognising one's own feelings (DUOF)	0,075	0,908	0,096
Tendency to use physiologically oriented defences (TUPOD)	0,099	0,004	0,876
Inability to withstand (tolerate) emotion (ITE)	0,273	0,290	0,712
Difficulty in expressing emotions (DEE)	0,336	0,681	0,214
Emotional prohibition (PE)	0,726	0,232	0,123

Note. **Method of factor extraction: Principal component method. Rotation method: Varimax with Kaiser normalisation. Rotation converged in 5 iterations.*

Scales whose factor loadings exceed 0.7 or are within acceptable limits are combined into appropriate groups (factors):

1. the 1st group (factor) included the scales "suppression of emotions" (SE), " emotion avoidance " (EA), "prohibitions on emotions" (PE);
2. The 2nd group (factor) included the scales "difficulties in realising one's own feelings" (DUOF) and "difficulties in expressing emotions" (DEE);
3. the 3rd group (factor) included the scales "tendency to use physiologically oriented defences" (TUPOD) and "inability to withstand (tolerate) emotions" (ITE).

Such grouping of scales into groups (factors) corresponds with the model of the research toolkit of difficulties of personal reflection of emotions, according to which the 1st factor is psychological mechanisms preventing effective reflection of emotions (PE, EA, SE); the 2nd factor is unformed abilities of understanding and expressing one's emotions (DUOF, DEE); the 3rd factor is instability to emotional stresses (TUPOD, ITE).

The results of the statistical analysis show that the internal structure of the analysed set of statements is quite strong and easily lends itself to meaningful interpretation, which corresponds to the theoretical structural model of difficulties in personal reflection of emotions, which formed the basis for the development of the DPER questionnaire. The vast majority of statements make a high contribution to their corresponding scale, and the scales have high loadings on their corresponding factor. Thus, the meaningful interpretation of the DPER questionnaire is possible on the basis of seven scales that unite into three summary indicators of difficulties in personal reflection of emotions.

The *third* stage investigated the ***convergent validity of the DPER questionnaire***, which was determined by assessing the values of the correlation coefficients between the scales of the DPER questionnaire and the scales of other methods that study similar phenomena, based on our theoretical assumptions (Anastasi, Urbina, 2003).

The results of the correlation analysis are presented in Table 12, where the scales of psychodiagnostic techniques that showed reliable correlations with the scales of the DPER questionnaire are included.

Table 12

Correlations of DPER questionnaire scales with scales of methods measuring similar phenomena

	1	2	3		4		
Scales THRE questionnaire	Having served expressiyas	Self-efficacy emotionality internal control	Understand emotion	Intrapersonal emotional individual intelligence	Mate favourites	Extravertirovanity	Emotiostable vulnerability
Suppression of emotions	0,297	-0,169	-0,216	-0,078	-0,1934	-0,131	-0,065
Emotional avoidance	0,026	-0,120	-0,104	-0,096	-0,136	-0,094	-0,101
Difficulties in recognising one's own feelings	0,0716	-0,522	-0,505	-0,059	-0,148	-0,071	-0,031

	1	2	3		4		
Scales THRE questionnaire	Having served expressiyas	Self-efficacy emotionality internal control	Understand emotion	Intrapersonal emotional individual intelligence	Mate favourites	Extravertirovanity	Emotiostable vulnerability
Tendency to use physiologically oriented defences	0,029	-0,127	-0,131	-0,382	-0,048	-0,076	-0,080
Inability to withstand (tolerate) emotions	0,072	-0,133	-0,093	-0,054	-0,299	-0,216	-0,364
Difficulties in expressing emotions	0,068	-0,160	-0,116	-0,017	-0,330	-0,245	-0,204
Emotional prohibition	-0,004	-0,116	-0,090	-0,068	-0,613	-0,528	-0,181

Note. *1 – Gross questionnaire; 2 – Mauss methodology; 3 – Emin Lucin test; 4 – TIPI-RU; for all correlations $p < 0.01$.*

The analysis of correlations between the scales of the DPER questionnaire and the scales of methods measuring phenomena close to the difficulties of personal reflection of emotions confirms the convergent validity of the DPER questionnaire: The "suppression of emotions" scale of the DPER questionnaire is positively correlated with the "suppression of expression" scale of the Gross questionnaire; the scale "difficulty in understanding one's own feelings" negatively correlates with the scale "self-efficacy of emotional control" of the Mauss methodology and the scale "understanding of one's own emotions" of the EmIn Lucin questionnaire; the scale "tendency to use physiologically oriented defences" negatively correlates with the complex indicator "intrapersonal emotional intelligence"

of the EmIn Lucin questionnaire, which is logical, since the presence of expressed physiological defences against emotions reduces a person's ability to be in conscious contact with his or her own emotions. the scale "inability to withstand (tolerate) emotions" negatively correlates with the scale of emotional stability of the TIPI-RU questionnaire, as well as with the scales "friendliness" and "extraversion" of this technique; the same scales of the TIPI-RU questionnaire are negatively correlated with the scale "difficulties in expressing emotions" and the scale "prohibitions on emotions", which is consistent with the idea that the problems of building trusting, friendly, open contacts with other people have an intrapersonal predisposition associated with difficulties in emotional self-expression and the presence of blocks to the free expression of emotions.

At the *fourth stage, the sensitivity of the* DPER *methodology to the factors "gender" and "age" was* investigated. Since the indicator "gender" is binary, the differences between male and female samples on the scales of the DPER questionnaire were determined using the t-criterion for independent samples (Table 13).

Table 13

Differences in the scales of the DPER questionnaire by gender *and age **

DPER scale	Gender	Age	
	t-value	Crascall-Wallis	Chi-square
Suppression of emotions	1,25887	6,5183*	9,3480***
p-values	*0,20825*	*0,1722*	*0,1875*
Emotional avoidance	-0,84063	6,353*	9,8687***
p-values	*0,40067*	*0,1135*	*0,1445*
Difficulty recognising your own feelings	-0,44213	1,4985	3,8939
p-values	*0,65845*	*0,4727*	*0,1427*

DPER scale	Gender	Age	
	t-value	Crascall-Wallis	Chi-square
Tendency to use physiologically oriented defences	-2,78514***	6,390*	9,357***
p-values	*0,00541*	*0,0410*	*0,0093*
Inability to withstand (tolerate) emotions	-0,59129	0,018	1,945
p-values	*0,55440*	*0,9910*	*0,3780*
Difficulties in expressing emotions	-0,04240	0,809	0,4932
p-values	*0,96618*	*0,6670*	0,7814
Emotional prohibition	0,51864	2,167	4,157
p-values	*0,60407*	*0,3383*	*0,1251*

Note. **Level of significance: * 0.05 < p < 0.10; ** 0.01 < p < 0.05; *** p < 0.01; table shows p-value values.*

The results of the analysis confirmed significant differences between male and female samples on the scale "propensity to use physiologically oriented defences" (TUPOD). The analysis of average values on the scale shows that this propensity is characteristic of men to the greatest extent.

To determine the differences in the scales of the DPER questionnaire between the three age groups, the Kraskall-Wallis test and the median test were used (Table 13), since it is reasonable to use it for three or more comparison groups. In order to remove limitations on the sample size (these criteria are usually used for small samples),

z-transformation was performed in the calculations. Statistically significant differences between the selected 3 age groups (15–19 years; 20–39 years; 40–60 years (Table 3)) were found on the scales "suppression of emotions" (SE), "avoidance of emotions" (EA), and "tendency to use physiologically oriented defences" (TUPOD) (Table 13). The analysis of descriptive statistics shows that the propensity to physiological defences against emotions, suppression of emotions and avoidance of emotions is more frequent in respondents 40–60 years old (the age of middle adulthood).

Discussion

As a result of the study on a representative sample of respondents and statistical analysis of its data, the psychometric validity of the developed methodology for assessing the difficulties of personal emotional reflection (DPER) was shown. The proposed construct of the research toolkit, which includes 7 scales (difficulties in understanding one's own feelings; difficulties in expressing emotions; inability to withstand (tolerate) emotions; tendency to use physiologically oriented defences; prohibitions on emotions; suppression of emotions; avoidance of emotions), grouped into three complex indicators (unformed abilities to understand and express one's emotions; instability to emotional stresses; psychological mechanisms preventing effective reflexion of emotions; prohibition on emotions; and psychological mechanisms preventing effective reflexion of emotions), was confirmed.

The contributions of some statements of the DPER questionnaire revealed during the analysis, not only in the corresponding theoretically proposed scale, but also in its other scales, have their logical explanation and do not reduce the diagnostic value of the DPER questionnaire scales, because, firstly, the contributions of the questionnaire statements in the scales corresponding to the key are high, secondly, the scales between which there are "intercepts" on the discussed statements, refer to one complex indicator (theoretically assumed and statistically confirmed by the exploratory factor analysis).

The convergent validity of the DPER questionnaire was confirmed through correlation analysis of its scales with the corresponding scales of questionnaire methods measuring phenomena close to the difficulties of personal reflection of emotions. A higher correlation coefficient was expected between the "suppression of emotion" scale of the DPER questionnaire and the "suppression of expression" scale of Gross's (2003) questionnaire. This is probably due to the greater orientation of the Gross questionnaire statements assessing the emotion regulation strategy "suppression of expression" towards external manifestations of emotions, their demonstration, than towards internal reflexive contact with them. No correlations were found between the scale "difficulties in realising one's own feelings" of the DPER questionnaire and the scale "intrapersonal emotional intelligence" of the EmIn Lucin questionnaire (Lucin, 2006), which includes the subscale "understanding one's emotions" and "managing one's emotions", while the negative correlations with the subscale "understanding one's emotions" are expectedly high

and significant. The "difficulty in expressing emotions" scale of the DPER questionnaire is not related to the scales and subscales of emotional intelligence, but correlates with the scales – personality characteristics of the TIPI-RU questionnaire ((Gosling, Rentfrow & Swann, 2003), adapted from Sergeeva, Kirillov & Dzhumagulova (2016)): introversion, emotional instability, and antagonism towards other people, which confirms the personal nature of difficulties in reflexive contact with one's own emotions. The scale "avoidance of emotions" does not correlate with any of the scales of the psychodiagnostic techniques used. This scale reflects a person's desire not to immerse in emotional experiences and to avoid situations that provoke them, i.e. it is associated with the personal blocking of emotion reflexion and the corresponding behavioural strategy. It is possible to verify this scale in subsequent studies through the use of the Thomas-Kilmann test to identify ways (strategies) of behaviour in conflict situations (the "avoidance" scale), the Lazarus and Folkman coping test (the "escape-avoidance" scale) and others.

The diagnostic sensitivity of the developed toolkit to the factors "gender" and "age" was confirmed. The scale "propensity to use physiologically oriented defences" is sensitive to the factor "gender". The scales "suppression of emotions", "avoidance of emotions", "tendency to use physiologically oriented defences" are sensitive to the factor "age" (we are talking about three age groups in the age range from 15 to 60 years).

The merits of the methodology include the fact that its construct clarifies scientific ideas (Garanyan & Kholmogorova, 2017; Lyusin & Ovsyannikova, 2013; Sysoeva, 2009, 2013; Pryakhina, 2017; Belasheva et al, 2018; Rottenberg, 2005; Direnfeld & Roberts, 2006; Bar-Haim et al., 2007; Derryberry & Reed, 2002; Gross & John, 2003; Gross & Jazaieri, 2014; Gratz & Roemer, 2004; Lis et al., 2007; Gard et al, 2007; Campbell-Sills & Barlow, 2007; Padun, 2015; Andreeva, 2006; Libin, 2000; Lucin, 2004; Vilenskaya, 2020; Rothbart, Sheese, Posner & Voelker 2014) about the process formations underlying the difficulties of personal reflection of emotions as intrapersonal predictors and indicators of the development of states of emotional ill-health, and allows us to measure the degree of their expression over a relatively short period of time, which is important for practical purposes of psychological counselling and correction.

Further work on the refinement of the construct, test norms and wording of statements on the scales of the DPER methodology can be related to the description of the results of step-by-step testing of scales with Cronbach's α thresholds for statements that reduce the consistency of the scales; testing the convergent validity of the scale "avoidance of emotions"; determining the retest validity of the methodology; determining the differences in the degree of expression of difficulties of personal reflection of emotions in representatives of different professions.

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Adaptation of the Russian-language Versions of the Self-Focused Attention Scale and the Self-Consciousness Scale Questionnaires

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Abstract

Introduction. The self-focused attention is considered as a personality trait that predisposes to the emergence of depressive and anxious thoughts. The purpose of this study was to validate the Russian-language versions of the Self-Consciousness Scale and the Self-Focused Attention Scale questionnaires, which allow assessing the degree of self-focus. For the first time, the reliability and validity of the Russian versions of the questionnaires were investigated. **Methods.** The study involved 149 participants (99 women, 50 men), mean age – 22.6, SD = 6.9. Exploratory and confirmatory factor analysis was used. **Results.** The use of factor analysis revealed a two-factor structure of the Self-Consciousness Scale (private self-consciousness subscale and a public self-consciousness and social anxiety subscale) and a single-factor structure of the Self-Focused Attention Scale. Analysis of the coefficients of internal consistency revealed a high homogeneity of the scales. The questionnaire scales correlated positively with symptoms of anxiety and depression and negatively with emotional stability. The self-focused attention scale, the subscale of public self-consciousness and social anxiety and the scale of trait anxiety positively correlated with each other. Compared to men, women had significantly higher scores on the self-focused attention scale and the public self-consciousness and social anxiety subscale. **Discussion.** The Russian versions of the questionnaires showed a good factor structure and high internal consistency of the

scales. The revealed gender differences by the scales correspond to those described in the literature. Correlations with scales of depression, anxiety, and emotional stability are consistent with theoretical predictions. The obtained results allow us to believe that the Russian-language versions of the Self-Focused Attention Scale and the Self-Consciousness Scale are reliable and valid instruments.

Keywords

self-consciousness scale, private self-consciousness, public self-consciousness, social anxiety, factor analysis, confirmatory analysis, reliability, validity, depression

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Introduction

Excessive self-focus has come to the attention of researchers as an important personality trait that predisposes to depressive and anxious thoughts (Gotlib & Joormann, 2010; Mor & Winquist, 2002). Initially, it was believed that focusing on oneself was primarily associated with depression. Later it was shown that focusing on the self can also be associated with anxiety, when a person focuses on the potential failure that they fear, and not on the actual failure (Pyszczynski, Hamilton, Greenberg, Becker, 1991).

The aim of this work was to validate the Russian-language versions of the Self-Consciousness Scale (SCS) and the Self-Focused Attention Scale (SFA) questionnaires, which allow assessing the degree of focus on oneself.

Two international questionnaires were translated – SCS and SFA. The SFA (Bögels, Alberts & de Jong, 1996) consists of 11 items, five of which refer to attention directed to one's own arousal in social situations (body state and emotional state), and six items – to focus on interpersonal behavior.

The SCS (Fenigstein, Scheier & Buss, 1975; Fenigstein, 1987) is a 23-item questionnaire assessing focus on self that was developed by Fenigstein et al. The SCS divides self-focus into a private and public subscale:

- The Private Self-Consciousness Scale assesses the propensity for introspection and the study of the inner Self and one's own feelings and is defined as the degree to which the subjects are aware of their own mood, principles, thoughts and physical condition;
- The Public Self-Consciousness Scale reflects a person's awareness of how they are perceived by other people and measures the extent to which a person is consciously concerned about how they appear in social situations. This form of self-consciousness can lead to excessive self-control and anxiety (Carver & Scheier, 1987).

In addition to assessing private and public self-consciousness, the SCS also includes a social anxiety subscale that assesses a specific type of focus on the public self. Social anxiety stems (at least in part) from public self-consciousness, since the subjective experience of social anxiety involves a focus on the public self (Schlenker & Leary, 1982).

There is also the Focus of attention questionnaire (Woody, 1996), which consists of two scales. One of the scales measures the focus on oneself, the other scale measures the focus on other people in social situations. This questionnaire is usually used immediately after completing the task to assess the condition of the subject (Woody, 1996). In this study, this Focus of attention questionnaire was not used.

Methods

Subjects

The study included 149 participants (99 women, 50 men), mean age – 22.6, SD = 6.9. Informed consent was obtained from all subjects participating in the study. The study was approved by the Research Institute of Neurosciences and Medicine Local Ethics Committee.

Questionnaires

The translation of the SCS and SFA questionnaires was made by the second author of the article, D. A. Lebedkin, who is a Russian native speaker and fluent in English. The translation was carried out according to the meaning of the original questionnaire items, was checked and finalized (several amendments were made to improve the understanding of the items of the questionnaires) by other authors of the article.

In addition to the SCS and SFA, a number of other questionnaires were used. The severity of depressive symptoms was assessed using the Beck Depression Inventory (Beck, Steer, Ball & Ranieri, 1996). In addition, the well-known Spielberger-Hanin questionnaire was used to measure personal anxiety (State Trait Anxiety Inventory) (Spielberger, Gorsuch & Lushene, 1970; Hanin, 1989). To measure personality within the framework of the five-factor model, we previously translated and validated (Knyazev, Mitrofanova, Bocharov,

2010) the Big Five Factor Markers (BFFM) questionnaire (Big Five Factor Markers, URL: https://ipip.ori.org/newitemtranslations.htm (Goldberg et al., 2006)). The BFFM questionnaire contains 100 short statements, based on which the five Big Five factors are assessed: Emotional Stability, Extraversion, Agreeableness, Consciousness and Openness/intellect. Emotional intelligence was measured using the Barchard questionnaire, also translated and validated by us (Knyazev, Mitrofanova, Razumnikova, Barchard, 2012).

Two questionnaires were used to assess the severity of individualistic and collectivistic tendencies. The first is the famous Singelis questionnaire, Self-Construal Scale (Singelis, 1994). The second questionnaire, The Relational-Interdependent Self-Construal (RISC), measures affiliative tendencies selectively towards immediate family or a loved one (Cross, Bacon & Morris, 2000; Dorosheva, Knyazev, Kornienko, 2016).

Data analysis

The analysis of the data collected using the questionnaires was carried out in the SPSS statistical package and included an assessment of the internal consistency of the scales with the calculation of Cronbach's alpha and the correlation of each item of the questionnaire with the scale, as well as exploratory and confirmatory factor analysis. In exploratory factor analysis, using the graph of factor eigenvalues, the number of factors corresponding to empirical data was estimated, which were then extracted and, using the Varimax orthogonal rotation, were transferred to such a space in which they were least correlated with each other. The matrix of factor loadings was used to assess the correspondence of the distribution of items of the questionnaire by factors to the key proposed by the authors of the original questionnaire. Confirmatory factor analysis was carried out in the AMOS program and was used to assess the correspondence of the theoretical model to empirical data, as well as to calculate factor loadings and model modification indices, which were used to assess the need for changes in the composition of the scales. To assess the internal consistency of the scales, Cronbach's alphas were calculated.

Results

Analysis of psychometric indicators of SCS

The values of KMO = 0.77 and the Bartlett test ($p < 0.0001$) were identified, which indicates the feasibility of factor analysis. In our factor analysis using the method of principal components with orthogonal rotation Varimax, the analysis of the eigenvalues of the factors showed that the two-factor solution is optimal for our data, since the graph showed a clear break after the first two factors (the eigenvalues of the first six factors: 4.6, 2.6, 1.6, 1.2, 1.0, 1.0). When extracting two factors, it was clear that the points of the scales of social anxiety and public self-consciousness are loaded onto one factor. Therefore, it

was decided to create two subscales - the Private Self-Consciousness subscale (PSC) and the Public Self-Consciousness and Social Anxiety subscale (PSCSA).

Next, we analyzed the reliability of these scales and the correlations of their items with the average values on the scales. Four items were found to be weakly correlated with their scales. The removal of these items led to an increase in Cronbach's alphas: PSC ($\alpha = 0.75$) and PSCSA ($\alpha = 0.83$), which indicates a good internal consistency of these scales. Initial eigenvalues and factor loadings are presented in tables no. 1 and 2.

Table 1

Initial eigenvalues of the SCS and SFA questionnaires (N=149)

Initial eigenvalues of the SCS questionnaire			Initial eigenvalues of the SFA questionnaire		
Total	% variance	Cumulative %	Total	% variance	Cumulative %
4.64	24.44	24.44	4.66	42.35	42.35
2.63	13.83	38.27	1.26	11.41	53.77
1.55	8.14	46.41	1.16	10.53	64.29
1.21	6.34	52.75	0.78	7.07	71.36
1.05	5.52	58.27	0.70	6.34	77.71
1.00	5.28	63.54	0.57	5.15	82.86
0.89	4.68	68.23	0.51	4.60	87.46
0.86	4.54	72.76	0.45	4.05	91.51
0.76	3.98	76.74	0.39	3.58	95.09
0.66	3.45	80.20	0.30	2.76	97.86
0.63	3.31	83.51	0.24	2.14	100.00
0.56	2.95	86.46			
0.53	2.77	89.22			
0.46	2.42	91.64			
0.42	2.21	93.85			
0.34	1.79	95.64			
0.31	1.62	97.26			
0.27	1.41	98.67			
0.25	1.33	100.00			

Table 2

Factor loadings of items of the SCS questionnaire (N = 149)

Question of the questionnaire	Factor loads	
6. Я обычно беспокоюсь о том, чтобы произвести хорошее впечатление на окружающих. (I'm concerned about the way I present myself).	0.73	0.17
14. Обычно я беспокоюсь о том, чтобы создать хорошее впечатление о себе. (I usually worry about making a good impression).	0.72	0.15
4. Мне нужно время, чтобы преодолеть свою застенчивость в новых ситуациях. (It takes me time to get over my shyness in new situations).	0.71	0.09
19. Я беспокоюсь о том, что другие люди думают обо мне. (I'm concerned about what other people think of me).	0.71	0.07
10. Я очень легко смущаюсь. (I get embarrassed very easily).	0.65	0.10
8. Я испытываю трудности при выполнении работы, когда кто-то наблюдает за мной. (I have trouble working when someone is watching me).	0.61	0.09
16. Я чувствую тревогу, когда выступаю перед группой людей. (I feel anxious when I speak in front of a group).	0.59	0.05
23. Большие группы людей меня нервируют. (Large groups make me nervous).	0.57	-0.10
12. Мне не трудно заговорить с незнакомыми людьми. (I don't find it hard to talk to strangers).	-0.51	-0.06
1. Я всегда пытаюсь разобраться в самом себе. (I'm always trying to figure myself out).	-0.03	0.76
5. Я много размышляю о самом себе. (I think about myself a lot).	0.11	0.74
15. Я постоянно думаю о причинах своих поступков. (I'm constantly thinking about my reasons for doing things).	0.24	0.67
13. Я обычно внимателен к своим внутренним ощущениям. (I'm generally attentive of my inner feelings).	-0.16	0.51
9. Я никогда не изучаю себя внимательно и пристально. (I never take a hard look at myself).	0.07	-0.50

Question of the questionnaire	Factor loads	
17. Прежде чем выйти из дома, я проверяю, как выгляжу. (Before I leave my house, I check how I look).	0.34	0.48
18. Я иногда мысленно делаю шаг назад, чтобы рассмотреть себя со стороны. (I sometimes step back (in my mind) in order to examine myself from a distance).	0.08	0.48
7. Я часто становлюсь объектом собственных фантазий. (I often daydream about myself).	0.06	0.45
2. Я озабочен тем, каким образом я делаю дела. (I'm concerned about my style of doing things).	0.17	0.43
20. Я быстро замечаю изменения в своем настроении. (I'm quick to notice changes in my mood).	0.10	0.41

Fig. 1 shows the results of a confirmatory analysis of a two-factor solution. By conventional standards, fit scores (CFI and IFI greater than 0.9 and RMSEA less than or equal to 0.05) can be interpreted as evidence of a good fit between the model and the empirical data. All regression weights of the latent factors PSC and PSCSA on their points are reliable and above 0.3. It is necessary, however, to note the two crossovers from the PSCSA factor to points 15 and 17 of the PSC factor, which had to be introduced in accordance with the modification indices. This indicates the incomplete independence of the PSC and PSCSA scales. However, the correlation between the factors was small (0.18) and not significant (p = 0.98). In addition, a separate structural model with one factor instead of two showed low fit indices and should be rejected.

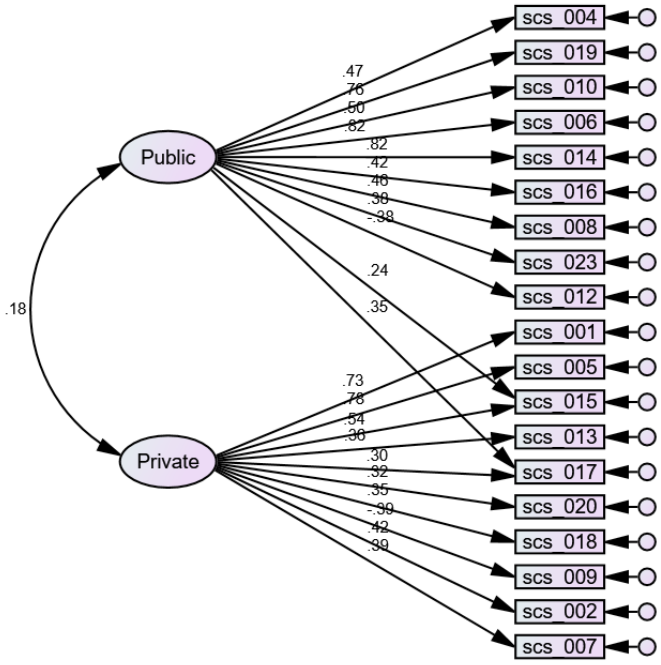
SFA questionnaire

KMO values = 0.85 and Bartlett's test ($p<0.0001$) were identified. Analysis of the eigenvalues of the factors in the factor analysis using the method of principal components showed a distinct advantage of the one-factor solution (the eigenvalues of the first six factors: 4.7, 1.3, 1.2, 0.8, 0.7, 0.6). Initial eigenvalues of SFA questionnaire are presented in Table 1. Cronbach's alpha ($\alpha = 0.86$) and correlations of items with mean value (all above 0.3) indicated good internal consistency. Confirmatory analysis confirmed the agreement of the one-factor model with the empirical data ($\chi2 = 76.4$, $p < 0.001$, CFI = 0.93, IFI = 0.93, RMSEA = 0.082, $df = 39$). According to Browne & Cudeck (1993), an RMSEA value of less than or equal to 0.05 indicates a close fit, and a value of less than 0.08 suggests an acceptable model fit (Browne & Cudeck, 1993). Other authors consider that an RMSEA value in the range of 0.05 to 0.1 is considered an indicator of acceptable model fit, and values above 0.1 are not considered by the model (MacCallum et al. al., 1996). However,

these suggestions are largely based on intuition rather than statistical evidence (Marsh, Hau & Wen, 2004). In their study, Kenny, Kaniskan & McCoach (2015) showed what percentage of well-specified models could be incorrectly rejected based on RMSEA less than 0.1 depending on different sample sizes and degrees of freedom. The authors argue that for models with small sample sizes and degrees of freedom, RMSEA can often erroneously indicate poor model fit (Kenny, Kaniskan & McCoach, 2015). The value of RMSEA = 0.082 found in our work for the SFA questionnaire may be due to the small sample size and the number of degrees of freedom. The values of CFI and IFI indicators found for the SFA questionnaire greater than 0.9 indicate a good agreement between the model and empirical data.

Figure 1

Results of the confirmatory factor analysis of the SCS questionnaire. ($\chi 2$ = 208.2, p<0.001, CFI = 0.91, IFI = 0.91, RMSEA = 0.05, df = 145). Standardized regression weights are given



The t-test for independent samples showed that the SFA and PSCSA scores were significantly higher in women than in men (t = 4.2, p < 0.001 and t = 6.7, p < 0.001, respectively).

To analyze the constructive reliability of the SCS and SFA questionnaires, the same subjects obtained data on the known, previously translated and validated questionnaires, which on this sample showed the following indices of internal consistency:

- Beck Depression Inventory (BDI-II) (Beck et al., 1996) for the severity of symptoms of depression (α = 0.92);
- Trait Anxiety inventory (TA) (Spielberger et al., 1970; Khanin, 1989) (α = 0.90);
- Big Five Factor Markers questionnaire (BFFM) (Goldberg, 2001; Knyazev et al., 2010) with scales of extraversion (α = 0.74), agreeableness (α = 0.74), conscientiousness (α = 0.73), emotional stability (α = 0.87) and openness/intellect (α = 0.67);
- Emotional Intelligence questionnaire (EI, Knyazev et al., 2012) (α = 0.88).
- Singelis' Self Construal Scale (collectivism, α = 0.78, individualism, α = 0.84) (Singelis, 1994).

Table 3 shows the statistically significant correlation coefficients of Spearman's scales of SCS and SFA with the scales of these questionnaires, as well as the mean and standard deviations of the scales. The SCS and SFA scales did not statistically significantly correlate with the consciousness scale of the BFFM questionnaire. We did not make a Bonferroni correction for the number of correlations, since in this case the pattern of associations is important, and not the reliability of each correlation. However, the Bonferroni correction gives in this case (0.05/27 = 0.0018), so all three-star correlations ($p < 0.001$) remain significant even after adjustment.

SFA and PSCSA show a similar pattern of correlations. They correlated positively with the severity of symptoms of depression and anxiety, as well as collectivism, and negatively with extraversion, emotional stability, openness/intellect, and individualism.

PSC correlates negatively with emotional stability. Unlike SFA and PSCSA, PSC is positively correlated with openness/intellect. In addition, PSC was positively correlated with agreeableness and EI (emotional intelligence).

The scales correlated with each other as follows: SFA–PSCSA ((ρ) = 0.53, $p < 0.001$), SFA–PSC ((ρ) = 0.19, $p = 0.024$), PSCSA–PSC ((ρ) = 0.22, $p = 0.007$).

Table 3

Correlations of the SCS and SFA scales with the scales of other questionnaires (N=149)

Questionnaire scales	SFA (19.3 ± 8.7)	PSCSA (14.8 ± 6.1)	PSC (19.6 ± 5.2)
BDI-II (10.9 ± 10.2)	0.36***	0.28**	0.11
TA (47.8 ± 9.9)	0.44***	0.52***	0.14
Extraversion (34.9 ± 7.37)	-0.24**	-0.32***	0.061

Questionnaire scales	SFA (19.3 ± 8.7)	PSCSA (14.8 ± 6.1)	PSC (19.6 ± 5.2)
Agreeableness (40.8 ± 6.03)	0.08	0.12	0.23**
Emotional stability (26.9 ± 8.1)	-0.31***	-0.37***	-0.2*
Openness/intellect (40.6 ± 5.8)	-0.29**	-0.3***	0.26**
EI (232.1 ± 25.6)	0.1	0.22**	0.32***
Collectivism (57.6 ± 10.8)	0.17*	0.22**	0.04
Individualism (53.8 ± 9.6)	-0.27**	-0.26**	0.12

Note. ****significant at p <0.001; **significant at p <0.01; *significant at p <0.05.*

Discussion

Analysis of the factor structure of the SFA questionnaire, performed using exploratory and confirmatory factor analysis, confirmed the good fit of the one-factor model to empirical data, Cronbach's Alpha (above 0.86) and correlations of items with the mean value (all above 0.3) indicated high internal consistency.

Analysis of the coefficients of internal consistency of the SCS questionnaire also showed good homogeneity of the SCS scales. Initially, it is assumed that the SCS contains three subscales – Private Self-Consciousness (PSC), Public Self-Consciousness and Social Anxiety. Our factor analysis of the SCS questionnaire showed a predominantly two-factor solution, and two subscales were created – PSC and PSCSA. Public self-consciousness refers to those aspects of behavior in which the needs, desires or reactions of other people are recognized and taken into account. It is driven by the desire for social approval

and the desire to consider the impact that an action may have on others' impressions of oneself (Carver & Scheier, 2000). According to the authors of the questionnaire, social anxiety stems from public self-consciousness, but the consciousness of the public self is not enough to cause social anxiety. The person must also have a sense of fear about being judged by other people in a social context, or doubt that he/she is capable of creating an adequate self-presentation (Scheier & Carver, 1985).

The PSCSA and SFA scales strongly correlated with each other. According to Noda, Okawa, Shirotsuki, Sasagawa, & Bögels (2021), self-focused attention appears to be the main mechanism for maintaining social anxiety. For example, self-focus reduction techniques have been shown to prevent and treat social anxiety (Vriends, Meral, Bargas-Avila, Stadler & Bögels, 2017). In general, the revealed correlation is consistent with the data of foreign studies on the association of SFA with social anxiety (Poole & Henderson, 2022; Woody, Chambless, Glass, 1997), as well as with the fact that the PSCSA scale we identified includes questions of social anxiety. Also, the SFA and PSCSA scales were strongly associated with personal anxiety, which is probably due to the similarity of these constructs.

According to research, private and public forms of self-consciousness are seen as personality traits that are relatively stable but weakly related to each other (Bögels et al., 1996). In our study, two cross-loadings from the PSCSA factor to the points of the PSC factor were identified, which indicates that the PSCSA and PSC scales are not completely independent, and a small correlation between them is consistent with data from other studies (Bögels et al., 1996). In general, the pattern of questionnaire correlations with each other and with personality scales is consistent with what was described in the literature for the original English-language scales (Scheier & Carver, 1985).

In women the estimates of SFA and PSCSA were significantly higher than in men. This is consistent with data on the association of SFA with social anxiety (Woody et al. al., 1997; Poole & Henderson, 2022) and the results of studies showing that women have more public self-consciousness (Bögels et al., 1996) and symptoms of social anxiety than men (Barinov, 2011; Asher, Asnaani & Aerka, 2017). Thus, we can conclude that the pattern of sex differences that we discovered is in good agreement with the established facts, which confirms the validity of the SFA and PSCSA scales.

It is interesting that the opposite direction of correlations with the openness/intellect scale of the BFFM questionnaire was revealed. Thus, the PSCSA and SFA scales were negatively related to the openness/intellect scale, while the PSC was positively related. The openness/intellect scale is associated with such properties as high self-esteem, activity, and risk propensity (Knyazev et al., 2010). The Public self-consciousness scale is associated with conformity, low self-esteem, and low risk-taking (Tunnel, 1984). Negative correlations of openness/intellect with the SFA and PSCSA scales are consistent with the fact that the scales are associated with social anxiety, which in turn is also combined with low self-esteem, low activity and lethargy (Nikitina and Kholmogorova, 2011; Dale,

Vanderloo, Moore & Faulkner, 2019; Jiang & Ngien, 2020). According to Carver & Scheier (1987), PSC is associated with the pursuit of personal, egocentric interests and does not require a person to consider the reactions of other people to what he does (Carver & Scheier, 1987). It is possible that the positive correlation of openness/intellect with the PSC scale may be associated with higher activity and risk appetite in people with a high PSC level, since they are less subject to the need for social approval, which can inhibit the manifestation of activity.

It should be noted that the PSC scale weakly correlated with depression ((ρ) = 0.11; p = 0.17), which is consistent with data from other studies (Takishima-Lacasa, Higa-McMillan, Ebesutani, Smith & Chorpita, 2014). PSC is a type of self-focused attention in which individuals evaluate their actions without taking into account the social context, which is likely to have fewer negative connotations than SFA and PSCSA. According to Mor & Winquist (2002), self-focus is maladaptive when a person finds a "negative" mismatch between the real self and the standard to which he is being compared and fails to minimize this mismatch. When experiencing negative life events, this discrepancy will be especially noticeable (Mor & Winquist, 2002). The presence of persistent negative affect contributes to the appearance of depression (Kotova, Belyaev, Akarachkova, 2021). It can be assumed that the focus of attention on oneself will predispose to increased depression and negative affect when experiencing negative events.

Importantly, the scales correlated positively with depressive symptoms and negatively with emotional stability. The results of the correlation analysis allow us to consider our Russian-language version of the questionnaires to be adequate. In general, the results obtained allow us to conclude that the Russian versions of the SFA and SCS are quite reliable, and the factor structure of the questionnaires corresponds to the theoretical one.

Conclusions

Summarizing the results of our analysis, we can conclude that the Russian versions of the SFA and SCS showed excellent psychometric properties (high internal consistency of scales and good factor structure). The identified gender differences in the scores on the SFA and PSCSA scales correspond to those described in the literature. Correlations with scales of depression, anxiety, and emotional stability are consistent with theoretical predictions. All this gives reason to believe that the Russian versions of the SFA and SCS are reliable and valid questionnaires.

Based on this, we can draw the following main conclusions:

- factor analysis of the structure of the Russian versions of the questionnaires revealed a two-factor structure of the Self-Consciousness Scale questionnaire (the Private Self-Consciousness subscale and the Public Self-Consciousness and Social Anxiety subscale) and the single-factor structure of the Self-Focused Attention;
- all three questionnaire scales showed high internal scale consistency and correlated negatively with emotional stability;

- the revealed results correspond to the theoretically predicted ones and to the data of other studies, which indicates the reliability and validity of the Russian versions of the Self-Consciousness Scale and Self-Focused Attention Scale.

Study Limitations

The sample consisted of university students (99 women and 50 men) and thus is not qualitatively representative. The RMSEA value of the SFA questionnaire was greater than the threshold value (RMSEA = 0.82), which may be due to the small sample size and the number of degrees of freedom (Kenny, Kaniskan & McCoach, 2015).

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Appendix

Опросник «Шкала самосознания» (SCS questionnaire)

Инструкция

Прочитайте внимательно каждое из приведенных ниже утверждений. Для каждого утверждения укажите, насколько оно подходит Вам, используя варианты ответа:

1. 3 = Очень похоже на меня;
2. 2 = В какой-то степени похоже на меня;
3. 1 = Немного похоже на меня;
4. 0 = Совсем не похоже на меня.

Постарайтесь быть максимально честны и точны. Помните, что здесь нет правильных или неправильных ответов.

Текст опросника

1	Я всегда пытаюсь разобраться в самом себе. (original text: I'm always trying to figure myself out)	ПСС+
2	Я озабочен тем, каким образом я делаю дела. (I'm concerned about my style of doing things)	ПСС+
3	В общем, я не очень хорошо самого себя представляю. (Generally, I'm not very aware of myself)	ПСС+
4	Мне нужно время, чтобы преодолеть свою застенчивость в новых ситуациях. (It takes me time to get over my shyness in new situations)	ПССТ+
5	Я много размышляю о самом себе. (I think about myself a lot)	ПСС+
6	Я обычно беспокоюсь о том, чтобы произвести хорошее впечатление на окружающих. (I'm concerned about the way I present myself)	ПССТ+
7	Я часто становлюсь объектом собственных фантазий. (I often daydream about myself)	ПСС+
8	Я испытываю трудности при выполнении работы, когда кто-то наблюдает за мной. (I have trouble working when someone is watching me)	ПССТ+
9	Я никогда не изучаю себя внимательно и пристально. (I never take a hard look at myself)	ПСС-

10	Я очень легко смущаюсь. (I get embarrassed very easily)	ПССТ+
11	Я осознаю то, как я выгляжу. (I'm self-conscious about the way I look)	ПССТ+
12	Мне не трудно заговорить с незнакомыми людьми. (I don't find it hard to talk to strangers)	ПССТ-
13	Я обычно внимателен к своим внутренним ощущениям. (I'm generally attentive of my inner feelings)	ПСС+
14	Обычно я беспокоюсь о том, чтобы создать хорошее впечатление о себе. (I usually worry about making a good impression)	ПССТ+
15	Я постоянно думаю о причинах своих поступков. (I'm constantly thinking about my reasons for doing things)	ПСС+
16	Я чувствую тревогу, когда выступаю перед группой людей. (I feel anxious when I speak in front of a group)	ПССТ+
17	Прежде чем выйти из дома, я проверяю, как выгляжу. (Before I leave my house, I check how I look)	ПСС+
18	Я иногда мысленно делаю шаг назад, чтобы рассмотреть себя со стороны. (I sometimes step back (in my mind) in order to examine myself from a distance)	ПСС+
19	Я беспокоюсь о том, что другие люди думают обо мне. (I'm concerned about what other people think of me)	ПССТ+
20	Я быстро замечаю изменения в своем настроении. (I'm quick to notice changes in my mood)	ПСС+
21	Я обычно осознаю свою внешность. (I'm usually aware of my appearance)	ПССТ+
22	Я осознаю, как работает моё мышление, когда я решаю проблему. (I'm aware of the way my mind works when I work through a problem)	ПСС+
23	Большие группы людей меня нервируют. (Large groups make me nervous)	ПССТ+

Совсем не похоже на меня (0 баллов); Немного похоже на меня (1 балл); В какой-то степени похоже на меня (2 балла); Очень похоже на меня (3 балла). 9 и 12 утверждения идут с обратной кодировкой: Совсем не похоже на меня (3 балла); Немного похоже на меня (2 балла); В какой-то степени похоже на меня (1 балл); Очень похоже на меня (0 баллов).

Опросник «Шкала фокуса внимания на себе» (SFA questionnaire)

Инструкция

Прочитайте внимательно каждое из приведенных ниже утверждений и выберете вариант ответа, который наиболее подходит для Вас.

В присутствии других людей я постоянно сосредотачиваюсь на том…

№		никогда	редко	иногда	часто	очень часто
1	бьется ли мое сердце (original text: whether my heart is beating)					
2	достаточно хорошо ли я владею социальными навыками (whether I'm sufficiently socially skilled)					
3	веду ли я себя напряженно (whether I behave tensely)					
4	бегло ли я говорю (whether I speak fluently)					
5	контролирую ли я свое дыхание (whether I'm controlling my respiration)					
6	насколько хорошо я участвую в разговоре (how well I take part in the conversation)					
7	выгляжу ли я напряжённо (whether I look tense)					
8	прилично ли я себя веду (whether I behave appropriately)					
9	краснею ли я, дрожу или потею (whether I blush, tremble, or sweat)					
10	понимаю ли я, что говорят другие (whether I understand what others say)					
11	насколько напряженно я себя чувствую (how tense I feel)					

никогда (0 баллов); редко (1 балл); иногда (2 балла); часто (3 балла); очень часто (4 балла).

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Mechanisms of Representation Construction in Categorical Search: the Role of Attention and Working Memory

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Abstract

Introduction. The task of visual search involves locating target stimuli among distractors. This task is one of the most popular in attention research. Both the methodology and theoretical understanding of attention mechanisms in this task have undergone significant changes with the development of cognitive psychology. Modern studies focus more on the ecological validity of the stimulus material used and the participant's response methods, while contemporary theoretical models attempt to consider different variations of target stimulus presentation. **Theoretical Justification.** We examine categorical search, a type of visual search in which target stimuli are specified by category name. We propose a theoretical model for constructing a representation of the target stimulus in categorical search. This type of search is viewed as a two-stage process: the first stage involves selecting a set of objects in the visual field through attentional guidance, and the second stage involves checking these objects for compliance with the attentional template. The verification process entails verbally naming stimuli based on motor program activation. Within this representation of categorical search mechanisms, we also consider empirical data obtained from various task modifications. Special attention is given to the methodology of hybrid search, where participants need to locate several pre-memorized target stimuli. **Discussion.** It is suggested that hybrid search is guided by one of the representations (likely the first memorized one), followed by sequential comparison of objects to the attentional template representation of the target stimulus. Each of the non-matching objects is sequentially compared with the other representations.

Keywords

categorization, visual attention, visual search, categorical search, hybrid search, representation, working memory

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Introduction

Visual search is the process of finding a target object among distracting stimuli (distractors) (Wolfe, 2010). This strict definition encompasses a multitude of tasks that we perform every day, often without even realizing it: searching for keys on a table, finding the right type of tomatoes in a supermarket, locating a friend in a crowd... Furthermore, there are professions that require constant visual search task-solving, such as radiology and baggage screening.

Visual search is also one of the most popular research methods in the field of perception and attention in cognitive psychology. The interest in this methodology is driven not only by the practical significance of studying the mechanisms of visual search task-solving (see, e.g., Biggs, Kramer, & Mitroff, 2018) but also by the fact that this method provides a convenient way to investigate both object-based (as instructions typically involve object-based selection) and spatial attention (as the search process involves scanning specific spatial locations).

This article will examine the fundamental findings of visual search research, theoretical perspectives on the mechanisms of this process, and propose a model for forming representations during visual search.

Despite visual search tasks appearing to be one of the most "real-life" manifestations of cognitive psychology, experiments typically use highly "unrealistic" stimulus materials: vertically and horizontally oriented lines (Wolfe, Palmer, & Horowitz, 2010), triangles (Wolfe, 1998), letters T and L (Fleck, Samei, & Mitroff, 2010). Moreover, participants' responses usually do not resemble what we do in everyday life: the classic visual search methodology involves pressing one key if the target is present and another key if it is absent. However, for everyday tasks, we often need to clearly point to an object or even grasp it with our hands. This discrepancy between laboratory studies of phenomena

and their everyday manifestations is not unique to the psychology of attention but is characteristic of other areas of cognitive psychology as well. It is primarily driven by the desire to study cognitive processes in maximum isolation from extraneous variables. Nevertheless, in recent years, there has been a growing interest among cognitive psychologists in ecologically valid tasks. This increased interest is associated with developments in cognitive psychology approaches, such as embodied, extended, and distributed cognition (see, e.g., Clark, 2008; Rogers & Ellis, 1994; Varela, Thompson, & Rosch, 1991), as well as practical demands.

Theoretical Justification

The emergence of new theoretical approaches is inseparably linked to the development of new research methodologies. Key modifications to the classic visual search task include: the search for multiple target stimuli (the "hybrid search" method) (Wolfe, 2012), the presence of two or more target stimuli on the screen (the " Subsequent search misses" methods (Adamo, Cox, Kravitz, & Mitroff, 2019; Adamo, Cain, & Mitroff, 2013) and "Incidental findings" (Wolfe, Soce, & Schill, 2017)), as well as various ways for the participant to respond – from clicking on the target stimulus with a mouse (Cain, Adamo, & Mitroff, 2013) to literally "capturing" the found stimulus (Gilchrist, North, & Hood, 2001). Some of these mentioned methods will be discussed in more detail later. For now, let's turn to another variation of the classic visual search task - categorical search.

Categorical Search

Categorical search represents a variant of visual search in which the target stimulus is defined by the name of a category (e.g., "search for apples") (see, e.g., Maxfield, Stalder, & Zelinsky, 2014). This type of task is ecologically valid (Schmidt & Zelinsky, 2009). Research on categorization is of particular interest because categorization itself enables efficient storage and manipulation of information through the grouping of objects (Rosch & Mervis, 1975).

Classical theories of categorization (Mervis & Rosch, 1981) suggest that categorization can occur at the subordinate, basic, and superordinate levels. The subordinate level includes the narrowest group of objects (e.g., "dachshunds"), the basic level encompasses a broader category ("dogs"), and the superordinate level is the most general ("animals"). Objects specified at the basic level category enjoy an advantage in various tasks, including visual search. The increase in speed and accuracy in tasks where the target stimulus is defined at the basic level, compared to superordinate and subordinate levels, is known as the "basic-level category superiority effect" (Murphy & Smith, 1982). Categorization theories typically explain the advantage of the basic level in terms of a balance between the specificity of the object and its distinctiveness at the intermediate basic level (Murphy & Brownell, 1985). Features of objects at the subordinate level may be highly specific, but these features often overlap with those of other object categories, thus lacking

distinctiveness. Conversely, characteristics of superordinate category objects are highly distinctive, but properties of category objects usually lack specificity.

The basic theoretical models of visual search

The most well-known theory in cognitive psychology that describes the mechanisms of visual search and the functioning of attention in general is the classical Feature Integration Theory (FIT) by E. Treisman (Treisman & Gelade, 1980).

FIT postulates that prior to the engagement of attention, various basic features of objects (color, orientation, shape, etc.) freely "float," while the visual system constructs independent maps of individual features. Features associated with the same location in the visual field are then integrated on the master location map, allowing the perception of a coherent object only when attention is directed to that specific location on the map. Subsequently, FIT was further elaborated to include the concept of top-down attentional control through the "object file," which comprises various attributes of an object (see, e.g., Kahneman, Treisman, & Gibbs, 1992; Wolfe & Bennett, 1997). The object file can be modified through experience, with new features added, and it can also incorporate categorical information, such as an object's belonging to a certain class and ways of interacting with it. Categorical information enables the formation of expectations about what might happen with a given object. FIT is primarily employed to explain simple processes of parallel and serial search, as well as asymmetries in visual search (see, e.g., Wolfe, 2001). More complex variants of visual search have been explained through the Guided Search model proposed by J. M. Wolfe (Wolfe, Cave, & Franzel, 1989; Wolfe, 1994; Wolfe & Gancarz, 1997; Wolfe, 2007).

The latest version of the Guided Search model, " Guided Search 6.0" (Wolfe, 2021), considers attention in a manner similar to the Feature Integration Theory (FIT), as a mechanism that selects elements in the visual field in such a way that their features can be associated into recognizable objects. To optimize the processing of objects, attention is "directed" towards them, and there are five sources of such attentional guidance: bottom-up and top-down guidance from features, past experience, reward (motivation), and scene characteristics (Wolfe & Horowitz, 2017). These sources of attentional guidance converge into a spatial "priority map" – a kind of dynamic landscape of attention that evolves during the course of a search. Selective attention is directed to the most active location on the priority map approximately 20 times per second, with the distribution of attention on the map being uneven – for example, prioritizing objects located near the fixation point. Objects in the visual field need to be compared to the template of the target stimulus to identify them as target stimuli or reject them as distractors. The template of the target stimulus is stored in the memory system.

J. Wolfe, in his model, considers not only classical visual search but also various modifications of this methodology, paying particular attention to the process of hybrid search. In experiments involving hybrid search, participants conduct searches on a screen

containing a set of pre-memorized objects, with variations typically involving the number of memorized objects and the number of objects present on the screen (Drew, Boettcher, & Wolfe, 2017). The task of hybrid search resembles a trip to a supermarket, where a list of groceries is memorized beforehand, and then the items are searched for on the shelves. J. Wolfe posits that in this scenario, two types of representations are formed: a "guiding template" and a "target template." The guiding template is a representation from working memory that "selects" objects in the visual field that fit the desired category. For example, if one needs to search for specific animals, and the visual field contains both animals and numbers, the guiding template will select only the animals, guided primarily by perceptual features, particularly shape. Subsequently, the target template determines whether a given animal in the visual field corresponds to those memorized as target stimuli. The target template is a more precise representation compared to the guiding template and operates within an activated long-term memory, which serves as a specialized intermediate system between working memory and long-term memory (Cowan, 2019).

J. M. Wolfe's notions about different types of representations in hybrid search resonate with G. Zelinsky's earlier proposition distinguishing between the processes of guidance and verification in classical visual search. In experiments conducted by Maxfield & Zelinsky, participants were tasked with locating objects that could be specified by a basic, superordinate, or subordinate category, with eye movements being recorded (Maxfield & Zelinsky, 2012). The process of stimulus discovery was divided into two subprocesses: guidance (the time from the start of the trial to fixation on the target stimulus) and verification (the time from fixation on the target stimulus to the response moment). The guidance time proved to be the shortest for subordinate-level categories and the most significant for superordinate-level categories. The authors attribute this result to the degree of specificity (a measure of perceptual differences) among categories. Conversely, verification time was the shortest for basic-level categories, explained by the clarity of categories associated with the distinctive features of the target object.

The Guided search model describes the fundamental factors influencing attentional guidance in visual search and aligns with a substantial body of experimental data. However, the process of forming a "guiding template" – a representation of the target stimulus – is not extensively detailed within this model. Furthermore, insufficient attention is given to the mechanisms involved in creating a "guiding template" for verbally specified stimuli, despite the fact that in real life, we often encounter such situations. For instance, when we need to find a cup but lack a clear mental image of its color, size, or spatial orientation. In such cases, the representation of the target stimulus is not predefined but rather formed within the information processing system based on several factors. In this article, we propose a model for constructing a representation of the target stimulus in categorical search.

Discussion

Before proceeding with the description of the model, let's define the key concepts that will be used in our discussion. Traditionally, **working memory** (WM) is understood as a memory system whose function is the short-term storage and manipulation of a limited volume of information (Baddeley, Anderson, & Eysenck, 2011; Cowan, 2010). This term has sparked considerable debate among researchers, particularly in the context of distinguishing between the functions of short-term and working memory (Cowan, 2008; Baddeley, 2011). In the framework of our model, we will adhere to the classic definition of working memory but will specify its function as the manipulation of **representations** (visual and verbal images) of stimuli. Additionally, there is a specialized system called the **activated long-term memory (ALTM)**, which acts as a link between working memory and long-term memory proper. Activated long-term memory represents the portion of long-term memory that is relevant to the task currently being performed (Cowan, 1995). We posit that when solving a visual search task, WM engages in the comparison of representations of stimuli in the visual field with guiding representations of target stimuli stored in ALTM. The selection of representations relevant to the task at hand and their transfer from ALTM to WM (for immediate task solving) is facilitated by **attention**.

The process of categorical search occurs as follows. A verbally specified goal enters the activated long-term memory system. The activated long-term memory triggers the retrieval of the name of the target object in semantic memory, which, in turn, activates key features for that object (characteristic shape, color, typical spatial position). Subsequently, the combination of these features is loaded into working memory, which carries out the process of guidance - directing attention - to these features in the visual field using an attentional template. The term "attention template" was previously proposed to denote representations in working memory that guide the visual search process (see, e.g., Carlisle, Arita, Pardo, & Woodman, 2011; Desimone and Duncan, 1995; Bundesen, Haberkost, & Kyllingsbaek, 2005), and is essentially analogous to the term "guiding template" proposed by J. Wolfe. In our view, the term "attention template" is more suitable than "guiding template" as it emphasizes the role of attention in transferring representations from ALTM to WM.

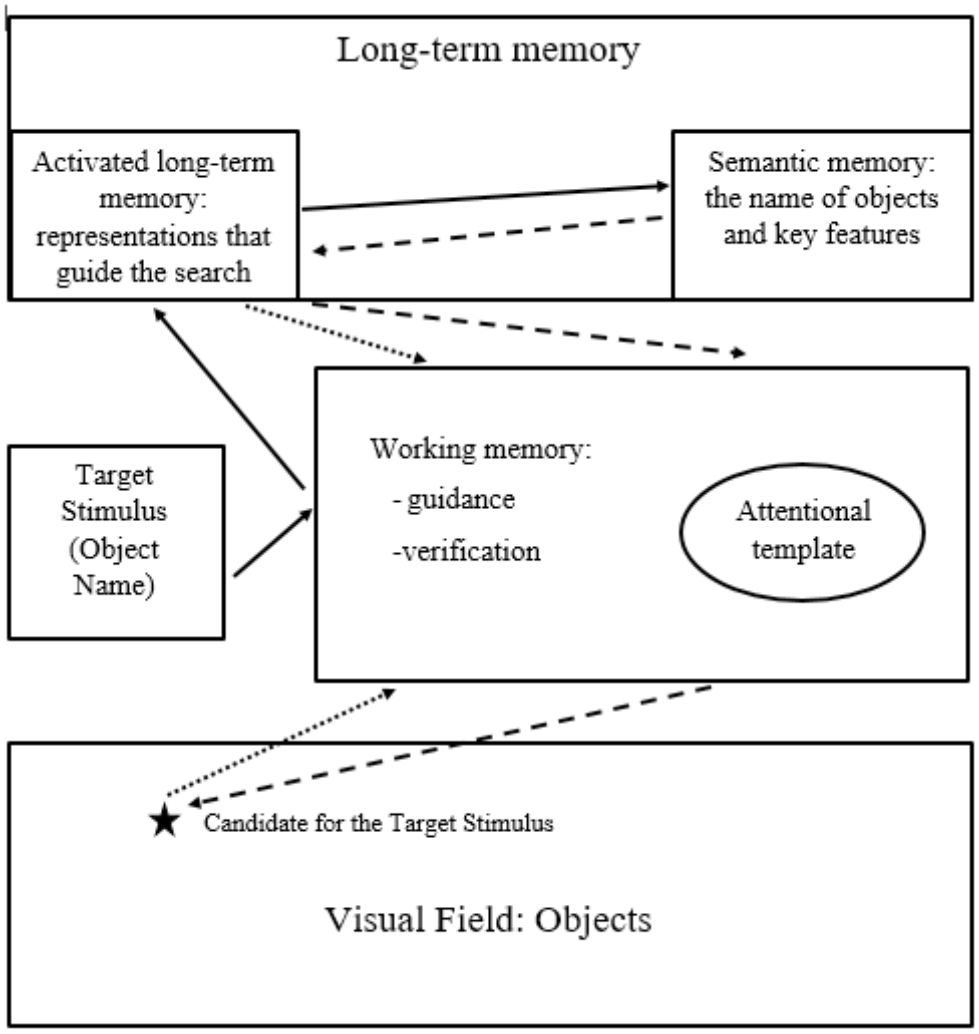
The number of features guiding the guidance process depends on how clear the representation of the target stimulus is. The clarity of the representation will primarily depend on two factors: the level of the category at which the target stimulus is specified (basic, superordinate, or subordinate), as well as the breadth of the category (the number of objects within that category). Additionally, the specificity of the representation may be influenced by past experience: if the search goal is a specific object that has previously appeared in the visual field, its representation will be the most detailed.

Visual search is a two-stage process. Initially, attention is directed towards objects in the visual field that match a set of target features, and each of these objects starts to act as a "candidate for the target stimulus." The second stage of the visual search process

involves verifying each of these "candidates" - verification. The verification process occurs in the working memory system and involves verbally naming the stimulus and comparing it to the verbal representation in ALTM. In this process, verification likely primarily relies on the function of the object and is associated with the activation of motor programs. If the "candidate for the target stimulus" passes verification, the search concludes with a response. If the "candidate" does not meet the criteria, attention is directed to the next "candidate." The graphical representation of the proposed model is shown in Table 1.

Table 1

Model of the representation building process in visual search. Solid lines represent the process of primary representation formation based on the target stimulus name, dashed lines represent the guidance process, and dotted lines represent the verification process



In this context, a particular interest arises when there can be more than one target stimulus in the visual field. We conducted a series of experimental studies on the phenomenon of "Subsequent Search Misses" (SSM) - a decrease in the success rate of detecting the second target stimulus after successfully finding the first target stimulus in the visual search paradigm (Adamo, Gereke, Shomstein, & Schmidt, 2021). In such studies, participants' task is to find all present target stimuli on the screen, which can be either one or two. Typically, the main finding is that the success rate of detecting the second target stimulus after finding the first one is lower compared to the success rate of detecting a single target stimulus. In a series of experiments, participants were required to search for target stimuli that could be perceptually similar (same color), categorically similar (belonging to the same category, e.g., pear and pineapple - both fruits), or could be similar both perceptually and categorically, or not similar either perceptually or categorically. It was found that the probability of finding the second target stimulus increased both with perceptual and categorical similarity, but categorical membership proved to be a stronger factor (Rubtsova & Gorbunova, 2021). It's worth noting that overall, the success rate of finding categorically defined stimuli (e.g., "find something sweet") was lower compared to the search for specific objects (e.g., "find a candy") (see, for example, (Rubtsova & Gorbunova, 2022). This result can be associated with either better guidance for specific objects or the fact that they exhibit greater perceptual differences between target stimuli and distractors. We believe that the perceptual similarity of objects influences the process of finding the second target stimulus at the guidance stage, while categorical similarity becomes significant at the verification stage.

Additionally, it is worth considering the situation when there is only one target stimulus in the visual field, but the search process is guided by multiple representations simultaneously. In one of our experiments, participants performed a hybrid search task – searching for a series of previously memorized objects on the screen (Angelgardt, Makarov, Gorbunova, 2021). These objects could belong either to basic-level categories ("apple") or superordinate-level categories ("fruits"). Participants were given 1 to 4 objects to memorize, and there could be 4, 8, 12, or 16 objects on the screen. The primary comparative measure was reaction time when searching for stimuli from basic or superordinate categories, with the expectation that, due to the category advantage effect, it would be shorter in the first condition. However, upon analyzing the data, no significant differences were found when comparing the search for objects from basic or superordinate categories. One possible reason for this could be the "overlap" in the fixed reaction time of the guidance process – directing attention to the stimulus and the verification process – identifying the stimulus as the target. To separate these processes, we conducted the following experiment.

The design of the new experiment was practically identical, with the exception that eye movements were additionally recorded (Sapronov, Makarov, Gorbunova, in press). Consequently, besides analyzing behavioral data, a comparison of eye-tracking metrics was conducted under conditions of searching for a target stimulus defined by basic or superordinate categories. Two metrics were used for analysis: guidance time and verification time. Guidance time was calculated as the time from the beginning of the trial to fixation on the target stimulus, while verification time was the time from fixation on the target stimulus to the moment of pressing the response key. Guidance time was found to be shorter in the condition of searching for a stimulus defined by a basic category, which aligns with the results of experiments in classical visual search (Maxfield & Zelinsky, 2012). This result is likely associated with the creation of a more precise guidance when searching for an object defined by a basic-level category. Objects within the same basic category (as opposed to objects in the same superordinate category) possess more specific features and a greater number of distinguishing characteristics from other categories. For example, the category "apples" would provide a clearer guidance for locating a stimulus compared to the category "fruits." Thanks to a clearer guidance in the search for basic categories, a smaller number of objects become "relevant" in the visual field, resulting in a faster actual process of locating the target stimulus.

A separate question is how the process of guidance is implemented in hybrid search since there are multiple representations of the target stimulus in this case. We assume that initially the search is directed towards one of the representations (most likely the first one remembered). Subsequently, a series of consecutive fixations on objects corresponding to this template occurs, and if each of the objects does not match the template, it is sequentially compared with the other representations.

At the same time, the verification time in the hybrid search paradigm remains the same for objects of both the basic and superordinate categories, while in the study of classical visual search (Maxfield & Zelinsky, 2012), there was an advantage in verification for basic-level categories. During the verification stage, the perceptual system needs to make a decision about whether the fixated stimulus is the target (whether the object belongs to the list of pre-memorized categories). It would be logical to assume that in the process of hybrid search, this process occurs sequentially in several stages. According to our data, verification time in hybrid search depends on the number of categories to be memorized, meaning that the fixated stimulus is likely to be matched with each of the pre-memorized categories in order, while in classical visual search, by definition, only one such comparison occurs.

Of particular interest is also the role of functional knowledge in the formation of object representations and their categorization. By functional knowledge, we mean the understanding of the function that a particular object can perform. This term is

closely related to the concept of affordance – the potential way of interacting with an object (Osiurak, Rossetti, & Badets, 2017). This issue becomes especially important since verification, according to our model and in line with Zelinsky's views, is based precisely on the function of the object and is associated with the activation of motor programs. A significant amount of research indicates that functional knowledge about an object affects its processing. For example, there is the widely known "compatibility effect" – the congruence of an object's position and the human's action: when the object is positioned in accordance with the actions performed by the person, its processing speed increases (see e.g., Borghi, Bonfiglioli, Ricciardelli, Rubichi, & Nicoletti, 2007). However, this effect is not always replicated, leading to doubts about the universality of this phenomenon. For instance, in our recent study, participants performed a "pinching" or "grasping" hand movement, while simultaneously conducting object search in the miss-and-continue paradigm (Anufrieva, Gorbunova, 2022). The hand movements could be either congruent or incongruent to the target stimulus. No congruence effect was found: participants solved the task equally effectively regardless of whether the hand movement was "suitable" for the target stimulus. It's worth noting that the results might be related to the fact that the movement was performed by the non-dominant hand, as well as the possibility of concurrently launching irrelevant programs. However, such findings at least cast doubt on the stability of the congruence effect.

The task of categorization level assignment in the search task does not happen automatically but can be flexibly adapted depending on the context and the task at hand. For instance, in one of the studies employing the classical visual search paradigm, an intra-group design was used, where participants were tasked with searching for basic and superordinate categories, with objects corresponding to these categories being identical (Angelgardt, Anufrieva, Sapronov, & Gorbunova, 2024). Event-related potentials were recorded, and the CDA and N2PC components were analyzed, traditionally associated with guidance and the formation of attention templates in working memory. During the analysis, these components were observed, but differences in their amplitude were not found, and behavioral data were nearly identical when searching for basic and superordinate categories. The obtained results are likely related to the characteristics of the intra-group design used in this study: participants initially underwent a series of searches for superordinate categories and then basic ones (or vice versa), possibly implicitly learning to search for specific objects. Consequently, the task of searching for an object of a certain category was reduced to finding this stimulus based on perceptual features.

Conclusion

As cognitive psychology continues to evolve, increasing attention is being given to the ecological validity of research and the role of motor programs in cognitive processes.

Visual search studies are no exception: instead of simple geometric stimuli, experiments increasingly use real-world objects, and responses are made using methods more closely aligned with the real world, rather than keyboard presses.

The modification of visual search methodologies reflects the development of theoretical understandings of attention in this context. One of the most contemporary models of visual search is J. M. Wolfe's guided search model. The latest version of this model aligns well with a wealth of empirical data, but it does not provide a detailed account of the process of constructing representations in categorical search tasks, where the goal is to find an object by its name; precisely the types of tasks encountered frequently in real life.

We believe that in visual search, the leading role is played by the working memory system, which compares representations from the activated long-term memory system with representations of stimuli in the visual field. We consider categorical visual search as a two-stage process: first, attention directs the selection of a set of objects, and then these objects are checked for correspondence to the attention template. The verification process involves verbal naming of stimuli and is based on the activation of motor programs.

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Consolidation, Reconsolidation of Memory, Extinction and Forgetting: a Review

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Abstract

Introduction. To study the regularities of formation of individual experience we summarize the results of research in consolidation, reconsolidation of memory, extinction and forgetting within a unified idea that considers them in the frames of systems psychophysiology as manifestations of two coordinated processes: formation of new experience and modification of previously formed experience. **Theoretical Justification.** Within the framework of the theory of functional systems, it had been proposed that systemogenesis also takes place in adults, since the formation of a new behavioral act is the formation of a new system. In studies with single-neuron activity recording it was shown that during performance of new behavior the simultaneous activation of multiple earlier formed systems occurs along with activation of new systems formed during learning. Therefore, we consider consolidation, reconsolidation, extinction, and forgetting as manifestations of reorganization of individual experience as a whole. **The results of research** in the neurophysiology of memory show that the processes of memory formation (including its consolidation) and forgetting are not mutually exclusive and can take place independently. Some forms of forgetting are caused by the inability to use memory, rather than by its removal, that makes forgetting similar to the formation of extinction. **Discussion.** We argue that (re)consolidation, extinction and forgetting may be based on similar long-term changes in previously formed experience, in particular those that do not let some elements of this experience to be utilized further.

Keywords

memory, reconsolidation, forgetting, extinction, systemogenesis, learning, individual experience, intersystem relations

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Introduction

A common sense view of a "good" memory is remembering what is needed and recalling it at the right time. Studies of the process of forgetting, including forgetting traumatic events, encourage appreciation of how much memory allows not to recall when it is not necessary. As accurately noted by V. V. Nourkova and A. A. Gofman (2016a), education is aimed mainly at remembering and ensuring its effectiveness, while the "culture of forgetting" is much less pronounced.

Consolidation, reconsolidation of memory, forgetting and extinction are the phenomena that can be labeled as "memory dynamics" (Sozinov & Alexandrov, 2022). Modern researches show that forgetting, including that by interrupting access to some components of memory, is a permanent part of the individual's learning and development, no less significant than memorization.

The goal of this review is to summarize the data from literature on the dynamic memory processes from the viewpoint of learning as a unity of two interrelated processes: formation of new experience and reorganization of the earlier formed experience.

Theoretical justification

The research by our team has led to the development of a system-evolutionary approach (Shvyrkov, 1988; Shvyrkov, 2006; Alexandrov & Krylov, 2005; Alexandrov, 2009; Alexandrov, 2020) and a new discipline – systems psychophysiology. The specific tasks of systems psychophysiology are to study the patterns of formation and implementation of systems, their taxonomy, dynamics of intersystem relations in behavior. These ideas are derived from the theory of functional systems (TFS) by P. K. Anokhin (1968, 1973).

The TFS includes the concept of a factor that forms the system – its result – an adaptive effect achieved during implementation of the system. Consequently, according to the TFS, the determinant of behavior is not the past event (stimulus), but the future event (result). P. K. Anokhin defined a functional system as a complex of selectively involved elements, in which interaction and relation between them is what he called interCOaction (mutual assistance) aimed at obtaining a useful result (Anokhin, 1968). Considering any behavior as goal-directed implies that activity is a fundamental property of living matter; the specific form of activity depends on the level of organization of this matter (Anokhin, 1978). The principle of activity indicates that an individual's action is determined by the future goal (a model of result). The ideas of activity and goal-direction are manifested in the concept of "anticipatory reflection" (Anokhin, 1978). Anticipatory reflection is inextricably linked with subjectivity, since the goals determine the individually specific division of the world, previously (before the appearance of life) "neutral", into "good" and "bad" objects and phenomena that contribute to and hinder the achievement of individual goals. Another basis of this link is that planning of the future (the formation of goals) depends on the the individual memory and motivations (Alexandrov, 2022).

In the activity paradigm, the view on the functioning of an individual, as well as that of a single cell in a multicellular organism, is different from reactivity paradigm. The development of P. K. Anokhin's idea of the "integrative activity of a neuron" (Anokhin, 1975) brought the idea of the determination of neuronal activity in line with the requirements of the systems paradigm by rejecting the consideration of neuronal impulses as a reaction to synaptic input and accepting that a neuron, like any living cell, implements a genetic program and needs metabolites from other cells (Shvyrkov, 2006). In this regard, the sequence of events in the functioning of a neuron becomes similar to the one of an active goal-directed organism, and its impulses are similar to the action of an individual (Alexandrov et al., 1999; Alexandrov, 2008; Alexandrov & Pletnikov, 2022). From this viewpoint, the activity of a neuron is considered as a means of changing the relationship with the environment, directed to the future "action", which leads to the elimination of mismatch between the "needs" of the cell and its microenvironment. The neuron appears not as a "conductor" or "summator", but as an organism within body that provides its "needs" at the expense of metabolites coming from other cells. The neuron satisfies the "needs" of its metabolism by uniting with other elements of the body into a functional system. The consideration of a neuron as an organism in an organism corresponds to evolutionary ideas that imply similarity between the regularities of supporting the vital activity of a neuron and of a single-cell organism. It has been shown that organisms in colonies, including unicellular ones, like cells of a multicellular organism, provide respiration, nutrition and other community functions through cooperation; the metabolisms of individual organisms are synchronized (Grechenko et al., 2013; Weber et al., 2012).

Along with the concept of system, the main ideas that underlie the origins of TFS include that of development, expressed in the concept of systemogenesis. According to this concept, heterochronies in the laying and rates of formation of individual

morphological components of the organism at the early stages of individual development are associated with the need for the formation of "whole-organism" integral functional systems that require the involvement of many different elements from a variety of organs and tissues (Anokhin, 1975).

Within the framework of the TFS, the idea that systemogenesis also takes place in adults has been formulated quite long ago (Shvyrkov, 1978; Sudakov, 1979). According to this idea, the formation of a new behavioral act is the formation of a new system. Another fundamental idea is that the differences in the role of individual neurons in execution of behavior should be considered within accounting the history of its formation (Alexandrov, 1989; Alexandrov & Alexandrov, 1982), i.e. the history of successive systemogeneses. The system-evolutionary theory and the system-selection concept of learning have been developed (Shvyrkov, 1986; Shvyrkov, 2006), making it possible to interpret the spiking activity of neurons in terms of the effect of systems and allow us to consider learning as an evolutionary process, part of which is selection. The success of the selection determines the quality of the achieved results and is carried out through individual development, including the formation of "pre-specialized" and "specialized" neurons.

The individual development is a sequence of systemogeneses that underlie the emergence of new relationships with the environment. The formation of a system in the process of systemogenesis is considered as the formation of a new element of individual (subjective) experience in learning. The formation of new functional systems in learning is based on the selection of neurons from the "reserve" (presumably low-active or "silent" cells). The specialization of neurons in relation to a system being formed – system specialization – is permanent. Thus, the new system is an "addition" to the previously formed ones, it is "superimposed" on them.

The neurons are being specialized in relation to the elements of individual experience — the systems formed during individual development, including the individual-specific systems. Therefore, a set of systemic specializations of neurons in each individual is unique. In the studies conducted in our laboratory, the recording of electrical impulses of individual neurons is carried out during the performance of cyclic behavior formed during the learning process. The pattern of systemic specialization of neurons in a given brain area refers to the specific set of the systems in relation to which the neurons of this structure are specialized. The latter is expressed in the fraction of neurons that belong to different systems. The largest number of neurons associated with the functioning of systems of "new" behavior (formed when learning to get food), while in the motor area of the cerebral cortex, neurons of "old" systems predominated (activated, for example, in such acts as any capture of food and non-food objects or during movements) (for example, Alexandrov et al., 1999; Gorkin & Shevchenko, 1996; Kuzina, Gorkin & Alexandrov, 2016; Alexandrov et al., 1993; Alexandrov et al., 2001; Gavrilov et al., 1998; Sozinov & Alexandrov, 2022; Alexandrov et al., 2018).

We have shown that the performance of definitive behavior is underlied not only by the activation of new systems formed during the training of the acts that make up

this behavior, but also by the simultaneous activation of many older systems formed at previous stages of individual development (Alexandrov, 1989; Alexandrov et al., 2000; Shvyrkov, 2006). Consequently, the behavioral performance is, so to speak, the performance of the history of its formation–both philo- and ontogenetic, i.e. a set of systems, each being a record of one of the stages of formation of this behavior.

From this statement it follows that the the systemic organization of even outwardly identical actions differs if the history of their formation is different. Indeed, it was shown that the characteristics of the activity of neurons in the cingulate cortex of rabbits specialized for acts of complex instrumental behavior demonstrate significant differences when comparing groups of animals that learn acts of this behavior in a different order (Gorkin & Shevchenko, 1996). In other experiments, a relationship was found between the characteristics of the activity of neurons specialized in relation to the systems of newly formed behavior and the number of stages of learning this behavior (Kuzina & Alexandrov, 2019; Svarnik, Bulava, Fadeeva, & Alexandrov, 2011) Svarnik et al., 2011). In addition, the organization of neuronal activity that underlies outwardly identical instrumental food-acquisition behavior, where training includes different number of stages, turns out to be different (Kuzina & Alexandrov, 2019). Analysis of a set of specialized neurons makes it possible to evaluate "meaningful" changes in behavior — changes in the "state of the subject of behavior" (Alexandrov, 2018), which are described as a set of systems that are simultaneously active in behavior (Shvyrkov, 2006).

Learning begins with a mismatch between the needs of the individual and the possibilities for their satisfaction, which are provided to him by the memory formed at the given moment. This mismatch is manifested at the cellular level in the discrepancy between the metabolic "needs" of the cell and the metabolic influx it receives.

We define learning as system genesis: the process of formation of new functional systems due to the irreversible, lifelong specialization of nerve cells. These cells subsequently provide stability, or "constancy", of memory. Apparently, the activity of specialized cells makes it possible to use elements of experience for the transfer of learning, and also underlies the phenomenology of declarative memory. At the same time, the emergence of new systems entails a restructuring of the individual's experience. Consequently, in the course of individual development, the integral structure of individual experience is constantly changing. One of the manifestations of these changes is forgetting. Experience is changing both due to the "addition" of new systems that appear during learning, and due to the modification of previously formed ones.

The ideas formulated in the framework of the system-evolutionary approach make it possible to generalize the literature and define the similarities and differences between the traditionally distinguished processes of memory dynamics (consolidation, reconsolidation of memory, extinction, forgetting) as different aspects of modifying the structure of experience. We further discuss the studies of each of these processes.

Research results

Memory Consolidation

The fact that memory formation may not be instantaneous was first experimentally shown by G. Muller and A. Pilzeker at the end of the 19th century (Lechner et al., 1999), although the first assumptions on this were formulated much earlier (see Dudai, 2004a). They asked the participants to memorize two lists of meaningless syllables and revealed that if the second list is presented immediately after the first, then the effect of retroactive interference is observed (participants often give answers from the second list when the first one is to be reproduced). However, this effect is not observed if some time passes between memorizing the first and second lists. Thus, it was shown for the first time that memory is formed both during and after learning — in order to transition to a stable state, it must be consolidated (or "become firm" from Lat. Consolidare).

Ideas about memory consolidation have been further developed in studies of the consequences for the recall of new behavior of brain activity impaired by electroconvulsive shock or neurosurgical intervention (for more information, see Grechenko, 1979; Sozinov & Alexandrov, 2022; Corkin, 2002; Dudai, 2012; Eichenbaum, 2013; Squire & Wixted, 2011). These works demonstrated that memory has a stage of formation that takes a certain time and depends on brain processes.

The "standard model" of consolidation attributed a critical role to the hippocampus at the early stages of learning. This role is the activation of neurons in various areas of the neocortex during the reproduction of material. It was assumed that the neuronal changes that allow reproducing the material (the process of "cellular consolidation") occurs faster in the hippocampus than in the cortex, and over time the activation by hippocampus leads to "cellular consolidation" elsewhere — mainly in the neocortex. The process whereby the integrity of hippocampus becomes unnecessary for the recall of this material is called "systems consolidation" (Dudai, 2004b; Runyan et al., 2019). This process, according to the data on distruption and recording of brain activity, can take up to several years in humans (Teng & Squire, 1999) and up to several weeks in rodents (Bontempi et al., 1999). It is believed that this process prevents interference between new and previously formed memories.

A later idea of consolidation, the "multiple trace theory", implies that the hippocampus is always activated during recall (Moscovitch & Nadel, 1998). Consolidation of episodic memory, according to this theory, is based on the formation of many connections between the hippocampus and cortical areas upon the use of this memory (for more information about these and other ideas about consolidation, see: Sozinov & Alexandrov, 2022).

The results of using optogenetic methods correspond to the ideas about changes in the hippocampus and cortex during memory formation (Tonegawa, Morrissey &

Kitamura, 2018). In particular, the suppression of the activity of neurons that were labeled during training impairs behavior, if the suppression has been made at the early stages of consolidation (up to two days) in the hippocampus, and at the late (usually two weeks or more) – in the cortical zones. At the same time, these studies show that the neurons of the cortical regions form the so-called the "silent engram" already at the early stages of consolidation, and in the hippocampus the "silent engram" is revealed at the late stages: such neurons have fewer spikes, but artificial activation of these "engrams" causes recall (Josselyn & Tonegawa, 2020). Consequently, the idea of changing the set of brain structures, on which the recall depends, does not contradict the idea of the irreversibility of the specialization of neurons, introduced here in the "Theoretical foundations". The reorganization of previously formed experience during learning, at least under conditions of our experiments (comparison of the proportion of neurons in the first and second weeks of registration during daily training without changing the task), is not associated with changes in the proportion of neurons specialized in relation to systems of new behaviors (Sozinov et al., 2017).

In contrast to the study of engrams, including those in which neurons are labeled and then artificially activated, and even "false memories" are created (see Josselyn & Tonegawa, 2020), electrophysiological registration of neuronal spikes allows you to determine the specific specialization of neurons in relation to the system of behavioral act and to evaluate sets of specialized cells in individuals with different learning histories. In a study of brain activity during formation of complex behaviors at its successive stages with identifying stable and dyniamic indicators of neural activity, the sets of specialized neurons and neurons with a high probability of activation recorded from the anterior and posterior cingulate cortex zones in rabbits during the performance of food-acquision behavior, we compared between the first and second weeks of the experiment (Sozinov et al., 2015). It was revealed that the "repetition" of outwardly similar behavior does not mean a repetition of the corresponding brain processes. Also, using a similar technique for recording the activity of neurons in the brain of rats, an additional involvement of neurons in the process of specialization that continues during memory consolidation was shown (Kuzina et al., 2015).

Since the effect of consolidation and changes in brain activity associated with the reproduction of behavior at successive stages of consolidation are shown both for declarative memory ("memory systems", see Squire, Wixted, 2011) and for "motor memory" (Brashers-Krug et al., 1996; Shadmehr & Holcomb, 1997; Korman et al., 2003), the consolidation process is considered as a universal pattern of memory formation (see also: Anokhin, 2010; Dudai, 1996). Since the 2000s, the generally accepted ideas about memory consolidation have undergone significant changes. In the case of some authors, these changes affected the general understanding of brain activity, leading to a number of similarities with the concepts developed in systems psychophysiology (Alexandrov, 2005; Alexandrov et al., 2015): the separation of activity related to the actualization of past experience and that related to the formation of a new one (Grosmark, Buzsaki,

2016; McKenzie, Eichenbaum, 2011), linking brain activity not to the reflection of the environment, but to the solution of specific behavioral tasks (Grosmark, Buzsaki, 2016; Weible et al., 2009), dependence of memory reorganization on past experience (Morris, 2006). In addition to the development of ideas about the consolidation process, these shifts were evoked by the studies on memory reconsolidation.

Memory reconsolidation

The phenomenon of temporary vulnerability of memory resumes after a "reminder" - the presentation of one of the components of the learning situation, that is, the recreation of part of the experimental situation. In addition, a reminder presented shortly before retrieval allows the recovery of "forgotten" behaviors that are not recalled without a reminder (Sara, 2000). The resumption of the sensitivity of behavior to interfering influences began to be explained by the "re-consolidation" of memory. It was assumed that when a behavior is reproduced, the memory trace is "reactivated" (used) and again goes into a state whereby changes are possible in it.

Although the reconsolidation effect was first described in the 1960s, the interest in this topic increased mainly in the 2000s (Dudai et al., 2015; Nader, 2015). Specific molecular processes necessary for the consolidation and reconsolidation of memory do not match for all behavioral tasks and brain structures; the speed of these processes and the influence of various learning factors on them are also not the same (see Akirav, Maroun, 2012; Anokhin, 2010; Sozinov & Aleksandrov, 2022).

The effect of reconsolidation is detected not only in animals with the use of pharmacological procedures, but also in humans – in this case, additional learning is used as an amnestic agent. It was shown that the resistance of previously formed behavior to interference vanishes if it is reproduced before learning a new (second) behavior (Hupbach et al., 2008; Lau-Zhu et al., 2019; Walker et al., 2003).

Thus, memory reconsolidation is understood as a process of memory modification similar (but not identical) to consolidation after its reactivation (Debiec et al., 2002; Dudai et al., 2015; Nader, 2003; Walker et al., 2003). Although the effect of reconsolidation is experimentally demonstrated as a violation of recall after a reminder, reconsolidation is considered as a constructive process that allows, if necessary, to reorganize, or "update", previously formed memories.

(Re)consolidation of memory view within systems psychophysiology

From the appearance of the first ideas about the non-instantaneous formation of memory to the present time, memory, as a rule, is considered as preserving a "trace" that the influence of the external environment leaves in the brain structures, or is a model of the external environment. With all the variety of approaches to understanding consolidation (for a review, see: Dudai, 2012), as a rule, long-term strengthening of synaptic conduction in a reflex arc, networks of neurons, etc. is considered as the basis of its regularities.

From a systemic point of view, the neuron is not considered as a conductor of excitation, and the formation of new memory is not considered as creating a neural path or the formation of a "trace" via increasing the efficiency of synaptic communication between the neurons. The formation of memory is the formation of a new system of jointly active cells of the body, including neurons located in different structures of the brain, not necessarily directlu connected. This view is derived from the theoretical positions of the systems approach and from the data obtained within its framework (Alexandrov, 2005; Alexandrov et al., 2018; Alexandrov & Pletnikov, 2022), as well as the results of other studies (for example, Horn, 2004).

The systemic description of consolidation, from our viewpoint, includes two groups of inextricably linked processes: the processes of systemic specialization, i.e. morphological and functional modification of neurons associated with their involvement in a newly formed system; and accommodative reconsolidation. In order to introduce the second group of processes, it is necessary to take into account that the formed memory is not immutable, it is constantly being modified (Alexandrov, 2022; Alexandrov et al., 2015).

Activation of memory, as well as its formation, requires protein synthesis for reconsolidation processes, which, as we pointed out above, are similar to consolidation processes, although not identical to them. Thus, protein-dependent consolidation processes are associated not with a "new", but, more broadly, with an "active" memory (Nader, 2003).

Ideas about accommodative reconsolidation do not contradict the position about the constancy of the systemic specialization of neurons. Reconsolidation does not cancel the modifications that caused the formation of long-term memory (Nader et al., 2000). For a neuron, it is another stage of differentiation, perhaps less extensive than its specialization in learning.

We consider learning as the specialization of a new group of neurons in relation to the system being formed and the "addition" of the latter to previously formed systems. This addition requires mutual coordination of the new element with the previously formed ones and leads to their reconsolidational modification (Alexandrov, 2022; Sozinov, Alexandrov, 2022; Alexandrov et al., 2001). Currently, the results of research on memory reconsolidation lead other authors to the assumption that reconsolidation is indeed a common mechanism for the reorganization of previously formed memory during the formation of a new one (Hupbach et al., 2008).

Earlier, we presented data indicating that neurons belonging to a system and involved in providing one behavior, do not change their system specialization, but rebuild their activity, when this system is included in providing another behavior (Alexandrov, 1989). Later, in experiments with acute (Alexandrov et al., 2001) and chronic (Gorkin, 2021) registration of neural activity, data were obtained that support the assumption of reorganization of the previously formed system of behavioral act after learning the next act.

The reconsolidational modification undergone by the previously formed "old" system after the appearance of a new system connected with it was called by us the "accommodative" reconsolidation (Alexandrov et al., 2001; Alexandrov, 2022). The results of experiments with mapping brain activity by the expression of "early" genes (the *c-fos* gene) during training also support the assumption of reorganization of the previously formed system of behavioral act after learning the next act (Svarnik et al., 2013).

Thus, the second group of processes – the processes of accommodative reconsolidation caused by the inclusion of the system being formed into the existing structure of individual experience – consist in morphological and functional modification of neurons that belong to previously formed systems. This modification does not change the systemic specialization of neurons. The processes of morphological and functional modification of neurons that can unfold during learning without forming a new system were called "reorganizational" reconsolidation (Alexandrov, 2005; see also Safrazyan et al., 2019).

In most cases, there is no distinction between the processes of system specialization and reconsolidation in the studies of memory dynamics. Neurophysiological, morphological, molecular, biological, and other studies of neuronal modifications during learning confound the first and the second group of processes. A differentiated approach to these modifications is a necessary component of a research program aimed at identifying patterns of memory formation.

Since the formation of a new experience is based on previously formed experience, the specifics of the consolidation process depends on the characteristics of the latter. By isolating the components of the structure of individual knowledge and evaluating their composition in a study that employs strategic game of two partners, it was revealed that at several stages of the formation of new knowledge, the components that underlie previously formed acts of the game are activated within the sets of components of the knowledge structure (Alexandrov, Maksimova, 2003). It has been shown that the consolidation and reconsolidation processes are affected by the history of learning (Alberini, 2005; Krakauer et al., 2005; Tse et al., 2007). Therefore, it is also natural that brain ischemia affects further consolidation of memory (Nikishina et al., 2022). Consequently, one of the key aspects of the learning process is the involvement of the individual's "past" experience (see also Arutyunova, Gavrilov, 2014; Gavrilov, 2007; Krylov, Alexandrov, 2007; Krylov, 2015; Kuzina, 2017; Sozinov, Alexandrov, 2022; Shvyrkov, 2006; Alexandrov, 2008; Alexandrov et al., 2018; Brod et al., 2013; Grosmark, Buzsáki, 2016; Kuhl et al., 2012), leading to its modification (Alexandrov, 1989; Alexandrov et al., 2001; Dudai et al., 2015).

Based on the data provided by us in this section and other results (for more information, see Sozinov, Alexandrov, 2022) it has also been suggested in the literature that memory consolidation, once started, almost never ends (Dudai et al., 2015). It is shown that during this process memory is "freed" from information about the learning context, transformed, symbolized, etc. (see Sozinov & Alexandrov, 2022 for more details). It can be assumed

that the contribution of long-term memory to the formation of meaning (Ermakov, Denisova, 2019) is also due to reconsolidational changes. This means that consolidation and reconsolidation of memory are accompanied by "getting rid" of part of the memory, i.e. by forgetting.

The coexistence of the processes of "remembering" and "forgetting" during (re) consolidation corresponds to our idea of learning as a unity of two processes — the formation of new experience and modification of previously formed experience. We consider all the processes that are attributed to memory and describe its dynamics (acquisition, storage, reproduction, forgetting; consolidation, reconsolidation, reactivation) from this viewpoint. According to propositions on the dynamics of memory, it is also believed that the comparison of new and previously formed behavioral acts in terms of the individual experience should be made (McKenzie, Eichenbaum, 2011). It follows that normal (not caused by illness) forgetting is a natural and necessary part of the modification of individual experience.

Adaptive forgetting

Forgetting can be defined phenomenologically as the inability to recall what an individual could recall earlier (Roediger, Weinstein & Agarwal, 2010). Although the benefits of such forgetting are less obvious from everyday knowledge than its harm, forgetting of traumatic events and irrelevant or outdated information and the resulting improved possibility of generalization and memorization possess productivity (Luria, 1994; Parker, Cahill & McGaugh, 2006; Roediger et al., 2010). Therefore, forgetting is considered as an adaptive process necessary for normal memorization (Nurkova, Hoffman, 2016a; Sozinov et al., 2013; Nairne, 2010; Ryan, Frankland, 2022).

Considering forgetting as an adaptive process implies that it is consistent with the behavioral task and depends on previously formed experience. Indeed, the rate of forgetting differs between various tasks that require recall: studies of the "functional decay" of memory have shown that the more often it is necessary to replace certain types of information (for example, when we park a car), the faster they are forgotten (Altmann, Gray, 2002).

The connection of forgetting with the behavioral task is a particular consequence of a more general principle — that of goal-directed behavior, introduced by P.K. Anokhin into the conceptual apparatus of physiological research (Anokhin, 1973) and generally accepted in Russian psychology (which is expressed in the concepts of activity, attitude, dominant, and many others). Classical (Blonsky, 2001; Bartlett, 1995) and later works (Lyaudis, 2011; Schacter & Loftus, 2013) show that memory is not for reproduction of the past, but for adaptation and solution of current and future tasks. Therefore, memories are reconstructions, and they are associated with individual traits and life events (see also Anokhin, 1968; Shvyrkov, 2006; Nairne, 2010). Therefore, the identification of "unnecessary" knowledge occurs with respect to the task being solved by the individual.

Forgetting also depends on the "location" of the forgotten in the structure of experience: using the idea of the hierarchical structure of complex memory episodes, it was shown that the nature of forgetting the material is associated with its level of hierarchy in the structure of the episode (Andermane et al., 2021). The authors claim that forgetting has its own specifics at each level and propose the idea of "holistic" and "fragmented" forgetting.

According to the representational theory of forgetting, forgetting is determined by the type of "cognitive representation" formed during memory acquision (Gamoran et al., 2020). The adaptability of forgetting is also evident in the fact that it is often heterogeneous (different aspects of memory are forgotten at different rates), incomplete, dependent on context and time (see the review on this topic: Nørby, 2020). In addition, forgetting can be intentional: ideas about forgetting as a repression, suppression of memories have been formulated, and studies of intentional forgetting have been conducted (Nurkova, Hoffman, 2016b), including that of individual and collective amnesogenic practices (Nurkova, Hoffman, 2022).

Thus, the reorganization of experience, expressed in forgetting, depends on the task and on the individual structure of experience. If forgetting is a necessary part of the modification of experience, then one of its variants can be considered as the formation of a structure of experience that prevents the activation of some of its elements. The creation of such "access difficulties" is revealed in studies of memory consolidation.

Studies of the brain bases of memory consolidation, for the most part, are based on artificial intervention into the processes necessary for the delayed recall of new behavior (see Grechenko, 1979 on the use of electric shock for this purpose, as well as reviews: Alexandrov, 2005; Anokhin, 1997, 2010; Sozinov, Alexandrov, 2022; Barry & Love, 2023; Dudai et al., 2015; de Oliveira Alvares & Do-Monte, 2021; Runyan et al., 2019, etc.). The blockade of protein synthesis or of receptors in nerve cells during training leads to the impairment of recall of a new successfully learned behavior after a break (usually after a few hours). This effect can be interpreted as forgetting and, according to medical terminology, is classified as amnesia (for example, Kozyrev, Nikitin, 2009). In a number of studies of the features of pharmacologically induced amnesia, it has been shown that "forgetting" in this case is a consequence of the inability to utilize memory. So, using passive avoidance training in chicks (in which they stop pecking a bead that had been previously moistened with a bitter substance: Tiunova et al., 2016; Tiunova et al., 2020) and conditioned freezing (Tiunova et al., 2017) in mice with amnesia caused by blockade of NMDA-receptor, protein synthesis and other molecular processes, the possibility of repeated training of animals was assessed. Upon various periods after the disruption of memory consolidation (2 or 24 hours), the possibility of re-learning was impaired, while learning with other new signals (the color of the presented bead in chicks and sound in mice) in the same experimental model was not impaired. Similarly, suppressing the activity of the neurons that have been active during the formation of a new behavior disrupts not only the recall of this behavior, but also the ability to learn it again (Matsuo, 2015). The authors interpret these data with the idea of memory

"allocation" (Matsuo, 2015), according to which one behavior can be provided only by a certain set of neurons (despite the presence of a "reserve" of cells for new learning). The inability to form behavior anew, shown in these studies, means that the corresponding memory is preserved, but cannot be retrieved. Interestingly, the conclusion about the preservation of the "memory trace" has already been made earlier solely on the basis of consolidation studies with electric shock and the author's own data on the electrical activity of invertebrate neurons (Grechenko, 1979).

Memory preservation in amnesia has also been demonstrated using optogenetic methods by identifying so-called "silent engrams" (see Tonegawa et al., 2018). This method makes it possible to influence the activity of neurons in which the early *c-fos* gene was expressed during training. This expression is considered as the unfolding of a molecular genetic cascade of events underlying the process of cell specialization in relation to the newly formed system and the accommodative reorganization of previously specialized neurons (Alexandrov et al., 2015; Svarnik et al., 2011; Alexandrov et al., 2001, 2018). Optogenetic activation of neurons in the dentate gyrus of the hippocampus, active during the training and consolidation disruption procedures in mice, has led to the recall of this behavior even 8 days after training, although without this activation, the animals showed forgetting (Ryan et al., 2015).

Thus, one of the reasons for forgetting may be the formation of such a structure of experience with which the actualization of some elements of new experience (systems) is difficult. At the same time, the presence of these elements can influence the further formation of experience. For example, in a study of the neurochemical foundations of behavior at different stages of its formation (Romero-Granados et al., 2010) using early gene mRNA registration, it was shown that activation patterns during primary learning and learning after complete "forgetting" are similar (activation of the hippocampus, somatosensory and perirhinal cortex), but not identical. It is possible that this difference is due to the active creation of inaccessibility, "isolation" of memory, the molecular foundations of which are studied in the framework of "active forgetting".

The activity of forgetting means that the corresponding biochemical processes require energy and are comparable in complexity to the processes necessary for memorization. It is generally believed that forgetting requires disruption of synaptic connections that were formed during the training of a new behavior, and then the prevention of this disruption should prevent forgetting. Indeed, blocking the endocytosis of AMPA glutamate receptors in the hippocampus of rats leads to the prevention of forgetting the location of objects and of preferring the context in which the animal previously received food (Guskjonen, 2016).

In studies on mollusks (Sangha et al., 2005), fruit flies (Berry, Davis, 2014) and rats (Hardt et al., 2013), based on data on specific neurochemical changes in the brain that accompany decrease in the level of reproduction of new behavior, it has been shown that the blockade of these processes leads to the prevention of forgetting (and also often to the disruption of the formation of new behavior). Based on the data obtained, the

authors argue that forgetting cannot be considered a "mistake", a malfunction in memory. On the contrary, it is an active, adaptive and normal process necessary for learning and generalization (see also Quiroga et al., 2008). Moreover, intentional forgetting is based on such active processes (Gallo et al., 2022).

A situation in which a previously formed behavior becomes "unnecessary" and previously performed new behavior is inhibited, is also created with the extinction technique. If one of the reasons for forgetting is a temporary limitation of access to memory, then is this type of forgetting similar or identical to the processes underlying extinction?

Extinction

In the frames of conditioned reflex theory, the extinction of the classical conditioned reflex is a decrease in the expression of a conditioned reaction after the termination of reinforcement. Since "spontaneous recovery" of the reaction often occurs after extinction, I.P. Pavlov believed that extinction is due to "internal inhibition", which does not destroy the formed memory (Pavlov, 1952). Therefore, extinction was initially considered as learning (Bouton, Peck, 1992; Myers, Davis, 2002). Currently, it is known that extinction is not so much "destruction" of memory, as it is formation of a new one.

The fact that extinction is an "overlay" and not the destruction of previously formed nenory, has been repeatedly shown in neurophysiological studies (Berman, Dudai, 2001; Davis et al., 2017; Lacagnina et al., 2019). For example, selective inactivation of neurons that were active during the formation of extinction leads to restoration of previously formed behavior (Lacagnina et al., 2019).

The use of contextual freezing shows that the manifestations of fear before the formation of extinction and after it are provided by different brain processes. In one of these studies, it was shown that the formation of behavior is accompanied by increased fos activation of pyramidal neurons of the basolateral amygdala, and the formation of extinction is accompanied by a decrease in their activation and activation of neurons of the medial prefrontal cortex, the integrity of which is associated with the formation of a new memory for extinction (Davis et al., 2017).

In another study with the same technique, the characteristics of the spines of neurons in two zones of the limbic cortex of mice were evaluated (Vetere et al., 2011). The authors found that only large spines remain in the anterior cingular cortex after extinction, and many new spines appear in the infralimbic zone (compared to the group without extinction). They suggest that spines remain in the anterior cingular cortex after extinction, on which the restoration of behavior depends in the future.

Thus, extinction, like other phenomena of memory dynamics discussed here (consolidation, reconsolidation, forgetting) is one of the variants of changing the structure of individual experience. Extinction is produced by learning — the formation of new systems (due to the specialization of neurons) and modification of previously

formed experience (accommodative reconsolidation). Interestingly, consolidation effect has been demonstrated for extinction (see Dunsmoor et al., 2015). Moreover, pharmacological disruption of memory for extinction, simulating active forgetting in drosophila, causes spontaneous recovery of appetitive behavior, and the blockade of active forgetting prevents spontaneous recovery (Yang et al., 2023). Consequently, the formed structure of experience assumes the possibility of restoring behavior and allows freezing and extinction memories to coexist.

Discussion

Similarities and differences of (re)consolidation, extinction, and forgetting

Describing the common features of the processes of memory reconsolidation, extinction and forgetting, L. de Oliveira Alvares and F. Do-Monte (de Oliveira Alvares & Do-Monte, 2021) indicate that after memory consolidation, its subsequent state is determined by its use: if this memory is not "retrieved", then it is "filtered out" as a result of the processes of active forgetting and interference; after retrieval in a new behavioral situation, the memory is destabilized, and can either be modified if the novelty is insignificant (reconsolidation), or supplemented with a new memory that will prevent the retrieval of the first (extinction). It is noted that the exact knowledge for a clear separation of the two latter processes has not yet been obtained. In particular, the authors point out that the only difference in methods between reconsolidation and extinction is the duration of the procedure of "reactivation" of memory: if the reactivation is short, then memory reconsolidation occurs; if it is prolonged, then extinction occurs (de Oliveira Alvares & Do-Monte, 2021). Next, we will consider a number of studies that point to additional similarities between forgetting, extinction and reconsolidation of memory.

In a series of studies using snails that learn to reject two types of food during pharmacological disruption of reconsolidation, it was shown that amnesia caused by the blockade of protein synthesis before the "reminder" procedure (presentation of one of the foods) is characterized by long-term dynamics: the activity of defensive-behavior neurons during presentation of a juice used as the reminder had been decreasing for seven days (the corresponding indices were recorded 1, 3, 7 and 15 days after the reminder procedure) (Kozyrev, Nikitin, 2009). In other words, the severity of amnesia increased over time. Consequently, the process underlying this amnesia is gradual and depends on protein synthesis. In this sense, the dynamics of the active process of "forgetting" is similar to the dynamics of learning: the inability to reproduce behavior is formed gradually.

In the later stages, amnesia after disruption of the process of reconsolidation is accompanied by the inability to re-learn behavior, that is, in a certain time interval, this amnesia is not only retrograde (the reproduction of previously formed behavior is

disrupted), but also anterograde (long-term memory is not formed anew for this behavior) (Kozyrev et al., 2014). These results show that amnesia after a disruption of reconsolidation is a consequence of the lack of "access" rather than "destruction" of memory. Arguments in favor of the assumption that the reconsolidation effect is due not to the loss of memory material, but to the inability to retrieve it have been published before (Amelchenko et al., 2012, 2013; Anokhin et al., 2002; Dudai, Eisenberg, 2004). This statement also follows from the ideas about the constancy of the systemic specialization of neurons, which is being developed in our research (see above in the section "Theoretical foundations"). Interestingly, the severity of anterograde amnesia also depends on the time of amnesia induction after training: it is strongly pronounced and stable if the induction of amnesia was 2 days after training; if it was carried out 10 days after, then amnesia is not detected; however, the induction of amnesia 30 days after training is successful, but is not accompanied by anterograde amnesia (Kozyrev et al., 2014).

Further studies of the molecular bases of the dynamics of amnesia led the authors to the conclusion that the processes of reconsolidation and amnesia are independent, but both depend on protein synthesis (Nikitin et al., 2020). These and other results allowed them to propose that the development of this type of amnesia is similar to the learning process (Nikitin et al., 2020). Thus, this amnesia is specific to the type of food in relation to which it was formed; it depends on protein synthesis (Nikitin et al., 2019) and RNA methylation at a certain time interval (the blockade of these processes leads to a decrease in amnesia and the ability to form behavior if carried out within 9 hours after the disruption of reconsolidation); its severity changes over time (see above in this section); the reminder presented long time after this interval opens up the possibility of disrupting amnesia again with the blockade of DNA methylation (a time-window is opened to reduce amnesia similar to memory impairment after the blockade of protein synthesis during its reconsolidation). Moreover, using this technique, the authors demonstrated an impairment of re-learning not only after disruption of reconsolidation, but also consolidation (Nikitin et al., 2020). At the same time, the impairment of re-learning after reconsolidation of memory is also shown in vertebrates (Tiunova et al., 2022) using the experimental model we discussed above in relation to memory consolidation in chicks (Tiunova et al., 2020).

The processes underlying artificial amnesia may be similar to the processes that cause memory disorders (Nikitin et al., 2020). It can also be assumed that "healthy" forgetting develops in a similar way (Tiunova et al., 2020). In this case, forgetting and extinction are similar not only as alternative ways of changing consolidated memory depending on use (as suggested in de Oliveira Alvares & Do-Monte, 2021), but also as options for such modification of experience that prevents the use of previously formed experience.

It is also important that there are differences between forgetting and extinction. In particular, in case of amnesia, there is no spontaneous recovery of behavior, and in case of extinction, there is the possibility of re-learning (Nikitin et al., 2020). The differences between the processes underlying the phenomena of reconsolidation and extinction have also been shown earlier (Suzuki et al., 2004).

Thus, the process of forgetting, caused artificially by the blockade of molecular processes in the brain, develops as a separate process, the dynamics of which is similar to the dynamics of learning.

The research results discussed here show that forgetting, extinction and learning are variants of experience modification, differing in whether a new element of experience is formed (which is the case during learning and extinction, but not during forgetting), and how previously formed experience is modified, in particular, whether intersystem relationships change (see Yu.I. Alexandrov et al., 1999; I.O. Alexandrov, 2006; Bezdenezhnykh, 2004) so that it hinders the activation of previously formed experience (which takes place with extinction and forgetting, but not with learning). Such rearrangements of intersystem relations may underlie the ability of control of behavior, including that during consealing information (Uchaev, Alexandrov, 2022).

Conclusion

The description of the phenomena of consolidation, reconsolidation of memory, extinction and forgetting using the concepts of systems psychophysiology suggests that all these phenomena are a manifestation of learning, i.e. changing the structure of individual experience due to two processes: the formation of a new experience and modification of previously formed experience that provised coordination with the new one in the case of its formation. During this process, the formation of new experience, on the one hand, is impossible without updating previously formed experience, and on the other hand, leads to its modification, including the one that prevents further updating of a part of previously formed systems.

Reconsolidation of memory implies the presence of a time-window when it is possible to form "restrictions" on the implementation of some elements (systems) of previously formed experience. Apparently, the consolidation of the memory for extinction and the process of forgetting are also based on the possibility of forming such a restriction. Therefore, it can be assumed that reconsolidation, extinction and forgetting are based on similar long-term changes in previously formed experience, which exclude activation of some of its elements.

In systems psychophysiology, learning is considered as an evolutionary process. The increase in the relative number of specialized neurons diring consolidation shown in our laboratory (Kuzina et al., 2004) reveals the course of selection and changes that occur in the neural subserving of new behavior. The data presented in this review show that forgetting and extinction can be a manifestation of the selection process at the system level — the same as selection during learning, when some elements of experience start to be involved in new behavior, but on the opposite: when other elements are gradually eliminated.

Based on this, we can draw the following main conclusions:

- Consolidation and reconsolidation of memory are accompanied by forgetting, i.e. hindering some of the memory components;

- Studies in which forgetting is pharmacologically prevented or enahced show that forgetting can occur by interrupting the "access" to memory;
- Extinction has common features with forgetting, since it is formed as an addition of a new memory that co-exists with a preserved but inaccessible memory for the behavior being extinguished;
- The use of the conceptual apparatus of systemic psychophysiology allows us to describe the phenomena of consolidation, reconsolidation of memory, extinction and forgetting as manifestations of changes in the structure of individual experience via two differently pronounced processes: the formation of new experience and modification of previously formed experience.

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The Influence of Color on Recognition Memory for Cultural Landscapes

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Abstract

Introduction. Color is an important factor influencing success in scene recognition memory. It has been experimentally proven that the mechanisms for color participation in the perception of natural and anthropogenic landscapes are fundamentally different. We continued to study the impact of color on visual memory and provide the first experimental evidence for the role of color in memorizing scenes containing natural and anthropogenic components (cultural landscapes). **Methods.** The study sample comprised 154 subjects (45 males) aged 18-66 years (mean age = 24.88, SD = 9.28). A continuous recognition task was used to simulate the process of how people see and recognize images in the real world. First (at the encoding step), participants were shown a sequence of 36 color and black-and-white photographs of various types of cultural landscapes on a computer monitor. Experimental stimuli followed each other in a random order with an exposure of 64, 128, 300, or 2000 ms; the interval between presentations was 7000 ms. Then (at the recognition step) the same 36 photographs were presented with the equal number of duplicate stimuli. Half of the stimuli were the same as in the memorization stage; for the second half, the color conditions were changed. Participants had to determine the images that had already been shown in the first stage of the experiment and those they had seen for the first time. **Results**. Color plays an important role in the encoding phase in designed and naturally evolved landscapes. On the contrary, in associative landscapes color is important in the recognition phase as a part of the representation of complex images in episodic memory. **Discussion.** The results showed that the patterns of recognition of cultural landscapes differed from the reception of both natural and anthropogenic landscapes and were related to the degree of cultural development of the original natural environment.

Keywords

color perception, experiment, cultural landscape, continuous recognition, visual memory, recognition memory, color vision

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Introduction

In everyday life, people continuously recognize hundreds of images replacing each other (Kostina, Filippova, Allahverdov, & Allahverdov, 2022). We only need to look quickly to remember what a room, street, or entire city skyline looks like (Thorpe, Fize, & Marlot, 1996; Oliva & Torralba, 2006; Motoyoshi et al., 2007; Whitney & Yamanashi Leib, 2018). In recent decades, experiments have shown that scenes are encoded in our memory at the same speed as individual items (Oliva & Schyns, 2000; Joye, Steg, Ünal, & Pals, 2016). However, in comparison to simple forms, the mechanism of scene perception is fundamentally different. In most cases, we do not have time to recognize and identify the individual objects of the image, and we perceive the entire scene by focusing on its special spatial characteristics and visual properties (Steeves et al., 2004; Brady & Alvarez, 2011; Sekimoto & Motoyoshi, 2022).

Color is one of the important factors that impact memory for scenes, as demonstrated by extensive experimental data (Gegenfurtner & Rieger, 2000; Wichmann, Sharpe & Gegenfurtner, 2002; Spence, Wong, Rusan & Rastegar, 2006; Griber & Sukhova, 2020). First, in the encoding phase, color helps the visual system quickly segment complex images, understand the composition, define the boundaries of individual objects and facilitate their identification and semantic labeling. Memory researchers propose to call this possible color advantage *sensory facilitation* (Wichmann et al., 2002), as it is characteristic of early visual processing and has nothing to do with representing scenes in memory. Later, in the recognition phase, color is a part of the representation of complex images in episodic memory and provides *cognitive facilitation* in the recognition process (Gegenfurtner & Rieger, 2000, p. 807).

Research findings show (Kardan et al., 2015; Taniyama, Suzuki, Kondo, Minami & Nakauchi, 2023) that the role of color in the perception of natural and anthropogenic landscapes is quite different. Color greatly facilitates the recognition and designation of natural landscapes (forest and desert landscapes, sea coasts and canyons, mountains and cliffs) (Oliva & Schyns, 2000), but has a significant reduction in the impact of artificial objects on landscape perception (interiors of residential buildings, university campuses, railway stations, airports and city streets) (Wichmann et al., 2002, p. 514). The rate of naming natural scenes decreases when they are presented in unnatural colors or without colors, but does not change at all when the same phenomenon occurs in non-natural landscapes (Oliva & Schyns, 2000).

According to researchers, this can be explained by the fact that natural and anthropogenic landscapes have fundamental differences in spatial characteristics, visual characteristics, and dominant colors (Field, 1987; Burton & Moorhead, 1987; Frey, Honey & König, 2008). Natural landscapes usually have large areas with uneven contours, which are colored in the typical, almost identical colors. On the contrary, in artificially created landscapes, vertical and horizontal lines dominate and there are no such zones. Unlike natural objects, artificial objects have clear, long, and regular boundaries, and are characterized by greater chromatic variability, which is generally observed at a small spatial scale (Oliva & Schyns, 2000). For example, city color consists of a large number of dynamically changing elements, including pedestrian clothing, moving vehicles, goods in store windows, street lighting elements, and signs located along the street (Grieber, 2017; 2021; 2022).

The color information of natural and anthropogenetic scenes is involved in visual memory in different ways (Oliva & Schyns, 2000; Steeves et al., 2004). Short-term viewing generally does not use small-scale spatial information, and recognition is based mainly on large-scale data. This means that in anthropogenetic landscapes, color is not used as a signal. However, it plays an important role in natural scenes.

We continued to study the influence of color on visual memory ***and experimentally investigated how people memorize and recognize cultural landscapes.*** These landscapes, which we live in most of our lives, combine natural and anthropogenic elements and are the result of conscious and deliberate human activities to meet their practical needs (Lavrenova, 2021).

Our ***hypothesis*** is that the mechanisms by which color is involved in the perception of cultural landscapes can differ from the recognition of natural and anthropogenic landscapes. In addition, the recognition pattern can be associated with the degree of cultural development of the initial natural environment. Thus, in designed, naturally evolved, and associated landscapes the role of color may differ (Vedenin & Kuleshova, 2004).

Methods

Participants

The study sample comprised 154 subjects (45 men, 109 women) aged 18-66 years (mean age = 24.88, SD = 9.28). All participants had normal color vision and normal or corrected to normal visual acuity.

Stimuli

To create the stimuli, we selected 72 photographs from three different categories:

1. Designed cultural landscapes included images of landscape architecture, noble estates, mosaics on the facades of city buildings, city sculpture, traffic flows, festively decorated streets, city advertising, industrial landscapes, and residential quarters.
2. Naturally evolved cultural landscapes included photographs of cultivated fields, rice terraces, views of villages in central Russia, northern towns, panoramas of cities, and historical centers.
3. Associative cultural landscapes included photographs of memorable places, places of creativity, sacred places, and battlefields.

Photographs were selected from the *McGill Calibrated Color Images Database* (Olmos & Kingdom, 2004) and other open color image databases. All selected images were reduced to a resolution of 1024 x 768 pixels. Figure 1 shows example images for each category.

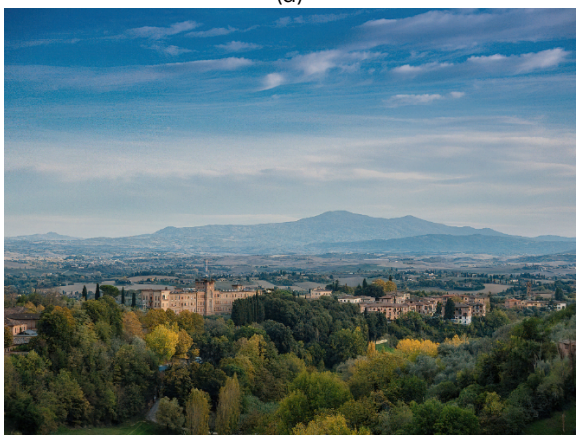
A 32-inch *Dell S3221QS* monitor with a vertical refresh rate of 60 Hz was used to demonstrate the stimuli. The participants sat at an 80 cm distance from the screen, which provided a visual angle of about 28 x 21 degrees.

Each image was represented in one of the two representation conditions – in color or in black-and-white (gray scale). For black-and-white images, the intensity of the red, green, and blue luminophores was at the same value for each pixel. Thus, the brightness of each pixel was the same in the color and black-and-white representation conditions. Black-and-white images are shown in Figures 2 and 4.

Figure 1

Examples of experimental stimuli with different types of cultural landscapes: (a) designed; (b) naturally evolved; (c) associative

(a)



(b)

(c)

Experimental procedure

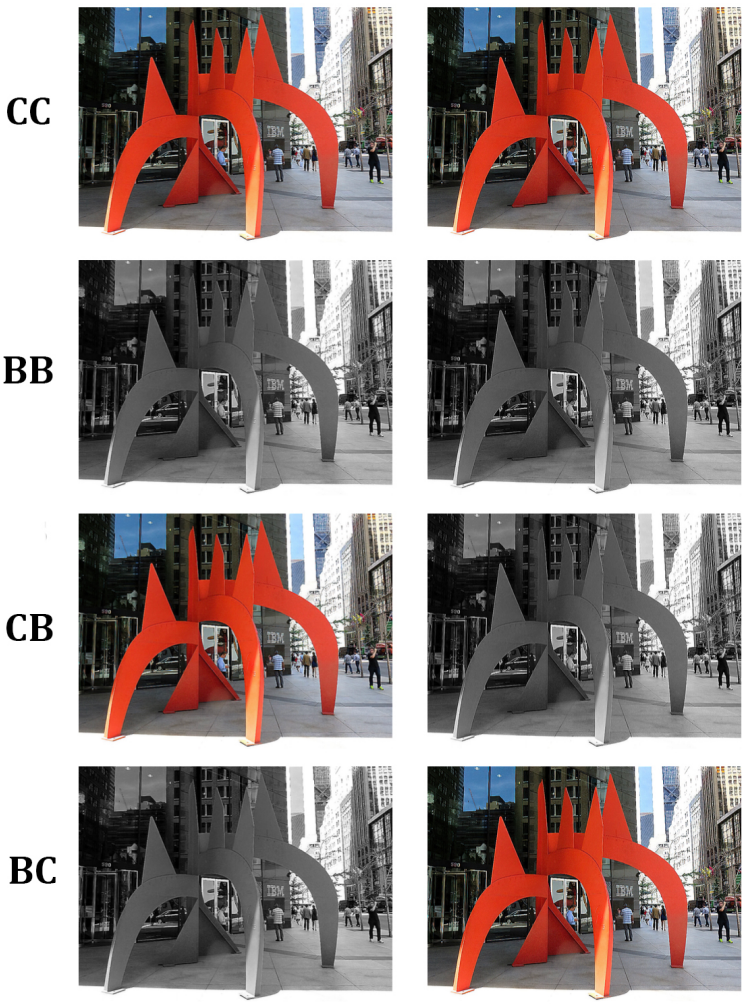
The experiment used a continuous recognition procedure that simulated how people see and recognize images in the real world (Potter, 1976; Wichmann et al., 2002).

First, in the encoding phase, participants were randomly shown a sequence of 36 alternating photographs of different types of cultural landscapes. Each image appeared on the screen in color or in a corresponding black-and-white mode at different speeds (64, 128, 300, or 2000 ms), but with the same interval between stimuli (7000 ms).

After this, in the recognition phase, participants were shown the same 36 photographs mixed with the same number of duplicate stimuli and asked to identify which of the images they saw in the first stage of the experiment. Half of the images we asked to remember in color were shown in black-and-white. The second half of images were shown unchanged (both times in color).

Thus, the experimental design was a 2x2 design, which was traditionally used in natural and anthropogenic landscape studies (see, e.g., Gegenfurtner & Rieger, 2000; Wichmann et al., 2002; Spence et al., 2006). The scheme included two levels of encoding (color / black-and-white) and two levels of recognition (color / black-and-white) and resulted in four possible combinations of color conditions (Figure 2): color images at both stages (CC condition), black-and-white images at both stages (BB condition), a color image at the encoding stage and a black-and-white image at the recognition stage (CB condition), a black-and-white image at the memorization stage and a color image at the recognition stage (BC condition).

Figure 2
Four combinations of color conditions: color images at both stages (CC condition), black-and-white images at both stages (BB condition), a color image at the encoding stage and a black-and-white image at the recognition stage (CB condition), a black-and-white image at the encoding stage and a color image at the recognition stage (BC condition).



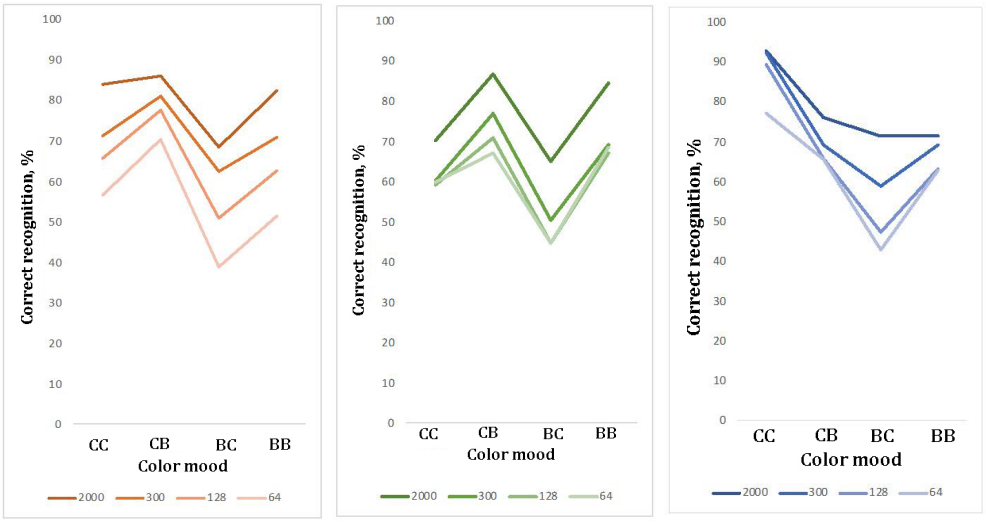
Results

Patterns of recognition of different types of cultural landscapes

For each type of cultural landscape, we identified specific recognition patterns that were consistently repeated at different exposure durations (Figure 3).

Figure 3

Patterns of recognition of different types of cultural landscape: (a) designed; (b) naturally evolved; (c) associative



(a) (b) (c)

As we expected, recognition of images from different categories was significantly correlated with presentation length ($F = 13.78158$, $p < .00001$). However, even with a very short-term exposure (64 ms), the number of correctly recognized images was quite large (59 %), indicating the high speed at which we process complex visual images. When the presentation duration was increased to 2000 ms, the success of image recognition was maximum and reached 78 %.

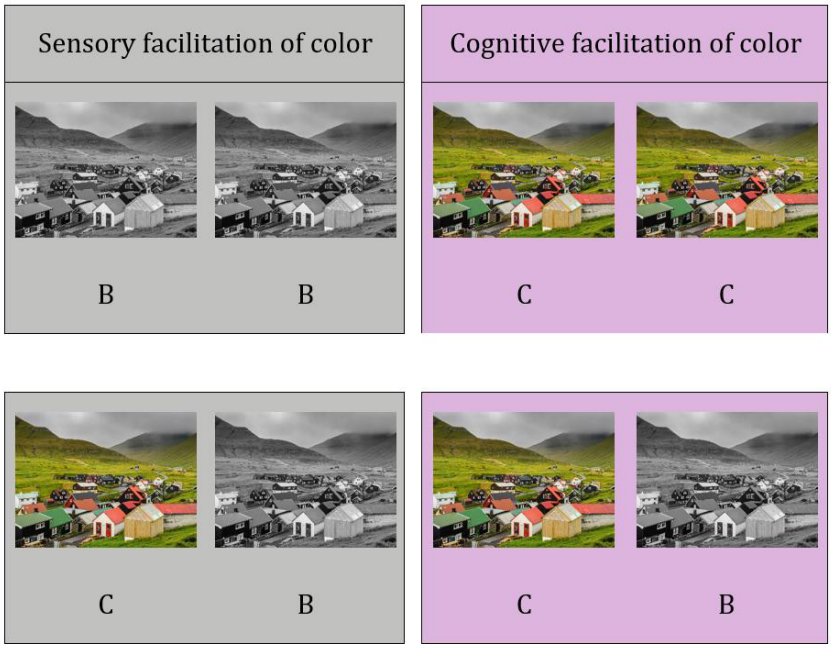
Sensory vs. cognitive facilitations of color

The analysis paid particular attention to the differences between BB and CB conditions, as well as between CC and CB conditions. Based on previous research (see Gegenfurtner & Rieger, 2000), we believed that color did not affect decision-making if photos were initially presented in color and then shown in black-and-white (CB condition). It plays a certain role only during memorization – in the processes of image segmentation and determination of the boundaries of the figure and the background. Thus, the differences between BB and CB conditions (Figure 4, left) indicate the importance of colors at the information encoding stage (sensory facilitation). If color only plays an important role at cognitive level, there will be no difference between BB and CB conditions.

On the contrary, since the encoding conditions for the CC and CB stimuli (Fig. 4, right) are the same (in both cases the photograph was presented in color), any differences between the two groups arise during the process of comparing the target image with its

memory representation. Consequently, the advantage is explained by the fact that color relates to this representation as an additional attribute and provides cognitive facilitation.

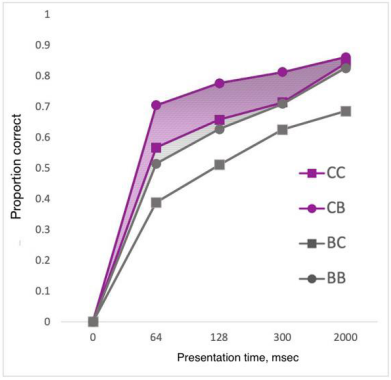
Figure 4
Sensory and cognitive facilitations of color: difference between the BB and CB conditions (left), and the CC and CB conditions (right)



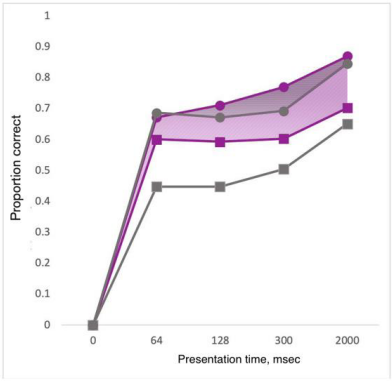
The analysis showed qualitative differences in the way we memorize images of different types of cultural landscapes. Designed landscapes are created purposefully, characterized by a certain thoughtful planning composition, and include a large number of various kinds of anthropogenic elements created on the site of natural formations. Here, color provides a sensory facilitation and plays an important role at the encoding stage (differences between the BB and CB conditions ($t(306) = 4.9252$, $p = .000001$) are indicated by gray shading in Figure 5-a). On the contrary, in associative landscapes, where the cultural component is often presented not in material form, but in mental form, based on the association of the object with a cultural phenomenon, color provides a cognitive facilitation and is important exclusively in the process of recognition (differences between the CC and CB conditions (($t (306) = 4.1612$, $p = .000041$) are indicated by pink shading in Figure 5-c). Moreover, both in designed and naturally evolved rural, historical, and industrial cultural landscapes (Figures 5-a and 5-b) there is an unexpected 'shift' in the CB condition compared to the CC condition ($t(306) = 4.7751$, $p = .000001$), which indicates that the color added to the initially black-and-white photographs in the process of comparing the target image with its representation in memory represents a kind of cognitive obstacle and prevents us from memorizing.

Figure 5

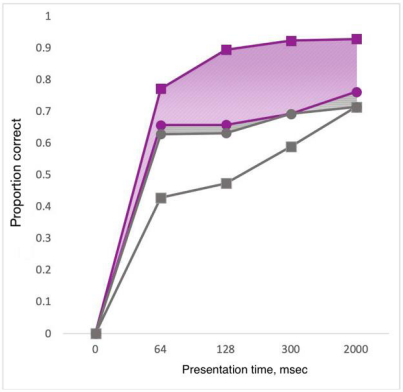
Correlation of the proportion of correctly recognized images of various types of cultural landscapes with exposure duration; sensory facilitation of color (difference between the BB and CB conditions) is indicated by gray shading; cognitive facilitation of color (difference between the CC and CB conditions) is indicated by pink shading.



(a) designed



(b) naturally evolved



(c) associative

Discussion

The comparison of recognition patterns of various types of cultural landscapes in our experiment (Figure 3) with the configurations generated by the linear model that is used in analysis of variance in I. Spence and his colleagues (Spence, 2006, p. 3) confirms that the shapes of the curves, rather than the absolute success rates, are significant for various types of cultural landscapes.

In recognition patterns of designed and naturally evolved landscapes, an asymmetry effect is clearly visible, similar to that of M. Pezdek and colleagues (Pezdek et al., 1988) described several decades ago in their study on the way people memorize different types of drawings. As in our experiment, the authors used a 2x2 experimental design. However, the changing condition was not color, but the complexity of the image. Thus, participants had to memorize several pictures and then to recognize them. The performance of recognizing images, which at the recognition stage had a simpler form than during memorization, was significantly higher than in cases where the stimuli initially had a simpler form than during recognition. The experimenters explained this by the fact that in a more complex image the new details change it to such an extent that it does not correspond to the memory representation. In our case, the same thing happened with color. Participants were unable to recognize color photographs that they had memorized as black-and-white (BC condition). On the contrary, they successfully identified black-and-white images that they had previously seen in color (CB condition).

The effect described may be due to the fact that color is involved in the memorization process indirectly. This is demonstrated in particular by previous research that people rarely know whether they have seen a particular image in color or in black-and-white (Suzuki & Takahashi, 1997). In a color image, we tend to memorize not the color itself, but some important encoding characteristics that color improves, thus facilitating memorization. On the contrary, if color is added only at the stage of recognition, it changes the image so much that it prevents us from recognizing a scene we saw in black-and-white.

This effect is not observed in natural landscapes, where color mainly performs a diagnostic function (Oliva & Schyns, 2000). Natural landscapes tend to have unique colors. Thus, canyons are mostly red and orange, forests – green, sea coasts – blue, and deserts – yellow. The projections of images of these landscapes occupy separate, non-overlapping zones in the a*b* plane of the CIELab color space. Consequently, chromatic information is distinct (diagnostic) for them. Even when they are seen in black-and-white, the color of natural objects can be predicted with high probability. In cultural landscapes, color is much less predictable and can radically change the image of the area and affect its mental representation.

In associative landscapes, higher recognition rates corresponded to conditions under which the images were the same at the stages of memorization and recognition (CC and BB conditions). The high recognition rate of CC type stimuli indicated the important role of color during both encoding and recognition processes. In the BB condition, color was not involved in the determination of boundaries and the segmentation of the image during encoding. However, the presence of exactly the same information about shape and brightness during memorization and recognition was more important than the possible enhancement of encoding processes that color could provide. Thus, recognition performance was directly related to compliance with the principle of encoding specificity, which states that the performance of memorization and recognition increases when the same information that is available at encoding is also available at retrieval (Tulving & Thomson, 1973). It was not the presence of color, but rather the quality of correspondence between the initial image shown and the image to be recognized, which was fundamental.

With a very short-term presentation (64 ms), in the CC condition, the recognition performance was noticeably lower than with longer-term exposures (128, 300, and 2000 ms). Based on previous research (Spence et al., 2006), this may be due to the fact that shape and color are processed in different cortical areas. For color to improve memory, these properties must be synchronized. Although linking color and shape occurs quickly, the process still takes some time. Therefore, for very short-term exposures, when shape and color processing have not yet had time to synchronize, the response pattern will differ from those obtained with longer-term exposures.

At the same time, the general correlation between the proportion of correctly recognized images and the duration of their presentation, also noted in previous studies of the mechanisms of memorizing complex images (Gegenfurtner & Rieger, 2000; Wichmann et al., 2002; Spence et al., 2006), can be explained by the fact that longer-term exposure increases the number of gaze fixations and their duration, resulting in more detail information being encoded (Potter, Staub, Rado, & O'Connor, 2002).

Conclusion

Our experiment confirmed that the mechanism of color participation in the perception of cultural landscapes differs from the reception of both natural scenes and anthropogenic landscapes and correlates with the degree of cultural development of the initial natural environment.

First, color significantly reduced the recognition performance of designed and natural landscapes, which participants memorized as black-and-white. Conversely, performance at identifying black-and-white images that were in color at the encoding stage increases. A similar effect of recognition asymmetry is not observed in natural landscapes, where in most cases color performs a diagnostic function and is easily predictable.

Secondly, the recognition performance of associative landscapes is directly related to compliance with the principle of encoding specificity, which states that memorization efficiency increases when the images are the same in the stages of encoding and retrieval (both times are shown in color or, conversely, in black-and-white).

Thirdly, comparing the recognition performance patterns of different types of cultural landscapes with the configurations generated by the linear model that is used in analysis of variance confirms that the shapes of the curves, rather than the absolute success rates, are significant for cultural landscapes. Color provides a notable sensory facilitation in designed landscapes and is less significant in naturally evolved ones. On the contrary, in associative landscapes, it is important only in the recognition phase as a part of the representation of complex images in episodic memory.

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Manifestations of Speech Defects in the Processes of Speech Perception and Inner Speaking

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Abstract

Introduction. Existing research in the field of speech disorders does not provide a systematic understanding of the relationship between brain bioelectric activity and the nature of speech disorders, characteristics of speech perception and inner speech. This study aims to compare brain activity during the perception and inner speaking of words between a group of non-language impaired subjects and a group of subjects with functional dyslalia. For the first time, an analysis and comparison of evoked potentials (EPs) of the brain in the process of speech perception and inner speaking in individuals with and without rhotacism were carried out. **Methods.** A total of 36 subjects participated in the EEG study, including 18 subjects suffering from the rhotacism speech impediment. The subjects were presented with auditory stimuli (words) spoken by a speaker with rhotacism and a speaker without sound pronunciation peculiarities. Subsequently, the study participants were asked to mentally repeat the word, maintaining the tone and pronunciation characteristics as in overt speech. **Results.** During the EEG study, the most significant differences in the EP structure were found in lead C3. **Discussion.** The differences in EP in the process of speech perception and inner speaking in subjects with and without rhotacism were analyzed. It was shown that for the task on speech perception and inner speaking of speech stimuli, there is a tendency to distinguish between defective and normative pronunciation of words by a group of individuals without speech disorders. No significant differences in EP were observed in subjects with rhotacism under the same conditions. It can be assumed that individuals with rhotacism do not perceive the difference between these pronunciation options.

Keywords

electroencephalography, inner speech, rhotacism, evoked potentials, perception, speech disorders, functional dyslalia, sound image, pronunciation defects, inner speaking

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Introduction

The prevalence of speech disorders, according to various sources, varies from 5–10 % (Yagunova, 2018) to 22 % (Goulart, 2017). In recent years, there has been an increase in the number of patients with cognitive deficits and speech development disorders (Makarov, Emelina, 2017). The use of electroencephalography (EEG), magnetic resonance imaging (MRI), and computed tomography (CT) to assess the functional state of the brain has become widespread. Using these methods, in recent years, epileptiform and local pathological changes (with temporal predominance) in the brain have been discovered in children with severe speech disorders and organically caused severe mental retardation (Gamirova, Belousova, Utkuzova, & Zaikova, 2014), neuropsychological and neurolinguistic aspects of specific speech disorders (Pachalska, Jastrzębowska, Lipowska, & Pufal, 2007). A correlation has been established between temporomandibular disorders, atypical swallowing, and dyslalia (Marchesi et al., 2019).

Despite research into the diagnosis and treatment of speech disorders in children and adults, such issues as the pathogenesis of various speech disorders, the relationship between brain bioelectrical activity characteristics and speech defects and the characteristics of inner speech and perception remain unresolved. Understanding the neurophysiological mechanisms of the organization of speech activity is a necessary condition for the development and application of appropriate methods to correct speech development disorders.

Functional dyslalia

Functional dyslalia is a defect in sound pronunciation caused by a dysfunction of the cortical parts of the speech-motor and speech-auditory systems or a defect in the speech production mechanism. It is manifested by motor (distortion) or sensory (mixing,

substitution) inaccuracy in the pronunciation of phonemes. Rhotacism is a form of dyslalia associated with the presence of a defect in the pronunciation of the [r] and [r'] sounds.

Causes of functional dyslalia

In individuals with functional dyslalia, the structure of the peripheral speech apparatus is normal, the innervation of the articulatory muscles is not impaired, and physical hearing is preserved. The pronunciation defects are due to disruption of neurodynamic processes in the cerebral cortex. Functional dyslalia can be caused by the following two types of factors:

1. **Biological factors**. These include delays in speech and mental development and general physical exhaustion due to long-term illnesses or severe infectious pathologies. Disorders of general physical development predetermine a neurodynamic deficit that manifests itself in the weakening of subtle differentiations in the speech-auditory or speech-motor systems. Articulatory movements are unclear, speech kinesthesia is unclear, phonemic hearing is not formed.

2. **Social (pedagogical) factors**. These include cases of incorrect speech training: parents' imitation of 'babbling' pronunciation, children's assimilation of defective speech patterns of adults, excessive stammering of parents and close relatives, which children begin to mimic. Speech development is negatively affected by upbringing in a bilingual environment. In this case, the normative features of sound pronunciation for one language can be transferred to another, where they are not the norm. Among other things, the cause of dyslalia may be a delayed visit to a speech therapist or pedagogical neglect (Boltakova, 2013).

Mechanism for occurrence of dyslalia

The occurrence of functional dyslalia is associated with an imbalance of excitation and inhibition in the cortical areas of the speech-auditory and speech-motor systems of the human brain. The nature of the main defect is determined by the localization of cortical neurodynamic dysfunction. When the motor speech center (Broca's area) is damaged, motor failure occurs mainly. Firstly, the reproduction of phonemes is affected, and secondly – speech hearing. When neurodynamic disorders are localized in the sensory speech area (Wernicke's area), the ability to perceive speech sounds as linguistically significant decreases.

Early studies showed contradictory results on the relationship between speech production and auditory perception in individuals with speech disorders. Some authors suggest that the perception of sounds is a critical variable and impacts speech production (Munson, Edwards & Beckman, 2005; Nijland, 2009; Cabbage, Hogan & Carrell, 2016). Other authors argue that there is little evidence that the presence of a speech impediment causes problems in auditory speech perception (Nagao, 2012; Hearnshaw, Baker, &

Munro, 2018). Thus, recent research (Berti, Guilherme, Esperandino & de Oliveira, 2020) has confirmed the relationship between speech production and speech perception, although it is noted that speech perception does not fully reflect the process of speech production.

Given the ambiguity of previously results, it appears necessary to continue studying the relationship between speech production and perception in individuals with defects in sound pronunciation.

There is an ongoing debate about whether overt and inner speech are equally processed in the brain. Do both types of speech contain detailed articulatory information and inner speech lacks only sound production? Does inner speech contain no detailed articulatory information (Stephan, Saalbach, & Rossi, 2020)? A study (Stephan et al., 2020) has shown that the brain successfully distinguishes between overt and inner speech. By simultaneously using EEG and functional near-infrared spectroscopy (fNIRS), the authors showed that differences between overt and inner speech are explained not only by specific language and motor processes, but also by inhibitory mechanisms. In addition, recent attempts have been made to automatically decode inner speech using EEG and other non-invasive methods (Simistira, Gupta, Saini, De, & Liwicki, 2022; Nieto, Peterson, Rufiner, Kamienkowski, & Spies, 2022; Berg, Donkelaar, & Alimardani, 2021).

A study (Mehta et al., 2015) has shown the presence of generalized EEG abnormalities in children with speech impairments. Significant statistical changes in the EEG parameters have been found, characteristic of various levels of general speech underdevelopment. These changes are necessary for the differential diagnosis of moderate and severe impairments and for the prognosis of the disease (Razin'kova et al., 2019).

In a recent paper (Ballard, Etter, Shen, Monroe, & Tien, 2019), the authors demonstrated the feasibility of using EEG-based automatic speech recognition systems as a feedback tool in speech therapy for patients with aphasia. The results presented in another paper (Krishna et al., 2021) showed a first step towards demonstrating the feasibility of using non-invasive neural signals to develop a reliable speech prosthesis in real time for stroke survivors suffering from aphasia, apraxia, and dysarthria.

The processing of auditory information plays an important role in the process of inner speech. It is carried out in a number of cortical areas found in the lower bank of the lateral sulcus and adjacent to the superior temporal gyrus (Vartanov & Shevchenko, 2022). From the perspective of brain mechanisms, there is a complex system, which, on the one hand, is similar to the system of speech perception and representation of sound images, and, on the other, to the system of speech production.

Since inner speech can be considered as a derivative form of overt (sound) speech, it is reasonable to expect that impairments of overt speech can also manifest themselves in inner speech. However, on the other hand, since sound production itself is not required in inner speech, it would seem that pronunciation defects should not manifest themselves in the mental image of sounds. This contradiction represents **the main problem** of this

study. Its relevance and scientific importance are not so much related to the area of speech therapy and defectology, but to the field of neurophysiology. At present, there is no complete systemic understanding of the brain mechanisms of inner speech. The relationship of these processes and the nature of the speech defect has not been virtually studied (this is the **object of this study**). The corresponding manifestations of bioelectrical activity using EP have not been described, which is the **subject of this study.**

This study aims to use EEG data to construct and compare evoked brain potentials in the process of perception and inner pronunciation (mental repetition) of words (pronounced normally and by a speaker with rhotacism) by a group of subjects with rhotacism and a group of subjects with normative pronunciation.

Methods

Subjects

A total of 36 subjects participated in the study (18 women and 18 men aged 22–38 years), including 15 subjects (6 women and 9 men) with a peculiarity of sound pronunciation in the form of rhotacism. The subjects had higher education. All subjects had no history of mental illness, and also signed a voluntary informed consent to participate in the experiment, approved by the ethics committee of the Faculty of Psychology, Lomonosov Moscow State University, No. 6, 2020.

Equipment

The BrainSys software (BrainWin) was used to record and edit the EEG to exclude artifacts. Registration of electrical activity of the brain was carried out monopolarly, using the Neuro-KM 19-channel electroencephalograph (Statokin company, Russia). The electrodes were placed according to the international 10–20 system. The Presentation software (version 18.0 from Neurobehavioral Systems, Inc.) was used to present the stimuli. Average evoked potentials (EPs) and the corresponding 95 % confidence intervals were calculated for each stimulus.

Stimuli

1. Raketa – a meaningful word with the control letter [r] at the beginning.
2. R'aketa – a significant word pronounced by a speaker with rhotacism.
3. Biblioteka – a neutral word that does not contain the control letter [r];
4. Kur'er – a meaningful word with a control letter [r] in the middle of the word before the soft sign and at the end of the word.
5. Ograda – a meaningful word with the control letter [r] in the middle of the word before the vowel.

These stimuli were presented in audio format. In the audio presentation, recordings of a female voice were used to present these words without additional sounds, noises, and the possibility to form phrases and sentences.

Experimental procedure

The stimuli were presented in a random order, each 50 times. The total sequence of presentations consisted of 250 stimuli. The duration of the experiment was about 25 minutes. The beginning of inner speaking was indicated by a special signal (short sound). Auditory stimuli were presented through headphones. During the experiment, subjects had their eyes closed.

Data analysis

To exclude artifacts, the visual analysis of the EEG was performed using the Brainsys software (BrainWin). As a result of automatic sorting of EEG segments by stimulus numbers and averaging of EP fragments in the interval of 200 ms before the stimulus and 500 ms after its presentation, 5 EPs were obtained for the perception of stimuli and 5 EPs for their inner speaking for each of 19 leads for the two studied groups of subjects. For all EPs, 95 % confidence interval estimates were obtained, which were further used to determine the significant differences between them.

Results

For each of the studied groups of subjects (groups of subjects with and without rhotacism), averaged EPs were obtained during perception and during inner speaking of each of the presented words with an estimate of 95 % confidence interval, which made it possible to assess the reliability of differences in the amplitude of the corresponding peaks. In most leads, no significant differences were found between the groups of subjects for any of the word stimuli. However, subtle but significant changes in bioelectrical activity were detected for some conditions in lead C3. The perception task is characterized by virtually complete coincidence of evoked potentials in shape for both groups of subjects for all stimuli. In lead C3 there was a slight difference in the amplitude and shape of the EP for the words 'biblioteka' and 'kur'er'; the presence of an N450 peak was also characteristic when the word 'biblioteka' was perceived by a group of subjects with rhotacism (Figure 1).

Figure 1

Comparison of EPs between groups of subjects with and without rhotacism during word perception

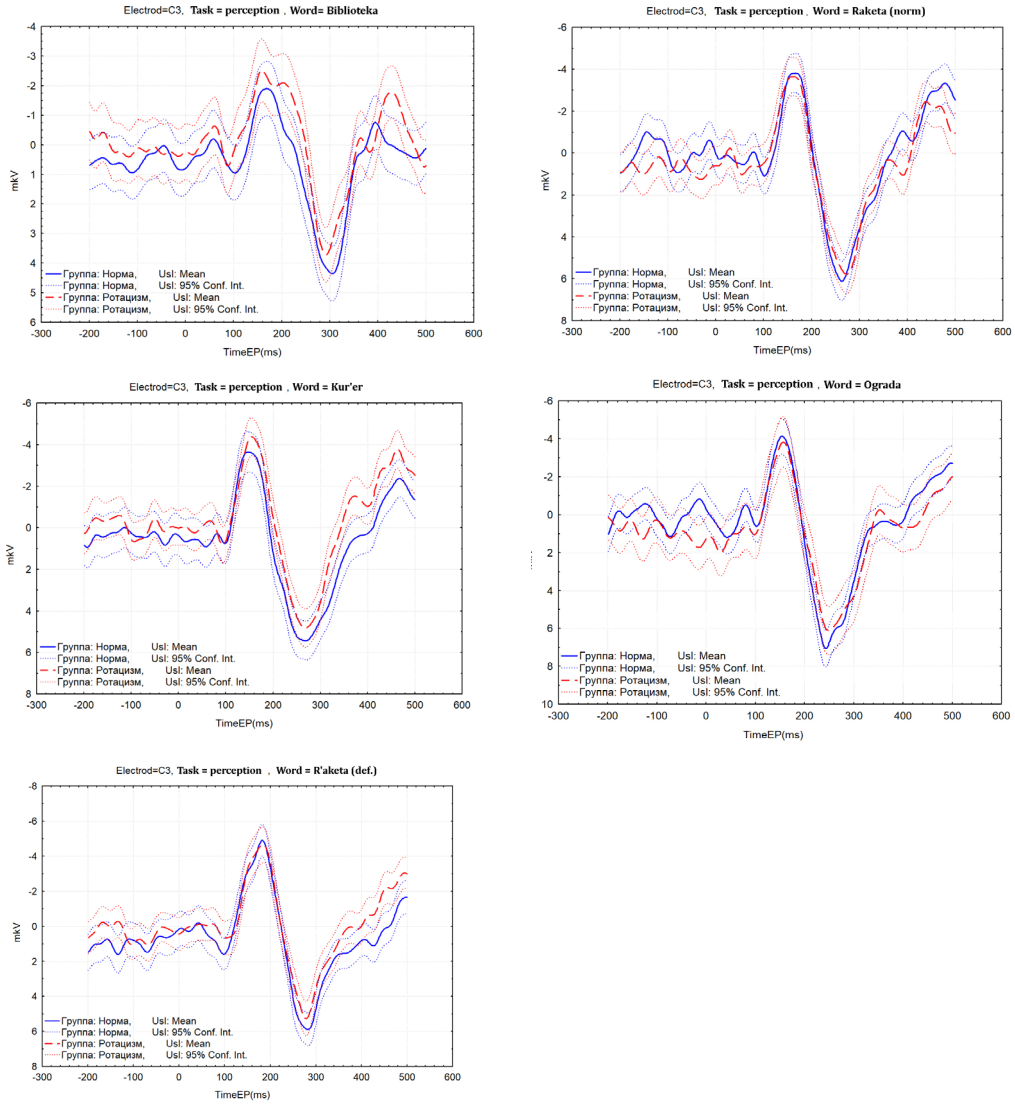


Figure 2

Comparison of EPs between groups of subjects with and without rhotacism during internal pronunciation of words

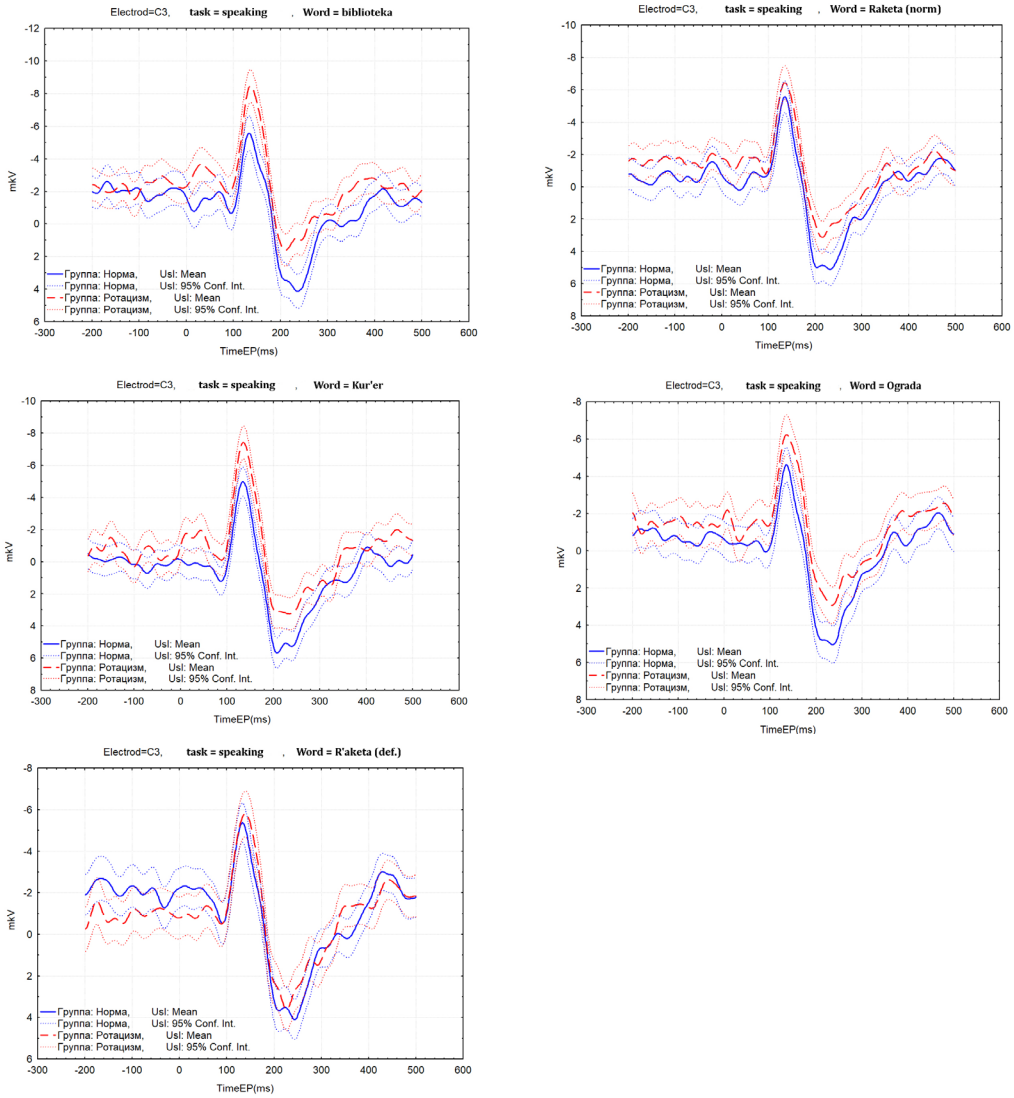
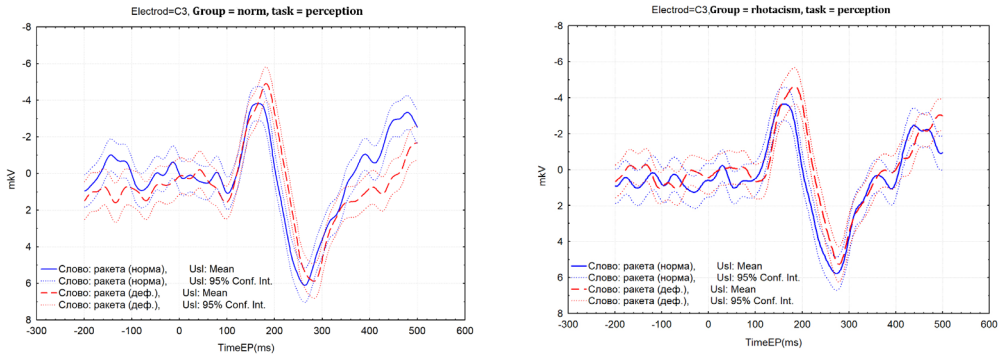


Figure 3 additionally shows a comparison of EP in lead C3 for the task of perceiving the words 'raketa', pronounced by a speaker without speech defects ('raketa' normal) and 'r'aketa', pronounced by a speaker with rhotacism ('raketa' (def.)). The presence of a shift in EP latency to the right is characteristic of the perception of a stimulus spoken by a speaker with a diction defect for both groups of subjects (Figure 3).

Figure 3

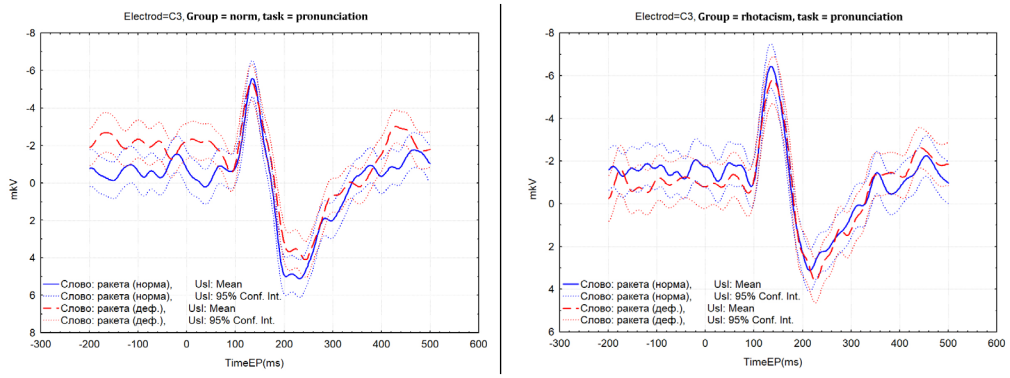
Comparison of EPs between groups of subjects with and without rhotacism when perceiving the word 'raketa', pronounced by a speaker with rhotacism and a speaker without speech defects



Pronunciation of the same stimuli is characterized by virtually complete coincidence of EP shapes, amplitudes, and latencies in lead C3 for both groups (Figure 4).

Figure 4

Comparison of EPs between groups of subjects with and without rhotacism during inner speaking of the word 'raketa' pronounced by a speaker with rhotacism and a speaker without speech defects



Discussion

The neurophysiology of severe speech disorders is presumably caused by organic factors due to perinatal hypoxic damage to the central nervous system. The mechanisms of moderate and mild speech impairments are determined by the discoordination of the processes of excitation and inhibition of certain brain structures (Razinkova et al., 2019), which undoubtedly affects changes in the overall EEG pattern. Such speech disorders are mainly associated with structural abnormalities of the left inferior frontal lobe. Thus,

it has been shown that biofeedback, developed on the basis of EEG signals in leads O2, O1, C3, C4, F3, F4, F7, F8, effectively helps in correcting speech disorders (Jayawickrama & Thelijjagoda, 2020).

The results of this study demonstrate that the largest and only differences in EP between groups of subjects with and without rhotacism were found only in lead C3.

The model of language analysis (Emelina, Makarov, & Gasanov, 2019), based on numerous neurophysiological studies of the process of language analysis (Frisch, Hahne & Friederici, 2004; Friederici, 2011; Yurchenko, 2017), suggests the existence of a three-stage model of processing linguistic information in the brain. At the first stage (time interval 100-300 ms), syntactic analysis is carried out; it is determined to which part of speech a particular word belongs and whether it can be included in the semantic configuration of the sentence. In the range of 120–200 ms, the early left anterior negativity (ELAN) (Hahne & Friederici, 2002; Frisch et al., 2004; Friederici, 2011), can be observed, which determines the correct recognition of the sound stimulus and the correlation with a memory pattern. At the second stage (300–500 ms), lexical-semantic information is processed and the meaning of the received information is integrated into the context. In this range, the left anterior negativity (LAN) can be observed (Gunter, Friederici & Schriefers, 2000; Sabourin & Stowe, 2004), which characterizes the perception of stimuli with morphosyntactic anomalies, which result in difficulties in assigning thematic roles. At the third stage (from 500 ms), all types of information are combined. In the presence of syntactic and sometimes semantic anomalies, the P600 effect occurs, which most likely characterizes the stage of reanalysis of the received information.

This work shows that, for a perception task, there is a tendency to distinguish normal pronunciation of the word 'raketa' from defective pronunciation at late latency (400–500 ms) in the group of subjects without speech impediments. This probably indicates a LAN effect. For the group with rhotacism, EPs at this latency do not differ, which may indicate that subjects with rhotacism do not perceive the difference between these pronunciation options at the level of speech perception.

During the process of inner speaking, there is also a tendency to distinguish between two variants of pronunciation of the word 'raketa' by the group of subjects without speech defects at a latency of 250 ms. Repeating the word 'r'aketa' after a speaker with rhotacism, subjects without the speech defect try to recognize the stimulus and correlate it with an existing memory pattern, which is accompanied by the ELAN effect. In the group of subjects with rhotacism, such EP differences are not observed. In other words, both variants of the word 'raketa' are repeated in the same way. We should note that, according to the subjective oral report of subjects with rhotacism, they also have a defect in the pronunciation of the letters r and r' in their inner speech.

Noteworthy is the fact that the amplitude of the N150 EP decreases during inner speaking of all words in the group of subjects without speech disorders. According to Risto Näätänen's model of speech production (Näätänen, 1998), this can be explained by

the process of ignoring the deviant stimulus. We should note that the N150 amplitude is lower in the normal group only during inner speaking (during perception, no difference is observed). Therefore, we can assume that in subjects with rhotacism, inhibition during the generation of sound images during internal pronunciation is not sufficiently developed. In other words, a pronunciation defect may be associated with an insufficiently correct construction of the inner sound image. Thus, they cannot properly adjust articulation according to the sound standard and do not see their own defect.

EP similarity for perception and pronunciation in the normal group indicates that the same sound image appears in pronunciation and perception, or indicates involuntary pronunciation in perception.

Conclusion

1. The largest and only differences in EPs between the groups of subjects with and without rhotacism were found only in lead C3.

2. For a perception task there is a tendency to distinguish between normal and defective pronunciation of the word 'raketa' (at a late latency of 400–500 ms) in the group of subjects without speech impediments. This probably indicates the LAN effect, which characterizes the perception of stimuli with morphosyntactic anomalies. In the group of subjects with rhotacism, such differences in EP are not observed.

3. In the process of inner speaking, there is also a tendency to distinguish between two variants of pronunciation of the word 'raketa' (at a latency of 250 ms) in the group of subjects without speech defects, which may indicate the ELAN effect, which determines the correct recognition of the sound stimulus and its correlation with the memory pattern. In subjects with rhotacism, no differences in EPs were observed when the same stimuli were presented.

4. During inner speaking of all words, the amplitude of the N150 EP differs in the groups with and without rhotacism (it is higher in the group of subjects). For the perception task, no differences in EP were observed in both groups of subjects. In subjects with rhotacism, inhibition is probably not sufficiently developed to produce a sound image during internal pronunciation. A pronunciation defect may be associated with an insufficiently correct construction of the internal sound image, which impedes correct adjustment of articulation according to the sound standard.

Based on this, we can draw the following main conclusions:

1. The only differences in EPs between the groups of subjects with and without rhotacism were found in lead C3;

2. When individuals without speech impediments perceive a word spoken by a speaker with rhotacism, late left anterior negativity is observed, which characterizes the perception of stimuli with morphosyntactic anomalies.

3. When mentally repeating a word pronounced by a speaker with rhotacism, in the group of subjects without diction defects, early left anterior negativity is observed, which determines the correct recognition of the sound stimulus and its correlation with the memory pattern.

4. In subjects with rhotacism, inhibition is not sufficiently developed when producing sound images during inner speaking.

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Author Contribution

Ol'ga Vladimirovna Shevaldova – conducted empirical research, analyzed and interpreted the results, worked with sources, contributed to the overview part of the article.

Aleksandr Valentinovich Vartanov – developed the research concept, analyzed the results, critically revised the content of the manuscript.

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Conflict of Interest Information

The authors have no conflicts of interest to declare.

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Development of Auditory Analysis Processes in Cochlear Implant Users Through Software Tools

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Abstract

Introduction. Modern technology for auditory prostheses (digital hearing aids, cochlear implantation) creates conditions for auditory rehabilitation of individuals with severe hearing loss and even deafness. In this case, the important task of developing and updating sensory experiences arises, including the formation of the primary auditory–speech analysis processes, the consolidation of new intersensory connections, and the mechanisms of auditory–motor integration, which form the basis for communication and cognitive activity under new interactions with the environment. An effective solution to this psychophysiological problem can be facilitated by using specialized software that provides a targeted training of the perception skills necessary to implement the function of auditory–speech communication in patients with hearing impairments and by objective assessment of the individual progress of their rehabilitation using psychophysical methods. This study aimed to test the effectiveness of using software in sophisticated situations of rehabilitation after cochlear implantation. **Methods.** The specially designed software tools were used to develop the processes of auditory analysis of perception and speech in cochlear implant users of different ages with pre- and post-lingual deafness. The results were assessed according to psychophysical testing based on quantitative indicators of correct recognition and reaction time. Three series of the study were related to the following sophisticated rehabilitation situations: (a) late implantation (n = 32),

(b) auditory analysis of dynamic signals during the perception of prosodic information in speech (n = 36), and (c) in conditions of spatial orientation (n = 25). **Results.** New data and the results of their comparison indicated a significant improvement in the detection and analysis of basic spectral-temporal features of non-speech and speech signals (interruption by a pause, change in a rhythmic pattern of sound stimulation, location and movement of the sound source, phonetic categories and prosodic characteristics of speech), as well as the use of auditory–speech skills by cochlear implant users in everyday situations after training. **Discussion.** In general, experience in the practical use of software tools indicates that it is advantageous to integrate them into methodological tools for cochlear implant centers and auditory training in the education of children with hearing impairments.

Keywords

auditory–speech analysis, cochlear implantation, software tools for auditory training, auditory rehabilitation of deaf people, phonemic awareness, perception of speech prosody, orientation in acoustic environments, auditory–speech function, psychophysical testing

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Introduction

Cochlear implantation is currently the most effective method of restoring auditory perception of deaf people (Wilson & Dorman, 2008; Tavartkiladze, 2013; Rulenkova & Smirnova, 2003; Koroleva, 2016; Korolev & Ogorodnikova 2019). A cochlear implant (CI), surgically inserted into the cochlea of a deaf person, can replace damaged auditory receptors and restore the transmission processes of acoustic information to the central parts of the auditory system through electrical stimulation of auditory nerve fibers (Loizou, 1998; Wilson & Dorman, 2008; Tavartkiladze, 2013; Queen, 2016). However, such prosthetics to some extent change the conditions and quality of auditory perception, since the sound signals transmitted by the CI to the central nervous system differ considerably from the signals transmitted by a normally functioning cochlea. After surgical

implantation, all patients need auditory–speech rehabilitation aimed at restoration (for post-lingual deafness) and development (for pre-lingual deafness) of the processes of auditory analysis and pronunciation skills in speech (Mironova, Sataeva, & Frolenkova, 2005; Borovleva, 2014; Harris et al., 2016; Koroleva, 2016; Zamiri, Ahmadi, Joulaie & Darouie 2017; Koroleva, Ogorodnikova, Pak, & Levin, 2017; Koroleva & Ogorodnikova, 2019).

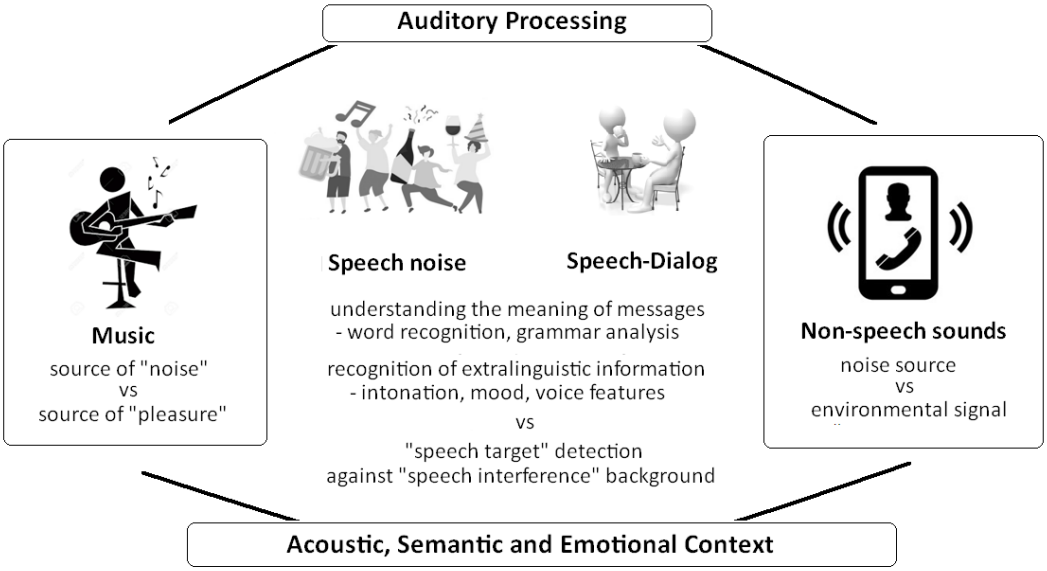
To restore the auditory-speech function of deaf patients with CI, an 'auditory' method has been developed. It highlights the systematic development of auditory analysis processes with CI in patients as a priority area of postoperative rehabilitation (Koroleva, 2014). The basis of the 'auditory' method is the idea that surrounding sounds and speech are acoustic signals with common physical and perceptual characteristics, and their processing processes are based on common basic operations of auditory analysis in the higher parts of the auditory system and the brain as a whole. At the same time, the concept of the method allows the identification of different target information in the same acoustic signal. For example, speech in a dialogue situation is primarily the semantics of a statement and extralinguistic information about the state of the interlocutor. In a 'party' situation, the speech of its participants becomes a competing signal that masks the speech message of a target speaker. Thus, the same sound can be a 'useful' signal that the brain seeks to isolate from the environment, or a 'noise' that it must ignore in order to solve the complex perceptual task of isolating an acoustic 'target' (Fig. 1). In this regard, an important point is the absence of pronounced central auditory processing disorders in CI users (Moore, 2012; Musiek & Chermak, 2014; Boboshko, Garbaruk, Zhilinskaya, & Salakhbekov, 2014; Koroleva, 2016; Gvozdeva, Sitdikov, & Andreeva, 2020), as well as organizing adequate auditory training and creating conditions for the development of auditory-speech skills with CIs in everyday communication situations. The use of training and development of hearing skills with CIs under natural conditions provides the possibility of consistent updating and formation of central mechanisms for detecting, distinguishing and recognizing non-speech and speech signals of varying degrees of complexity, auditory-speech memory, auditory selective attention and expanding the base of new auditory images of speech and non-speech signals from their intersensory (primarily audiovisual) connections.

Based on the 'auditory' method and fundamental knowledge about the physiological mechanisms of human speech and spatial hearing, specialists from Saint-Petersburg Research Institute of Ear, Throat, Nose and Speech, Ministry of Health, together with Pavlov Institute of Physiology, Russian Academy of Sciences, have created a set of software tools that provide conditions for teaching and training the auditory-speech function of CI users (Ogorodnikova, Koroleva, Lyublinskaya, & Pak, 2008; Koroleva et al., 2013). The use of this complex makes it possible to implement sophisticated techniques aimed at developing the constant perception of speech signals under conditions of speaker variability (various voice characteristics) and background interference; stimulation with complicated sound sequences with dynamic changes in parameters (interruption with a pause, comparison

of rhythmic and melodic patterns, detection of movement of a sound or speech source). Software tools also make it possible to save digital protocols of individual classes and the entire rehabilitation course to assess its effectiveness and the degree of formation of the auditory analysis operation based on the parameters obtained – the number of repeated listenings, the number of correct recognitions, and reaction time (Ogorodnikova et al., 2008; Koroleva et al., 2013; Koroleva et al., 2021). It is also important that the training procedures use visual reinforcement of acoustic stimulation (images/text on the monitor screen) and feedback for the patient. This provides the opportunity to work not only in the classroom mode under the supervision of a speech therapist, but also at home with assessment of results based on express assessment of task completion or intermediate self-testing. We should note that recording current progress and difficulties has an impact on the psychological state of patients and their motivation to continue the course of rehabilitation (Moore, 2012; Koroleva et al., 2021). Recording achievements and difficulties is also considered as an important element in working with patients at risk of refusing to use CIs, including late-implanted deaf adolescents who have a psychological basis for manifestations of communicative and social deprivation (Ermakov, Gorelov, 2022).

Figure 1

A simplified illustration of the complexity of auditory analysis processes under ambiguous conditions of the acoustic signals surrounding an individual



The modular structure of the software package and the range of specified parameters, which allow taking into account the auditory–speech level of auditory and speech perception skills of training participants and the degree of their adaptation to CI, can increase the efficiency of solving the assigned correction tasks (Solodukhin et al., 2020).

The article analyzes the experience and main results of practical using the software package in sophisticated situations, the development of recognition of environmental sounds and categorical discrimination of sound units of speech in a conditional risk group (CI refusal), the analysis of dynamic changes in speech (prosody) and in spatial perception (movement of a sound source) in CI users of different ages and levels of auditory-speech perception skills.

Methods

Methodological conditions and study participants

Series 1

In this part of the work, we assessed the effectiveness of using an updated set of software tools for the development of basic skills in auditory perception of non-speech sounds with various spectral-temporal characteristics and the processes of phonemic analysis of speech signals in prelingually deafened adolescents implanted at an older age (conditionally, a risk group for CI refusal). The training course (6 months) was completed by 32 adolescents aged 9 to 17 years with pre-lingual deafness and experience in using CIs (TEMPO+, OPUS-2; MED-EL) from 6 months to 7 years. Because of the high cost of the CI, all adolescents from this part of the work, as well as participants in other series of similar training (Koroleva et al., 2017), underwent only unilateral prosthetics.

A total of 27 adolescents from the group attended a school for children with hearing impairments, 5 attended a comprehensive school. All teenagers studied with a speech therapist using traditional oral method. Their inclusion in the training course at Saint-Petersburg Research Institute of Ear, Throat, Nose and Speech was determined by dissatisfaction with the results of implantation and/or manifestations of refusal to use CIs.

The prepared course of lessons included exercises on the perception of sound signals of different durations, rhythmic organization, timbres, voice fundamental frequency, and phonemic categories. Auditory analysis skills were developed in parallel with the correction of the pronunciation aspect of speech based on new possibilities of auditory control based on CI. Parents of the learners also carried out independent work with their children on tasks from the set of manuals entitled I Learn to Listen and Speak (Koroleva, 2014).

The results were assessed according to a number of tests: discrimination of environmental sounds (11 everyday sounds with different spectral-temporal characteristics, including the sound of water, the sound of broken glass, the sound of a hammer, the sound of human steps, etc.); perception of the rhythmic pattern of sound sequences (5 patterns of 3 elements of different durations – long/short; for 3 different musical timbres and 3 pitch options); determination of the gender of the voices of speakers (4 speakers,

male/female voice); recognition of speech signals of the target speaker under conditions of voice competition (12 words, 2 speakers – a man and a woman). We compared data from testing protocols before and after completing the training course, as well as scores on the Meaningful Auditory Integration Scale (MAIS) and the Use of Oral Speech Scale (MUSS) to assess the processes of spontaneous speech development (Ogorodnikova et al., 2008; Koroleva and al., 2013; Koroleva, 2016; Koroleva et al., 2017).

Series 2

This series was related to the study of the characteristics of CI users' perception of the dynamic characteristics of acoustic signals in speech and music. It is known that CI perception has limitations in distinguishing the pitch of sound signals and changes in voice fundamental frequency (F0), which are important for analyzing the melodic structure of musical works, prosodic information in speech, as well as distinguishing linguistic units in a number of tone languages (Li, Tang, Lu, Wu & Chang, 2021). This position has stimulated a number of studies on the perception of speech intonation by CI users in different language systems (Wang et al., 2012; Chen et al., 2013; Chen, Wong, Chen & Xi, 2014; Marx et al., 2015; Koroleva et al., 2016).

In Russian colloquial speech, the main prosodic categories are interrogative (ascending F0 contour) and affirmative (descending F0 contour) types of intonation structures (Bryzgunova, 1977; Svetozarova, 1982). Their reliable discrimination improves the quality of perception of speech information in communicative situations, and also contributes to improving the quality of perception of music with CIs (Drennan & Rubinstein, 2008; Bradley, 2016; Lehmann & Paquette, 2015).

The study involved 36 patients after unilateral implantation with at least 3 months of experience in the use of CIs (TEMPO+, OPUS-2; MED-EL). In the majority of patients (79 %), surgery was performed on the right ear. Among them, 21 were adult post-lingual patients aged 19–60 years and 15 represented a group of children and adolescents (aged 8–16 years) with pre-lingual deafness. All training participants were presented with a set of speech stimuli consisting of 20 short sentences with affirmative or questioning intonation, spoken by 4 speakers (2 men and 2 women with a F0 range from 90 to 240 Hz). The results were analyzed by comparing the test parameters before and after training.

Series 3

In this part of the study, the potential of spatial perception training in patients with one-side CI was assessed based on additional analysis of the data obtained (Ogorodnikova, Koroleva, Pak, 2020). 25 patients aged 9-39 years with different speech level (10 post-lingual and 15 pre-lingual) were the participants. All participants had more than a month of experience in using CI. In 5 patients, implantation was left-sided (left ear with CI), while in others ones – right-sided (right ear with CI).

Monaural prosthetics provides a high level of development and restoration of human speech communication, but limits the quality of spatial perception (Blauert, 1979; Altman, 2011; Akeroyd, 2014; Kumpik & King, 2019). At the same time, the perceptual basis for its development is preserved and is based on the sensory experience of comparing the spectral and amplitude characteristics of sound stimulation of both ears (Viskov, 1975; Blauert, 1979; Strelnikov, Rosito & Barone, 2011; Akeroyd, 2014; Ahveninen, Kopčo, Jääskeläinen, 2014; Risoud et al., 2018; Kumpik & King, 2019; Ludwig et al., 2021; Dillon et al., 2022). To test the effectiveness of spatial perception training in monaural CI users, a simple methodology scheme was used to organize stimuli using developed software. The stimuli corresponded to sound sequences of 5 clicks, simulating a change in the lateral position of a stationary sound source or its movement based on consistent sound intensity characteristics for 2 real speakers (Ogorodnikova, Koroleva, & Pak, 2005). The patients' tasks included determining the location of the sound source (left or right speaker); virtual motion detection (source standing or moving); distinguishing the direction of virtual movement (moving the source from right to left or left to right).

General research conditions

The groups of patients in different series did not overlap. Testing and training were carried out in a special quiet room without acoustic interference, at a comfortable level of stimulus intensity (65–70 dB SPL). The Logitech S100 speakers located frontally (70 cm from the listener) were used for stimulation. When training spatial perception, the speakers were spaced 1 m apart, at an angle of 45º to the right and left of the central position (in front of a patient's face).

All participants voluntarily underwent training and testing as part of rehabilitation activities. The experimental protocol was in accordance with the guidelines of the Declaration of Helsinki. Each participant gave informed consent to the training and psychophysical testing. For the children participating in the study, informed consent was obtained from their parents. All personal information about participants was deidentified before results were analyzed.

Results

Series 1

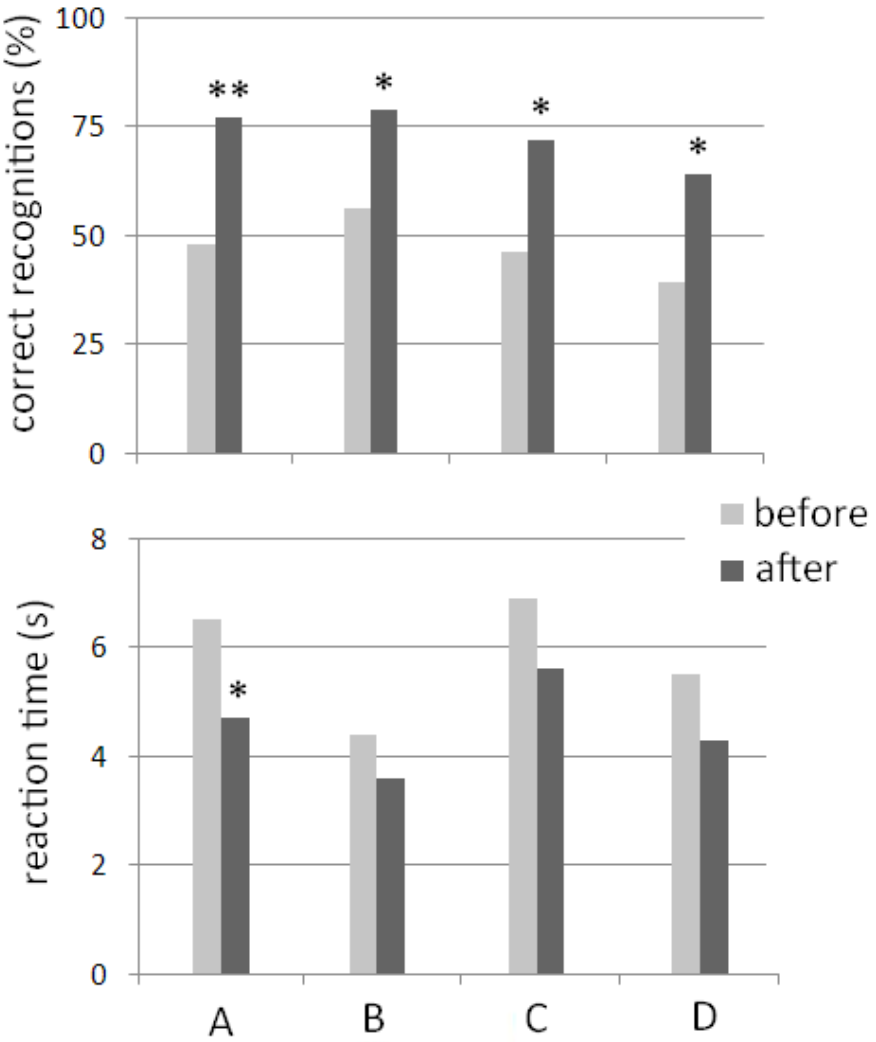
The results of testing before the training course showed that the majority of adolescents at risk of CI refusal had not sufficiently developed the basic operations of auditory analysis, especially when the conditions of perception become more complicated – recognition in a situation of voice competition (simultaneous pronunciation of different words by male and female speakers).

After a course of classes using well-designed software for the development of auditory–speech analysis, a significant improvement in performance in the group was

noted, which was observed both in terms of the proportion of correct recognitions (N) and reaction time (T) (Fig. 2). At the same time, individual dispersion in results remained very significant, especially for the reaction time implementation.

Figure 2

Test results before and after the training course in the group at risk of refusing to use CIs

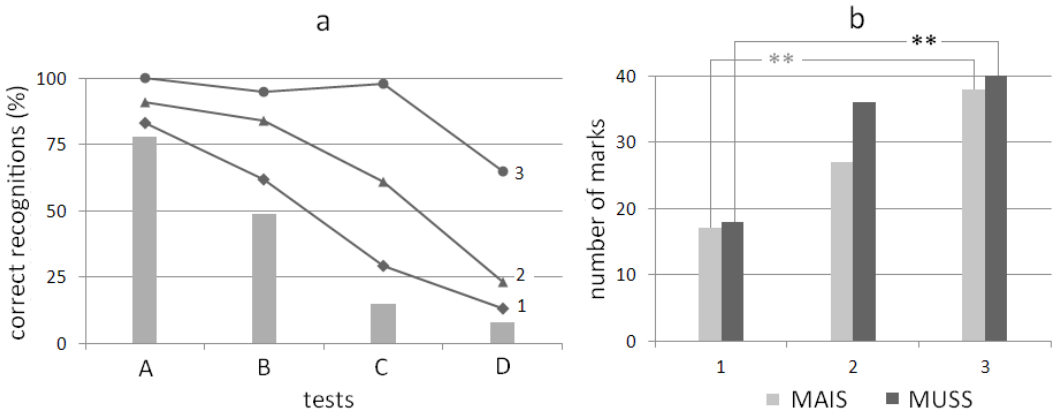


Note. *Comparison of recognition test performance indicators: A – environmental sounds, B – speaker voices (male/female), C – rhythmic pattern of sound sequences; D – speech signals (words) of a target speaker in conditions of voice competition. Vertical: number (%) of correct recognitions (top), reaction (s) time (bottom). Designations *, ** – level of significance of differences according to the Wilcoxon test (p <0.05 and p <0.01, respectively).*

With regard to phonemic categories, positive dynamics of recognition was also observed (Fig. 3a). For most of the adolescents in the group, it was accompanied by an increase in motivation for auditory perception in CIs. The trend towards expanding the use of listening skills and oral speech in everyday situations was also confirmed by the data obtained on the Meaningful Auditory Integration Scale (MAIS) and the Use of Oral Speech Scale (MUSS) (Fig. 3b). There was no significant improvement in the parameters evaluated only in 3 adolescents with cochlear anomalies.

Figure 3

Results of recognition of phonemic categories (a) and assessments on the scales of auditory integration and the use of oral speech (b) in patients at risk



Note. *Designations: a – identification of isolated vowels (A); identification of vowels in syllables (B); consonant identification (C); identification of consonants in syllables (D); columns – initial data (before the training course); curves 1–3 – average scores at the stages of training (1, 3, 6 months of training); b – 1, 2,3 average scores on the Meaningful Auditory Integration Scale (MAIS) and the Use of Oral Speech Scale (MUSS) after 1, 3 and 6 months of training; ** – level of significance of differences (p <0.01, Wilcoxon test).*

Overall, these series confirmed that pre-lingually deafened children implanted during adolescence have significant potential for auditory–speech development with CIs (Koroleva et al., 2017). To activate it, perceptual training is required, which aims to form the basis for auditory analysis of non-speech and speech signals. At the same time, the use of new software increases its effectiveness and promotes the constant use of CIs in children and adolescents with a deficit of sensory experience and insufficient development of

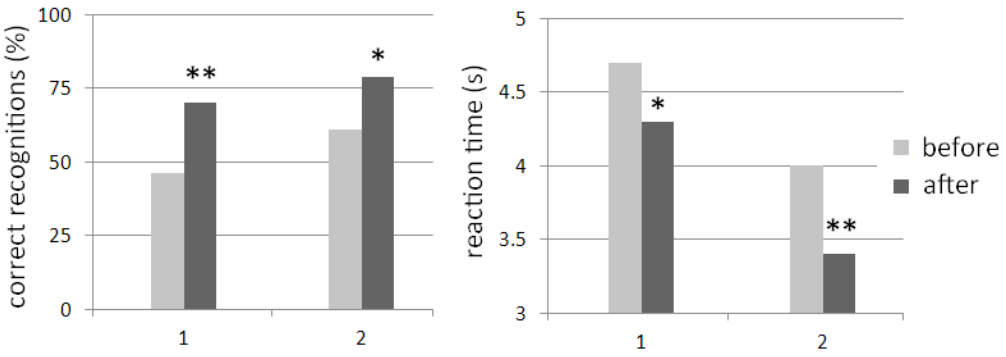
the central auditory processing, creating more favorable conditions for the spontaneous development of their listening, speech, and language skills.

Series 2

It was found that 54% of adult post-lingual CI users were able to adequately identify phrasal intonation in the first course of rehabilitation at the level of 65–70% of correct recognitions. At the same time, a significant proportion of such patients (46%) showed perceptual difficulties and a lower rate of intonation recognition (on average, 61 ± 3.5%). In pre-lingual adolescents with CIs, recognition of intonation in speech before the training was even worse and, on average, did not reach the level of 50%.

Training in perception and discrimination of intonation structures (5 training sessions) resulted in a significant improvement in the situation in all patients (Fig. 4).

Figure 4
Results of intonation perception by adolescents with pre-lingual deafness (1) and adults with post-lingual deafness (2) before and after targeted training using software



Note. *Y-axis: % correct recognitions (left); reaction time (right). Designations: *, ** – level of significance of differences (p <0.05 p <0.01, Wilcoxon test).*

Thus, in post-lingual CI users, the number of correct answers exceeded the level of reliable recognition of 75% and amounted to 79 ± 2.7%, and the reaction time became 600 ms shorter. In the pre-lingual group, recognition improved by 24%, reaching an average level of 70%; reaction time decreased by 400 ms.

It is important that the data obtained indicate that modern CI technologies provide conditions for adequate perception of speech intonation in the Russian language. At the same time, some implanted post-lingual adults who do not have central auditory disorders are capable of spontaneous learning in relation to the identification of acoustic features relevant for recognition of basic intonation structures (changes in the F0 contour)

already in the initial period of CI using. Adults who initially demonstrate poor intonation perception scores require targeted training, as do pre-lingual children and adolescents. The data are consistent with the results of modern studies using material from other languages (Karimi-Boroujeni, Dajani & Giguère, 2023).

Thus, the results of this part of the study also confirm a significant increase in correct responses and a decrease in reaction time after targeted training, which indicate the development and consolidation of the central auditory analysis of the dynamic characteristics of speech signals (intonation change in a speaker's tone of voice). Furthermore, CI users, along with an improvement in the perception of speech intonation, noted an increase in the quality of everyday communication and the conditions of general communicative interaction.

Series 3

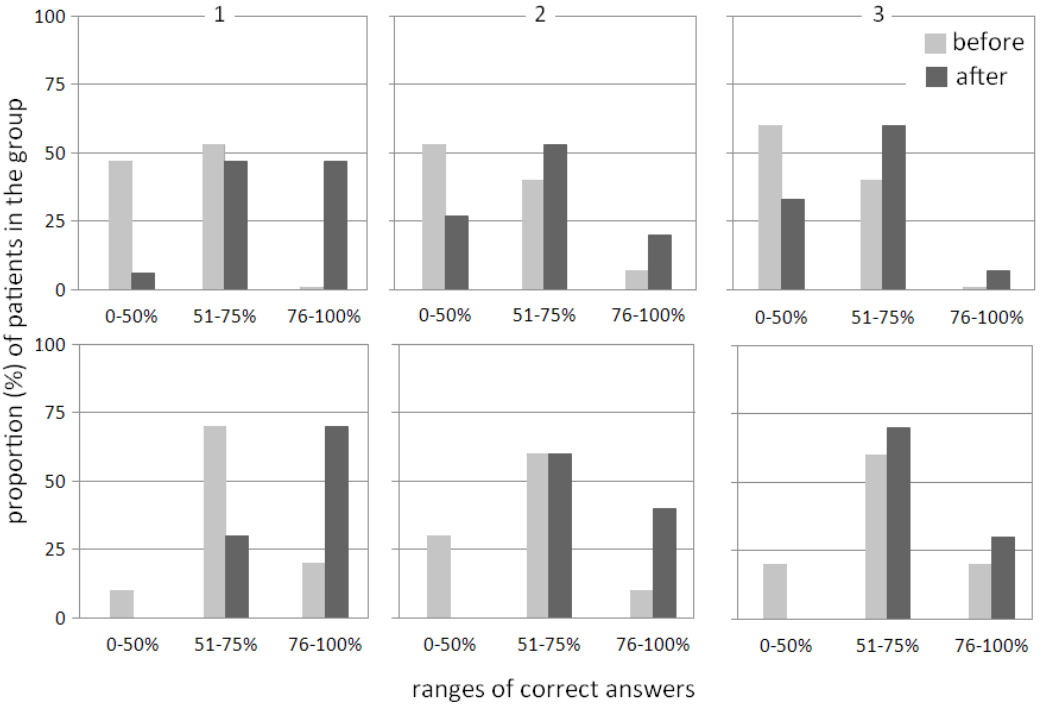
When performing tasks related to spatial orientation for the first time, the vast majority of patients (92 %) required additional explanations and running through the entire set of test stimuli. There were also pronounced differences in the initial ability of auditory spatial perception, especially in the group of pre-lingual CI patients. This was clearly evidenced by the distribution of their results in different series of measurements according to the ranges of the obtained scores, highlighting the proportion (% in the group) of 'unsuccessful' patients (less than 50% of correct recognitions), patients with average scores (from 51 to 70% of correct recognitions) and 'successful' patients – from 71 to 100% recognition (Fig. 5).

Therefore, the auditory assessment of spatial characteristics caused serious difficulties in the majority of patients, especially in the group with pre-lingual deafness and when performing tasks with dynamic changes in stimulation characteristics. These problems indicated the advisability of conducting training in spatial perception and including tasks in it that enable the formation/restoration of skills in auditory analysis and ongoing monitoring of perceptual signs of movement of a sound source during monaural prosthetics.

The positive impact of training was confirmed by an increase in the number of patients demonstrating higher recognition levels (score ranges) for all test tasks. It was most pronounced in pre-lingual patients, in whom at the beginning of measurements the average rate of correct determinations of the lateral position of a stationary sound source fluctuated around the level of random responses (49.4 ± 8.5), and after training it significantly exceeded it (73.5 ± 6.2). When detecting movement and determining its direction, the achieved level of correct recognition was lower and amounted to: 66 and 62 % (pre-lingual patients) and 73 and 71% (post-lingual patients), respectively. In general, the increase in the number of correctly completed test tasks after training was significant ($p < 0.01$ by Wilcoxon test). The change in reaction time does not reach the level of significance, but is also well expressed and, on average for the group of patients, decreases by 860 ms.

Figure 5

Distribution of pre-lingual (top) and post-lingual (bottom) patients according to the range of correct recognitions of spatial signals before and after training



Note. *Y-axis – the proportion (%) of patients in the group: 1 – data on location of a stationary sound source (right/left); 2 – data on detecting movement of a sound source (standing/moving); 3 – data for determining the direction of movement of the sound source (left-to-right/right-to-left).*

Comparison of the results obtained in this series supports the possibility of developing spatial hearing and acoustic orientation abilities after unilateral cochlear implantation (Strelnikov et al., 2011; Kumpik & King, 2019; Dillon et al., 2022). At the same time, the effectiveness of training has been confirmed in patients of different ages with different speech status before prosthetics and using a simple stimulation scheme that is available for clinical practice and the organization of classes in audiology centers and in special education for children with hearing impairments. It is also important to note the decisive role of the use and development of software in this area of training, without which it is methodologically difficult to provide adequate conditions for training spatial perception and automation basic acoustic orientation skills.

Discussion

The results of the study show that the restoration process of speech hearing in CI users is influenced by several internal factors, including the period and causes of deafness, the development of the central processes of auditory–speech analysis (sensory experience and speech status before deafness), and motivation to use CIs. Their appropriate assessment plays an important role in the organization of rehabilitation measures. Of great importance is the further development and use of software tools that make it possible to obtain an adequate assessment of the degree of development and automation of perceptual skills in CI users. Moreover, their use in training courses significantly expands the methodological capabilities and range of directions for the development of auditory analysis processes, as well as for the correction of individual rehabilitation programs and the basis for the spontaneous development of auditory–speech function with CIs. Furthermore, the data obtained demonstrate the possibility of achieving such results even in late-implanted adolescents who had problems using CIs (risk group).

The results indicate a significant improvement in the ability to discriminate speech prosody and to localize sound sources in the majority of post- and pre-lingually deafened CI users after targeted education and auditory training. They reveal the potential for the targeted development of basic processes of auditory–speech analysis, responsible for the adequate interpretation of speech and extralinguistic information whilst communication, as well as for the perception of the dynamic characteristics of sound signals during acoustic orientation (Chen et al., 2013; Ahveninen et al., 2014; Koroleva & Ogorodnikova, 2019; Ogorodnikova et al., 2020; Koroleva et al., 2021; Li et al., 2021; Ludwig et al., 2021).

Conclusion

The use of the software package in complicated situations presented in three series of studies contributed to the progress in the restoration and development of auditory–speech function and spatial perception in CI users of different ages and levels of auditory and speech skills. The following conclusions can be drawn from the results of the study:

- Pre-lingually deafened adolescents have the basis for developing auditory–speech perception with cochlear implants (CIs), despite missing a sensitive period for the development of auditory–speech centers in the brain.
- In order to form, develop, and restore the auditory processing in both pre- and post-linguistic CI users, targeted training of the auditory–speech function is required.
- Modern CI models provide a functional basis for the development of perceptual skills associated with the identification and analysis of complex dynamic characteristics of acoustic signals (speech intonation, sound source movement).
- The use of software greatly expands the scope of listening skills training for the rehabilitation of CI patients, enables continuous assessment of their results and

corrections to training, and contributes to the growth of motivation for the use of CI in everyday situations and the spontaneous development of speech.

- Experience in the development and practical application of the software package suggests that it should be included in methodological tools to assess the dynamics and efficacy of the rehabilitation of patients with CI, not only in cochlear implant centers, but also in territorial hearing centers and educational institutions where children with hearing impairments are studied.

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Anna Aleksandrovna Balyakova participated in training for patients (series 1), analyzed primary data and interpreted the results of the series.

El'vira Ivanovna Stolyarova participated in training for patients (series 2), analyzed primary data and interpreted the results of the series.

Sergei Pavlovich Pak developed the methodological framework, participated in training for patients (series 3), analyzed primary data and interpreted the results of the series.

Elena Aleksandrovna Ogorodnikova generalized and analyzed the results, described the methodological framework, prepared illustrative materials and the list of references, prepared and edited the text of the manuscript.

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What lies behind the "ambiguity disadvantages" when perceiving dual images?

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Abstract

Introduction. The focus of the problem of advantages and disadvantages of ambiguity is the question of whether it facilitates or hinders information processing. The relevance of the problem is due to the inconsistency of the available experimental data. Experiments do not take into account whether ambiguity is aware or unaware, but recording it could clarify the problem at hand. Our approach implies separating ambiguity that is both aware and unaware. In our study, we test the idea that the presence of unaware meanings provides greater concreteness of aware meanings compared to unambiguous stimuli. **Methods.** Stimuli were ambiguous figures. Subjects (n = 92) sorted two sets of cards, each containing one ambiguous figure, into a convenient number of classes. The operationalized hypothesis is that the classes into which images with unaware ambiguity fall will include fewer items than classes without ambiguous figures. **Results.** Intergroup comparisons revealed the differences expected according to the hypothesis: classes with ambiguous figures were more sparsely populated than classes with unambiguous versions of the same figures. **Discussion.** Rather than interpreting the result in favor of the disadvantages of ambiguity, we explain it by narrowing the equivalence range of an ambiguity stimulus, allowing the stimulus to be instantiated in an optimal way. The important role of unaware meanings in the process of interpreting perceived information is confirmed.

Keywords

ambiguous figures, unaware meanings, aware meanings, negative choice, positive choice, classification, ambiguity advantages, ambiguity disadvantages, range of equivalence, concretization

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Introduction

The prevalence of the problem of ambiguity perception cannot be overemphasized: incoming information almost always has several possible interpretations, some of which are cut off often before they are even realized (Tal & Bar, 2014; Kellner, Quement & Riener, 2022). The importance of understanding how ambiguity information is processed is emphasized in the current research literature (recent review: Rodd, 2018). Much attention has been paid to the problem of ambiguity advantage and ambiguity disadvantage in psycholinguistic research. The focus of the problem is whether ambiguity favors or, on the contrary, hinders information processing. The relevance of this problem is due to contradictory experimental data: in some cases, ambiguity favors stimulus processing (Haro, Demestre, Boada & Ferré, 2017; Haro & Ferré, 2018; Filippova, Kostina, Mezentseva, 2018; Tang, 2020; Tang, 2022), in other cases, on the contrary, it hinders it (Armstrong & Plaut, 2011; Filippova, 2011; Peterson, Cacciamani, Mojica, & Sanguinetti, 2012; Hoffman & Woollams, 2015; Leinenger, Myslín, Rayner, & Levy, 2017; Maciejewski, Rodd, Mon-Williams, & Klepousniotou, 2019; Maciejewski & Klepousniotou, 2020, Filippova, Chernov, & Gorbunov, 2023).

It has been repeatedly shown that lexical decision is accelerated for ambiguity words (homonyms), whereas semantic decision is slowed (e.g., Hino, Pexman & Lupker, 2006). The presence of multiple meanings speeds up lexical decision because this decision can be made according to whichever of the competing meanings is first to be realized. Semantic decision making, on the other hand, is reduced in the presence of multiple competing meanings, as it requires enumeration and evaluation of these meanings (e.g., Hino et al., 2006, Maciejewski G., Klepousniotou, 2020). It is still unclear whether semantic decision latency occurs at the level of processing the ambiguity word itself, as suggested

by the semantic competition model (Armstrong & Plaut, 2008; Kawamoto, 1993; Rodd et al., 2004), or only at the level of response selection, as suggested by the decision model (Hino et al., 2006; Hargreaves, Pexman, Pittman, & Goodyear, 2011). According to the semantic competition model, slowing arises because individual semantic representations compete for activation. And according to the decision model, slowing arises from difficulties in selecting a response with respect to an ambiguity stimulus: here, it is assumed that representations of all meanings are activated independently without interfering with each other. Studies supporting the decision model often use a semantic categorization task: here, a delay in the categorization of homonyms is revealed when homonyms need to be classified according to broad ('living/non-living') but not narrow ('animal/non-animal' or 'plant/non-plant') categories (Hino et al., 2006). The explanation for the results obtained in terms of the decision model is that the task of categorizing according to broad categories is more difficult: subjects need to find a large number of semantic features of the target word, which contributes to the interference of relevant and irrelevant features. Categorization into narrower categories, according to this model, is a simpler task, since the decision in this case is made on the basis of a small set of relevant features, and this ensures that irrelevant features can be cut off quickly.

However, in studies in this direction (advantages and disadvantages of ambiguity), the question of whether the selection and cutting off of irrelevant meanings occurs consciously (i.e., the question of awareness of ambiguity itself) is not discussed. The experimental conditions do not include a division of ambiguity into aware and unaware, which, in our view, renders the problem of cutting off irrelevant meanings lacking clarity. According to our ideas, whether ambiguity is realized or not is one of the key points in the discussion of the possibility of ignoring irrelevant characteristics of target stimuli, both in the semantic encoding of an ambiguity stimulus and in response selection.

In recent studies (Maciejewski et al., 2019; Maciejewski & Klepousniotou, 2020) using the priming paradigm, "ambiguity deficits" manifested themselves in the form of a slowing of the connectivity judgement of an ambiguity prime and target, with slowing found even in unrelated samples. To explain this nonspecific negative effect of ambiguity on connectivity judgements, the decision model was unsuitable because unrelated samples did not involve a conflict of responses. In addition, the authors of these studies recorded a specific component of evoked potentials (EP component), the N400 gain, at the time of presentation of an ambiguity word, but not at the time of response selection (Maciejewski & Klepousniotou, 2020). Evidence in favor of the semantic competition model was also obtained in our studies, where the presentation of verbal and non-verbal ambiguity stimuli was also accompanied by an enhancement of the N400 component (Filippova, Shcherbakova & Shtyrov, 2020). Based on our data, we can definitely state that the emergence of this EP component is related to the awareness of ambiguity. In our study, subjects performed the task of determining whether the presented stimulus was unambiguous or ambiguous. In this case, the correct recognition of ambiguous stimuli was accompanied by an increase in the N400 component.

The controversy surrounding the problem of ambiguity has fueled contemporary researchers' interest in studying the effects of suppressing competing interpretations (e.g., Kornmeier & Bach, 2014; Frings, Schneider, & Fox, 2015; D'Angelo, Thomson, Tipper, & Milliken, 2016; Rodd, 2018). What researchers, have neglected, however, is the question of what the presence of suppressed interpretations implies for the realized meanings of ambiguity information. Do realized meanings acquire any special properties when competing alternatives are suppressed? We pay attention to these questions in our research (Filippova, Allakhverdov, 2020; Filippova, Dorofeeva, 2023). The research builds on current scientific understanding that unambiguous clarity of aware experience requires a special unaware decision about which meanings will be realized and which will not (Dehaene & Changeux, 2011; Tal & Bar, 2014; Callaghan et al., 2017; Allakhverdov et al., 2019; Allakhverdov, 2021).

The study by Filippova and Allakhverdov (2020) used a judgement task to judge the relatedness of words and images. Images could be unambiguous and ambiguous. The images' ambiguity could indicate whether the subjects are aware or not. According to the results of this experiment, the unaware ambiguity condition had the highest number of errors of missing semantic relations compared to the other conditions. In another study implemented by Filippova and Dorofeeva (2023), an effect was found consisting in a rarer choice of word combinations related to the aware meanings of these logos as appropriate names of firms represented by ambiguous logos, compared to the choice of the same word combinations related to the unambiguous counterparts of these logos. We see the explanation of the obtained effects in the concretization of the aware meaning of ambiguity stimuli in the presence of unaware meanings. According to the ideas we have developed, the presence of unaware meanings narrows the range of equivalence (a term introduced by Gardner) of the realized meaning by assigning it to a narrow semantic category.

Although introduced as an individual variable, the range of equivalence is not rigidly defined. Current experimental evidence shows that the features of the stimuli presented also determine the breadth of the equivalence range. For example, Borghi et al. (2017) showed that the semantic domain of concrete concepts is narrower than that of abstract concepts, and therefore concrete concepts elicit fewer associations. V. D. Soloviev and colleagues using Russian nouns obtain confirmation of these findings in a recent study. According to the results of this study, the range of associations to concrete nouns is narrower than to abstract nouns (Soloviev, Volskaya, Akhtyamov, 2023).

The results of studies with illusory objects also suggest that the range of equivalence can vary depending on the perceived object and even its subjective interpretation. Different classification results can be obtained for the same object on the same subject. For example, in studies by V. Yu. Karpinskaya (2016) with illusory and ambiguous stimuli, when studying detection and distinction thresholds, it was shown that on a line or circle that subjectively seems larger, it is easier to notice a barely distinguishable point than on a seemingly smaller one (the geometric illusions of Ebbinghaus, Delbeuf, and Ponzo

were used). Similarly, on an element of an ambiguous figure that appears closer when one of its two meanings is realized, a barely discernible dot is easier to see than when the other meaning is realized (Necker's cube was used). This suggests that, depending on the interpretation of the object, the subjective equality zone of the stimulus sizes, or, in a broader sense, the range of equivalence, also changes in the subjects.

Following these observations, we suggest that the range of equivalence of ambiguity stimuli changes when they are realized as unambiguous: the field of activated associations of the realized meaning becomes restricted to close associations only. This explains, in our opinion, the semantic categorization results in the study by Hino et al. (2006), where a slowdown in the categorization of ambiguity words was observed when broad but not narrow categories were used. An alternative explanation given by these authors is that words with unaware ambiguity become more specific by activating a narrower semantic category, whereas the distant associations necessary for their categorization according to broader categories are suppressed in these words. Thus, we believe that the meaning of what is perceived is set not only by aware meanings, but also by unaware meanings that determine the perceptual context.

To further test this idea, the present study was implemented. Its **hypothesis** was that in free sorting, unaware ambiguity would influence the number of items in the classes created by the subjects: classes containing ambiguous figures would include fewer items compared to classes not containing ambiguous figures.

Methods

Preliminary coverage of the data from this study is given in the Proceedings of the Bruner Conference (Filippova, Chernov, 2022). Bruner (Filippova & Chernov, 2022). As noted in this paper, the operationalization of the hypothesis about the narrowing of classes containing unaware ambiguity implied two ways of testing:

1. In a between-group comparison, classes with ambiguous figures will include fewer items than classes without ambiguous figures.
2. In a within-group comparison, classes with ambiguous figures will include fewer items than classes with unambiguous versions of the same figures.

Sampling

The sample consisted of 92 subjects, students of St. Petersburg State University, aged 19 to 30 years (mean age 23 years, 58 women) with normal or corrected to normal vision. 46 subjects were assigned to the experimental group (EG) and 23 subjects to two control groups (CG1 and CG2).

Incentive materials

The target images in EG were ambiguous figures - "swan-cat" and "donkey-seal" (one in each set), and in CG1 and CG2 - their unambiguous analogues ("cat" and "seal" in CG1, "swan" and "donkey" in CG2). The rest of the cards for the three groups of subjects were identical. This distribution of target images across groups was necessary to compare the classification features of the aware meaning within the unaware ambiguity with the unambiguous version of the same figure under maximally similar conditions. The sets of cards used can be seen in Appendix 1 on the given classification examples.

Procedure and design of the experiment

The subjects' task in the realized experiment was to freely sort two sets of 34 cards into any number of classes. Each set contained one ambiguous figure.

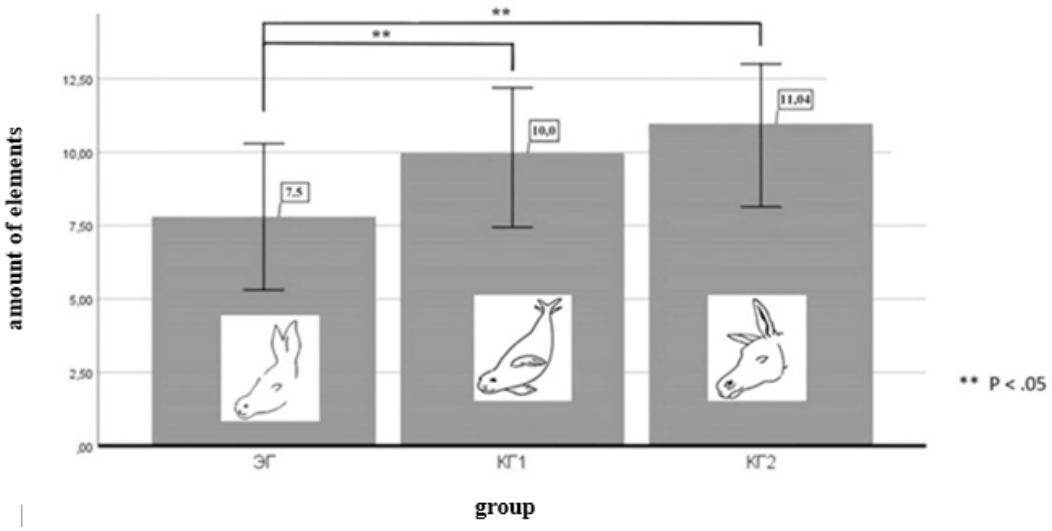
At the end of the experiment, the EG subjects, having the results of their classification in front of their eyes, answered the question about their interpretation of both ambiguous figures. When both meanings of any of them were realized, the classification results of the whole set including this figure for this subject were excluded from further analysis. As a result, data from four subjects who realized both meanings of the donkey-seal figure and data from nine subjects who realized both meanings of the swan-cat figure were excluded. These data were excluded rather than participating in the analyses of aware ambiguity because there were too few instances of awareness for a meaningful analysis in this condition.

The data were processed in the SPSS Statistics 2019 v26.0. The distribution of the number of elements in the classes created by the subjects differed from the normal distribution, so non-parametric criteria were used. The dependent variable was the number of elements in the class; the independent variable was the type of class (classes with unaware ambiguity , classes without ambiguous figures).

Results

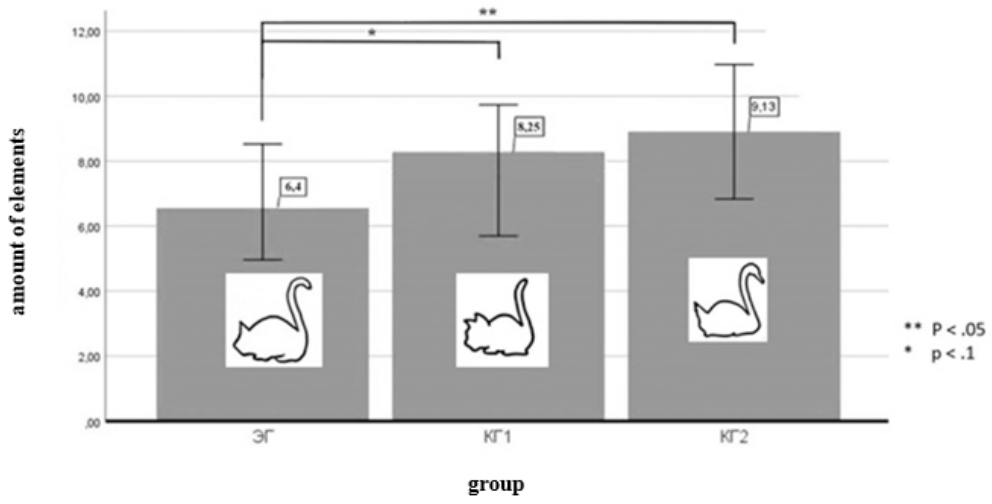
Based on the results of the within-group comparison, the number of items in the ambiguous figures class showed no significant differences from the number of items in the classes without ambiguous figures for either the first ($W = -0.982$; $p = 0.326$) or the second set of cards ($W = -1.282$; $p = 0.200$). However, intergroup comparisons revealed the differences expected under the second hypothesis. Thus, for the first set of cards, which included the donkey-seal figure, the differences between the three groups of subjects were significant ($H = 7.559$, $df = 2$, $p = 0.023$). Moreover, significant differences were found between both EG and CG1 ($U = 338$; $p = 0.045$) and between EG and CG2 ($U = 292$; $p = 0.016$). These data are presented in Figure 1.

Figure 1
Differences between experimental and control groups for the Donkey-Seal figure



For the second set, including the swan-cat figure, the differences between the three groups of subjects were also significant (H = 9.465, df = 2, p = 0.009). Moreover, between EG and CG1- the differences were at the trend level (U = 295; p = 0.052), and between EG and CG2- the differences were significant (U = 236; p = 0.004). These data are presented in Figure 2.

Figure 2
Differences between experimental and control groups for the Swan-Cat figure



As an illustration, Appendix 1 shows pictures of the results of the subjects' classification of both sets of cards with each of the target images.

Discussion

According to the results of the experiment, the first operationalized hypothesis was not confirmed: the number of items in the class containing the ambiguous figure did not differ from the number of items in the classes without ambiguous figures. The classes compared were too unequal for comparison, as it is not possible to take into account all variations in the arrangement of stimuli into classes to equalize them when creating stimulus material. However, an intergroup comparison of classes containing an ambiguous figure or its unambiguous counterpart (i.e., using as similar a condition as possible) revealed the differences expected under the second hypothesis: classes with ambiguous figures contained significantly fewer items than classes with their unambiguous counterparts.

This result is consistent with our earlier findings (Filippova & Allakhverdov, 2020; Filippova & Dorofeeva, 2023) and supports the idea that unaware ambiguity contributes to narrowing the range of equivalence of its aware meanings. However, instead of interpreting this result in favor of the disadvantages of ambiguity (because the reduction in the number of class elements, as in the present study, the omission of associations, as in the study by Filippova and Allakhverdov (2020), and logo names, as in the study by Filippova and Dorofeeva (2023), would be interpreted as disadvantages in the context of the theory of advantages and disadvantages of ambiguity), we explain it by the narrowing of the equivalence range of ambiguous stimulus, which makes it possible to concretize this stimulus in an optimal way.

The obtained results suggest an important role of rejected meanings in the process of interpreting incoming information, confirming the idea that the meaning of what is perceived is set not only by aware meanings, but also by unaware meanings that clarify the boundaries of the perceptual object. Explaining the obtained results, we proceed from V. M. Allakhverdov's concept of negative choice (Allakhverdov, 2021; Allakhverdov et al., 2019), which states that, perceiving an object, a person determines not only what this object is (positive choice), but also what it is not (negative choice). According to the ideas of this concept, simultaneously with recognizing an object as belonging to a category (positive choice), we also recognize it as a representative of some other categories, but we choose them negatively, i.e. we do not realize them. For unfamiliar objects, the categories are at first overly broad, but as we become familiar with the object, they narrow down. Concretization of the concept takes place, among other things, due to the exemption from unimportant features. Unaware meanings play an important role in such concretization, contributing to the narrowing of the semantic domain to which aware meanings belong.

This approach allows us to find expediency in what is commonly considered to be a characteristic of limited human abilities. This refers to the human tendency to overlook

multiple meanings, which has been pointed out by many authors (e.g., Rodd, Gaskell & Marslen-Wilson, 2002; Tal & Bar, 2014).

So what's behind the "ambiguity disadvantages"?

According to the view we are developing, the ambiguity disadvantages mask the provision of unambiguous clarity to aware experience (i.e., experience represented by aware meanings) by means of suppressed meanings that support the context chosen for awareness.

Conclusions

1. In the free sorting task, classes containing ambiguous figures with unaware ambiguity consist of fewer elements than classes without ambiguous figures;
2. Unaware ambiguity contributes to the concretization of its aware meanings;
3. The meanings rejected in the process of interpreting the meaning of incoming information provide the context of perception by narrowing it down.

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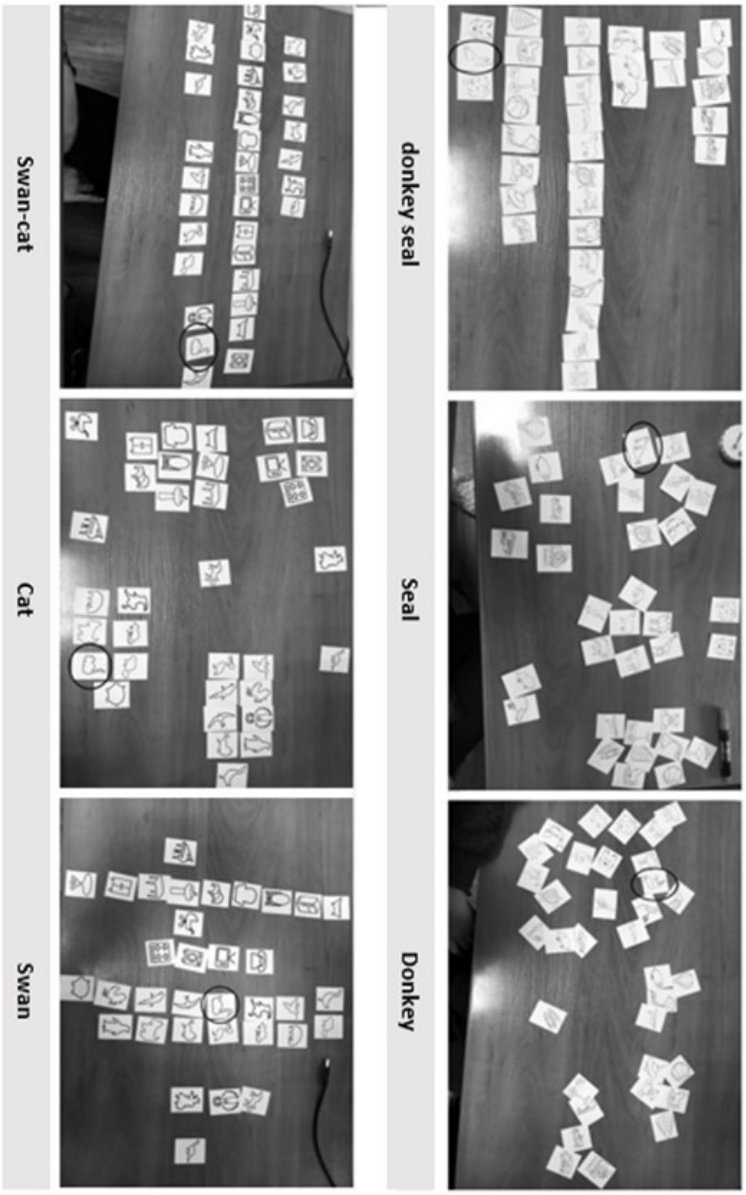
Annex 1

Example of subjects' classification of both sets with different target images (EG, CG1 and CG2)



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Lurking in Office WhatsApp Group: Examining the Role of Neuroticism, Knowledge Contribution Loafing, Fear of Losing Face, and Playing Dumb

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Abstract

Introduction. WhatsApp group is ofen used as online communication among employees for achieving effectiveness and efficiency at work. However, they often passive and silent and may hardly contribute much to work-related discussions which known as lurking behavior. This study aim to measure whether a number of variables such as neuroticism, knowledge contribution loafing, fear of losing face, and playing dumb affect the lurking in the WhatsApp office group. **Methods**. Participants in this study were 600 employees from various cities in Indonesia. Multiple regression was carried out to measure the effect of each variable on the hole as the dependent variable. **Results**. The results showed R square = 0.615 which means, all independent variables have a large and significant contribution on lurking behavior. Although all the independent variables had a great influence on lurking, partially it appeared that only neuroitisism and fear of losing face had a significant effect on lurking. **Discussion**. Tasks at work are often delegated, shared, and discussed with work team members through WhatsApp groups. These conditions can encourage individuals with high neuroticism to withdraw from conversations in WhatsApp groups. It happens because that condition makes individuals with high neuroticism feel anxious, uncomfortable, and vulnerable to pressure as a result of work-related discussions in WhatsApp office groups. In addition, the fear of getting a negative response in the form of criticism from other group members, which includes personality, the fear of being wrong, and not believing in the environment, is a factor that must be considered in lurking behavior.

Keywords

lurking, neuroticsm, knowledge contribution loafing, fear of losing face, playing dumb, office WhatsApp group

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Introduction

Online communication through social media become commonly thing and found in various aspects of life, including in the workplace. Social media usage not only useful for company marketing media and its products (Bossio, McCosker, Milne, Golding, & Albarran-Torres, 2019), but also maximize the effectiveness of communication among the workers and make them more merged with work (Adomi & Solomon-Uwakwe , 2019; Ariffin & Omar, 2018).

As like communication process involving many individuals, there are roles and dominance variants in the conversation. Some individuals in group chat are active speakers, an ordinary, and some others that quite and passive were doing lurking. Lurking commonly happened and often found in various form online communities communication (Hurtubise, Rivard, Berbari, Heguy, & Camden, 2017; Williams, Heiser, & Chinn, 2012). Online communities are virtual social groups that contain individuals with the same purpose of gathering (Schneider, von Krogh, & Jager, 2013). It is interesting to discuss groups that classified as a passive in online communication or lurkers. Lurkers are passive readers who prefer act as observers in a virtual community on social media and often referred as free-riders (Kollock & Smith, 1996; Preece, Nonnecke, & Andrews, 2004).

Lurking behavior can be found in education world when individuals prefer to be passive learners who do not provide feedback in the learning process in cyberspace (Bozkurt, Koutropoulos, Singh, & Honeychurch, 2020; Chen & Chang, 2011), it also found in social media relation for example due to privacy issues (Child & Starcher, 2016; Ortiz, Chih, & Tsai, 2018; Seigfried-Spellar & Lankford, 2018). Those issues were small part of lurking research on education and cyberspace social relations. Meanwhile, apart from the Neelen and Fetter studies (2010), there has not been much published research regarding employees as participants.

Lurking were considered to hamper the initial purpose of establishing a virtual community to maximize communication at work without being disturbed by employees' time and geographic location. However, individuals are not obligated being active in

virtual communities because the contribution is voluntary (Yeow, Johnson, & Faraj, 2006). On the other hand, the availability and ease of technology cannot always help individuals survive in achieving common targets, so further motivation is needed to keep individuals involved in online communities (Newell, Pan, Galliers, & Huang, 2001; Schneider, von Krogh, & Jager, 2013). At this point, it can be understood that lurking happened when there is a lack of reciprocity of communication and the process of sharing information smoothly and effectively related to work which is the main goal of the WhatsApp group formation.

Nguyen (2020) describes lurking behavior through a four-dimensional model. This model describes the reasons for lurking behavior which is categorized into four categories, namely individual, social, technological, and organizational or is called the ISTO model. According to Nguyen (2020), individual decisions to share knowledge or lurking are based on those four categories. Individual factors are individual characteristics that explain why different people show different behaviors for the same situation. Individual factors relate to members' perceptions of cognitive needs, knowledge self-efficacy, and loss of knowledge power (feel a sense of threat to their competitive advantage, power, importance and job security). Social, technological, and organizational factors explain how individuals respond under the influence of external factors. Social factors related to interactions with other members of the community, such as group cohesiveness, trust, and number of posts in the online community (information overload). Factors related to technical reasons that hinder individuals from posting, such as design quality, user perception, and level of ease of use. Organizational factors are related to the rules, norms, and structures in online communities that will influence lurking through commitment and management in the community.

Nonnecke and Preece (2001) tried to explain with The Gratification Model of Lurkers. This theory explains that lurking is a behavior based on a social relational context to get gratification and fulfill the needs. Lurking is thought to accommodate perceived needs. This theory explains that a person becomes lurker for four reasons, namely anonymity, privacy, and security, then time and work-related constraints, message volume and quality, and shyness over public postings. One other theory that can explain lurking is building an identity (Beaudouin & Vekovska, 1999). This theory explains that the involvement of individuals in a community is to form identity, take on roles and status. When the employee becomes aware through conversation and communication within the group that he or she does not match the primary identity of the group members, he or she will withdraw form conversation and showing passive behavior.

This research can be explained by using The Gratification Model of Lurkers belonging to Nonnecke and Preece (2001). Anonymity, privacy, and safety are the first reasons considered to accommodate the problem of neuroticism. Neuroticism causes individuals to easily feel uncomfortable and anxious in a social environment. When developing passive communication in conversations on WhatsApp Groups, individuals do not need to respond much so they can avoid feedback that might make them uncomfortable.

Then the second reason is shyness over public posting which represents variables such as knowledge contribution loafing, fear of losing space, and playing dumb. Individuals who refrain from providing comprehensive job information, fear of being criticized for posting opinions, and then pretending to be stupid do not know the topic being discussed are the reasons why employees are lurking in WhatsApp Groups. Meanwhile, other big reasons, such as time and work-related constraints, and message volume and quality, can be represented by other additional findings from the existing descriptive data.

Lurking doesn't happen suddenly for sure. There are several things that affect lurking. First is neuroticism. Personality has been referred as one of the internal factors that cause lurking in individuals (Amichai-Hamburger et al., 2016). Neuroticism personality types encourage individuals to engage in pleasant social online activities (Seigfried-Spellar & Lankford, 2018) because individuals with anxiety and low adaptability need a pleasant atmosphere to make themselves calm. One of the involvement of individuals with neuroticism personality types towards social internet usage is to accommodate their need to belongings and get a lot of information (Amiel & Sargent, 2004). Information and needs fulfillment can provide a pleasure for individuals when doing browsing. That is the reasonwhy the findings mention that neuroticism is positively correlated with the social media usage such as WhatsApp (Montag, Blaszkiewicz, Sariyska, Lachmann, Andone, Trendafilov, Eibes, & Markowetz, 2015).

Meanwhile, office WhatsApp group is an online community that was formed specifically for work. This is considered to accommodate the needs of its members to learn and develop their work needs (Pimmer, Abiodun, Daniels, & Chipps, 2019). There are lot of work delegated and discussed among members in Whatsapp group. At this point, work information develops into giving and demanding jobs. Dedeoglu, Okumus, Yi, and Jin (2019) stated that personality influences individuals in perceiving information sharing on social media. Changing information about work into giving work is not a pleasant and uncomfortable for individuals who avoid pressure in social relations. Thus, when an individuals' presence in an online social community brings them into an uncomfortable position for various reasons, they will tend to reduce their activities in the community. Therefore, the higher neuroticism tendency that individual have, the more passive they will be involved in the online community which they follow.

On the other hand, there are some other things that also suspected to support neuroticism in influencing lurking behavior in sharing knowledge, i.e. fear of losing face and pretending to be stupid. Emerging behaviors such as lack of self-confidence, fear of other people's perceptions, reluctance to share, less ready to get feedback, fear of making mistakes, hesitating and more comfortable being indifferent. Knowledge contribution loafingis often considered as a coping strategy of individuals to get a lighter effect from the perceived pressure (Fang, 2017). When individuals were holding the informations or intentionally not sharing work-related information, this is done not only because they feel uncomfortable, but also because they are afraid of getting negative feedback in the form of criticism and ridicule. At this point, fear of losing face causes the individual to

choose to be silent and passive (Fang, 2017; Osatuyi, 2015). Meanwhile, individuals also feel the need to be passive in a subtle way by pretending to be ignorant, ignorant the topic being discussed at that time in the group, or even pretending to skip the begining of the conversation regarding related topic discussed in the group (Conelly, Zweig, Webster, & Trougakos, 2012). This playing dumb behavior could help individuals reduce their influence in the group and also their social interaction (Demirkasimoglu, 2016). Based on those reasons, individuals can gave slower respond or not at all to work-related information which they dislike.

Based on the theoretical arguments presented earlier, this research aim to empirically investigate the effects of neuroticism, knowledge contributionloafing, fear of losing face, and playing dumb against employees'lurking behavior. This research also investigate the reason why employees doing lurking behavior in the WhatsApp group office.

Methods

Participants

The participants of this study were 600 employees who worked in several big cities in Indonesia. The majority of participants were men (N = 361), and the rest were women (N = 239).Google form were used for online data collection in order to get more participants because of geographical location consideration such as the city of residence, as well as the practical concerns in a data collection. At the beginning of the online questionnaire, the purpose of data collection and participant requirements was explained, as well as the willingness of applicant participants to participate or refuse to be part of this research.

Materials

Lurking is a passive behavior by not uploading something as a form of contribution in online communication for various reasons and preferring to be positioned as an observer (Edelmann, 2013; 2017). In this research, lurking was measured by using a scale belonging to Preece, Nonnecke, and Andrews (2004). This scale initially had a total of 25 items. One example of an item on this scale is "I feel like I'm in the wrong group".The reliability of this scale is 0.943.

Neuroticism is the tendency of inability to make psychological adjustments and emotional stability which is characterized by anxiety,fear, and distrust (Cullen & Morse, 2011). In this study neuroticism personality types are measured by using 5 Big Subscale that has been adjusted in the Indonesian context by Ramdhani (2012). This scale has a number of 4 items. Begins with the introductory sentence "I am a person who ...", an example of this item is "Easy moody". The reliability of this scale is 0.930.

Knowledge contribution loafing is individuals tendency to show less performance when working in a team than when working alone (Chidambaram & Tung, 2005). In this study the knowledge contribution loafings measured by using a scale belonging to

Kidwell and Robie (2003). One examples of items on this scale is"I share less knowledge than I have". The reliability of this scale is 0.830.

Fear of losing face is fear or anxiety feeling which associated with feelings of shame and worthless when the experience or knowledge shared were considered useless by others so that the individuals will hold the information that they have(Hwang, Francesco, & Kessler, 2003; Zhang & Ng, 2012). Fear of losing face is measured by using a scale belonging to Fang (2017). This scale has a number of 4 items. Begins with the introductory sentence "If I share knowledge in a group ...", an example of the item in this study is "I am afraid that others will find fault with the ideas that I have shared". The reliability of this scale is 0.944.

Playing dumb is a behavior in which the individuals pretend uncare about therelevant information therefore when they are presented certain topics to be discussed, they will behave as if they did not have enough knowledge related to the topic (Webster, Brown, Zweig, Conelly, Brodt, & Sitkin, 2008). Playing dumb is measured by using a scale belonging to Conelly et al. (2012). This scale consists of 5 items. Begins with the introductory sentence "When communicating in a group ...", an example of the items in this study is "I pretend not to understand what is really being talked about in the group". The reliability of this scale is 0.826.

Neuroticism scale has a response category Strongly Disagree to Strongly Agree with a score range from 1 to 7, knowledge contribution loafing scale has a response category Never to Very Often with a score range from 1 to 5, and the rests has a response category Very Inappropriate to Very Appropriate with a score range from 1 to 5.

Analysis Technique

The data analysis technique used in this study is multiple regression. This analysis technique is useful for measuring the effect of predictor variables in this study, i.e. neuroticism personality type, knowledge contribution loafing, fear of losing face, and playing dumb against lurking in WhatsApp office group. Some other things that are trying to be revealed such as reasons for lurking and discussion topics in groups which dislikewere asked through additional questions in other parts of the questionnaire where each participant can choose or give respond more than one answer.

Results

Correlation and Regression Analysis

Table 1 shows that employees' lurking behavior correlates with all independent variables, including demographic variables such as age, years of service, education level, and position in the organization. These demographic variables seem to provide additional interesting findings to complement the previously hypothesis. Table 2 and 3 show

that only neuroticism and fear of losing face make a significant contribution to lurking behavior. Meanwhile, knowledge contribution loafing and playing dumb are not strong enough. However, all independent variables have a large and significant contribution on lurking behavior.

Table 1

Correlation Matrix between Variables and Demographic Data

	1	2	3	4	5	6	7	8	9
1									
2	.587**								
3	.686**	.538**							
4	.739**	.647**	.694**						
5	.681**	.530**	.995**	.689**					
6	-.209**	-.279**	-.243**	-.282**	-.242**				
7	-.088*	-.076	-.091*	-.080*	-.092*	.436**			
8	-.393**	-.343**	-.301**	-.407**	-.296**	.208**	.127**		
9	-.322**	-.370**	-.332**	-.368**	-.328**	.549**	.113**	.343**	
M	70.01	13.56	15.54	11.03	15.51	31.55	3.89	4.37	2.16
SD	16.01	5.88	3.94	4.20	3.93	6.18	3.74	1.35	1.26

Note: *1 = lurking, 2 = neuroticism, 3 = knowledge contribution loafing, 4 = fear of losing face, 5 = playing dumb, 6 = age, 7 = years of services, 8 = education level, 9 = position in the organization*= p<.05, **= p<.01*

Table 2

Regression of Each Independent Variables on Lurking Behavior

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	27.115	1.664		16.298	.000
	neuroticism	.379	.092	.139	4.111	.000
	kbp	1.447	1.097	.357	1.320	.187
	tkm	1.647	.151	.433	10.935	.000
	ppb	-.188	1.092	-.046	-.172	.864

a. Dependent Variable: lurking

Table 3
Simultaneous Regression of All Independent Variables on Lurking Behavior

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.784[a]	.615	.612	9.971

Note. *a. Predictors: (Constant),ppb,neuroticism,tkm,kbp.*

Open-ended Questions

Based on the additional questions asked before, it is known that the presence of superiors or other people with higher positions is the most reason that mentioned by participants as the reason why they choose to be passive in WhatsApp office group. The following reasons are the number of coworkers in the WhatsApp group who are not very close, less confidence to participate, the number of work topics that are not mastered in the discussion, have conflicts with other group members, lots of unimportant things that were not related to work, busy with work, lazy, bored, refrain from being too active, and others reasons. For more details the results can be seen in Table 4.

Table 4
The reasons why participants do lurking

Reasons	N (%)
The presence of superiors or other people with higher positions	350 (34.34%)
The number of coworkers in the WhatsApp group who are not very close	194 (18.98%)
Less confidence to participate in the discussion	173 (16.92%)
The number of work topics that are not mastered in the discussion	146 (14.28%)
Have conflicts with other group members	50 (4.89%)
The number of unimportant things that were not related to the work	28 (2.73%)
Busy with work	23 (2.25%)
Lazy, bored and refrain from being too active	19 (1.85%)
Discussion topics were not related	10 (0.97%)
There are group members who gave the responds earlier	10 (0.97%)
Prefer to do direct communicatin (private chat or face to face communication)	9 (0.88%)
Others	6 (0.58%)

Table 5 shows the number of topics that the participants did not like as a topic of discussion in WhatsApp office group. The first thing that often mentioned the most is politics, followed by religion, private matters, the work itself, then gossip, topics related to sex or pornography (usually as a jokes), lifestyle, and so on.

Table 5
The Most Unpreferred Discussion Topic in the Office WhatsApp Group

Topics	N (%)	Topics	N (%)
Politics	440 (39.04%)	Gossip	13 (1.15%)
Religion	361 (32.03%)	Sex / pornography	8 (0.70%)
Private matters	235 (20.05%)	Lifestyle	7 (0.62%)
The work itself	53 (4.70%)	Others	10 (0.88%)

Discussion

Based on the statistical findings, this study showed some interesting results. Participants with a tendency for neuroticism more easily feel uncomfortable when they have to communicate face to face (Rice & Markey, 2009). The uncomfortable feeling encourages individuals to easily feel anxious and experience a mood swing (Costa & McCrae, 1980). Other media communication such as online computers can reduce the anxiety. This kind of communication can strengthen social relations between individuals (Gross, Juvonen, & Gable, 2002).

However, office WhatsApp group is a different matter. In this WhatsApp group, work is delegated, shared, and discussed with the group members involved. This condition could encourage individuals with neuroticism to withdraw. This occurs because these specific conditions touch the psychological aspects of individuals who are easily anxious, uncomfortable, and vulnerable to pressure (McCrae & Costa, 1987) as a result of work-related discussions in the WhatsApp office group. The presence of superiors at work will also certainly provide additional discomfort for individuals who have a structurally lower position. Sometimes, communication manner between superior to subordinates also exacerbates the pressure that individuals receive as subordinates (Kim & Lee, 2009), especially when delegating and discussing work in group conversations.

Ariffin and Omar's study (2018) found that WhatsApp often responded by employees as a social media which should be used for personal purposes only, not for work purposes. Work-related discussions often bring discomfort to many individuals involved in online discussion groups. Battistoni and Colladon's study (2014) found that neuroticism tendency is negatively affect chatting activities on social networks, regardless of the position and

role of individuals in the group. The finding neuroticism tendency is related to lurking also confirmed by the influence of fear of losing face. Amiel and Sergant (2004) state that individuals with neuroticism tendencies try not to be actively involved in online group discussions because they avoid criticism or confrontation with other group members. If the discussion is forced, people with neuroticism tendencies will try to do time lags in replying every conversation which intended or involving themselves (Barnes, Mahar, Wong, & Rune, 2017).

The absence of a significant influence from the knowledge contribution loafing and playing dumb behaviors in discussions about work on the WhatsApp group office shows the strong individual's unwillingness to get a response or criticism. This is also supported by the findings of Teh, Yong, Chong, and Yew (2011)'s studies, which explain neuroticism tendency is affacted the attitude in sharing knowledge, whether lazy or not. Basically, individuals still want to share knowledge or what they know about work and also do not pretend to lack understanding the topic being discussed or not to be aware that there are discussions about certain work topics being discussed in the WhatsApp group. However, there is a sense of shyness, discomfort and fear of being criticized or humiliated when individuals discuss thattopic in online work groups (Esmaeelinezhad & Afrazeh, 2018; Pour & Taheri, 2019).

The existence of WhatsApp office group also often perceived as a source of problems and new work pressure. Individuals may find it easier to be contacted by superiors or coworkers and interfere their private time. Those can exacerbates the cognitive workload that employees have gained while working in the office. Gagne et al. (2019)'study mentions, playing dumb behavior can be displayed individuals with high cognitifve workload in order not to get additional workloads. This playing dumb behavior triggers individuals to retreat and not get too involved in activities that make them feel burdened psychologically (Burmeister, Fasbender, & Gerpott, 2018), such as lurking behavior.

Work discussion in the office social media group are vulnerable to negative responses such as criticism or teasing. This can happen in serious context or just a joke. Negative responses can be given by coworkers or superiors. The presence of superiors who do not appreciate subordinates in online social media groups, not only gives uncomfortable feelings, but also distrust for group members. The results in the individual distrust because the group can't be an arena for him to contribute with ideas and personal opinions related to work. This issue has been alluded in the study Pour and Taheri (2019) which states that feelings of anxiety and fear of criticism can be reduced if there is trust in the online social media discussion group.

Wasko and Faraj (2000) state that sharing information in an online community basically can be done with two basic reasons, those are the necessity to share and altruistic feelings to help selflessly. In virtual communities, those two things become important because no rules arrange communication between members in cyberspace, so social attitudes is prioritized (Yang, Li, & Huang, 2017). In the context of WhatsApp

group office, the necessity for sharing becomes the dominant factor where the reasons for altruism are left behind. This reason itself will not be fulfilled by group members if empathy disappear because of neuroticism (Pence & Vickery, 2012). Without trust in group members, there is no comfort, so individuals with neuroticismwill resolve their worries about negative responses. Jadin, Gnambs, and Batinic (2013) confirm this, and explain that the opinions of superiors in the group have a negative influence on desire to share information voluntarily. This causes individual uncomfortable speaking in groups so they prefer to be quiet and passive in group discussions.

In a more complete perspective, overall effect of variable, i.e. neuroticism, knowledge contribution loafing, fear of losing face, and playing dumb have a great joint effect on lurking behavior in the WhatsApp office group. Bishop (2007) offers an ecological cognition framework to explain why individuals do lurking behavior in virtual communities. This concept states that lurking behavior can be explained by the non-fulfillment of individual passions in social relations in the virtual community. Some disrupted passions are order desires where group members have more power and dominate the flow of group conversation .The presence of superiors also turns off the social desire where there is no more free interactive space in the conversation that built in groups. On the other hand, the pressure from the flow of work conversations triggers excessive vengeance desire ,where conflict arisen too much in the existing conversations. This can disrupts the creative desire which is to emerge and help group members. These problems then trigger the lack of trust in group and the group members so that individuals prefer to be silent or passive in conversations in virtual groups (Cheng & Chen, 2014).

The neuroticism tendency inside individuals can increase when the office WhatsApp group contains members with higher position or coworkers who have personal conflicts. The work conversations flow are not always pleasant because it is like work reminders and sometimes part of supervisor monitoring. Individuals will lose space to express opinions or latest job progress report due to discomfort and fear of getting a negative response, so that they will hold the informations that should be given and sometimes pretending unknow that the group is talking about certain things related to the projects or jobs. Kucuk's (2010) findings emphasize that the dynamics in virtual groups greatly influence individual to take a position as a passive member and minimize the conversation in it.

Based on open-ended questions, besides the presence of superiors or other people with higher position in the office group WhatsApp, the number of group members who are not very close and discussions related to work topics that are not mastered also can increasing the distance between individuals and group. Tobin, Vanman, Verreynne, and Saeri (2015)'s findings state that lurking behaviors occurs not only when individuals did not feel as a part of the group but also when they feel their existence is not meaningful in the group potentially. This clearly indicates that the WhatsApp office group, is too common with diversity members could potentially encourage the members to be silent and passive in the communication process in the group.

Another interesting results about another reason for lurking are less confidence to participate in discussions, because many topics related to work that are not mastered, and the busy work that individuals have to do to involved in group discussions. Amichai-Hamburger et al. (2016) states that the issue of competence and time unavailability to participate in the discussion process are usually happened and encourages individuals to do lurking.

The rise of political topics in WhatsApp office group discussion are most likely related to presidential elections recently in Indonesia. Many individuals relatively difficult to refrain from expressing their opinions and political choices in public. Mutz and Mondak (2006) said when there is a big political moment that occurs in a country, various discussions about politics can burst and be founded everywhere, including in daily conversations at the office among employees. Topics related to religion are also often discussed and become the second place most mentioned by participants. In Indonesia, political and religious topics often mixed into one and become sensitive for many people who have an opposite opinion on those topic. Furthurmore, less important and not related to work discussion on WhatsApp group office, including sensitive topics such as politics and religion, could explain why many employees do lurking. Discussions are often accompanied by jokes which are not important and resulted in bias on topics related to work material.

Overall, based on statistical findings and open-ended questions, this research agrees with the findings of several previous studies. Sun, Rau, and Ma's (2014) study, for example, explains that there are three biggest reasons why lurking is done, that is because of environmental influences (in this case influenced by the presence of superiors and the number of group members who are not too close), prefer to respond to work-related chats (not about sensitive topics such as politics, religion, and personal matters), and group relationships that are not built harmoniously due to internal factors (such as the neuroticism tendency, knowledge contribution loafing, fear of losing face, and playing dumb). Meanwhile, network leagues also have a great influence on lurkingg (Liao & Chou, 2012), so it can be understood that the existence of group members, including the established norms, can influence how individuals become passive and do not contribute in the virtual community.

Conclusion

This finding shows only neuroticism and fear of losing face have an influence on lurking behavior as partially. The meaning of this finding is that fear of getting a negative response in the form of criticism reinforced by personality tendency,afraid of being wrong and distrust the environment becomes a factor that must be considered in the employee's lurking behavior. Another thing that can be emphasized is the presence of superiors (people in a higher position) has a great potential to encourage individuals to do lurking in WhatsApp office groups.

The study's findings revealed some intriguing findings. Participants with a tendency toward neuroticism typically experience more discomfort while communicating in person, hence they frequently use computer-mediated communication. The office WhatsApp group, on the other hand, is a different story since there are a variety of demands relating to job tasks there that cause individuals to feel uneasy and frightened. As a result, people with high neuroticism have a propensity to distance themselves from conversations in the workplace WhatsApp group.

Other findings show that the existence of a supervisor or person in a higher position is the reason that most often referred in lurking. Meanwhile, politics and religion are the two topics that are the most widely cited disliked by participants during discussion in the WhatsApp office group.

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Milka Santoso contributed to conceptualizing the research, finding respondents, collecting data, and editing research manuscripts.

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Attitudes Toward Appearance and the Construction of Perceived Age Among Men and Women: Why Do Women Look Younger?

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Abstract

Introduction. This study was conducted to identify the influence of gender- and age-related socio-psychological factors on the construction of perceived age in the process of social cognition. The study aims to investigate the characteristics of attitudes toward own appearance and perceived age in 35-75-year-old men and women. **Methods.** We used the Photo-video Presentation of Appearance procedure developed by T. A. Vorontsova and five diagnostic tools developed by V. A. Labunskaya to diagnose attitudes toward appearance. *The main sample* comprised 523 subjects (207 males and 316 females) aged 35 to 75 years. The reliability of the research results was achieved by descriptive statistics, Spearman correlation analysis, Student's t-test, Levene's test for equal variances, and Mann-Whitney U test. **Results.** The results of the study showed that (1) mature women (aged 35 to 59) look significantly younger than men of the same age; in old age (60-75 years), the discrepancy between perceived age and chronological age ("years saved") is similar for men and women (both look on average 3.5 to 4 years younger); (2) significant gender-related differences were found in cognitive, emotional, and behavioral components of attitudes toward appearance among men and women; in old age, differences were observed in only two parameters of attitudes – the desire to improve appearance and ideas about male friends' assessments of appearance (significantly higher in women); (3) correlations were found between the parameters of men's and women's attitudes toward their own appearance and their perceived age, mediated by the life stage. **Discussion**. The findings were discussed in the context of the social psychology of appearance, the "multifactorial model of attitudes toward appearance", gender stereotypes, expectations, and the "double standard of aging" between men and women.

Keywords

age, appearance, perception of age, perceived age, social perception, attitude, years saved, women, men, aging

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Introduction

In modern social psychology, an individual's perceived age (PA) is defined as a phenomenon of social cognition, as an age "assigned to an individual (object of perception) by another individual (subject of perception, assessor) in result of the perception of his/her own appearance" (Shkurko & Labunskaya, 2018 p. 450). Age perception (one's own and others') is considered a special case of social perception.

In Russian social psychology, Alexey Aleksandrovich Bodalev (Bodalev, 1982, 2015) described the socio-psychological patterns of human perception of another person, which refers to the perception of another person's age. In the studies of A. A. Bodalev, his colleagues and followers identified the main factors that characterize human perception of another person. These are psychological and socio-psychological characteristics of the object of perception, the subject of perception, the relationship between the object and the subject of perception, and the social situation of interaction. In his famous work, Perception and Understanding of Man by Man (Bodalev, 1982), A. A. Bodalev have shown that the age of another person is presented in various components of his/her appearance: in physical appearance, in expressive behavior (A. A. Bodalev speaks of the 'senile' gait); appearance design, which, according to A. A. Bodalev, "... is an additional sign of age" (Bodalev, 1982, p. 28).

To date, the relationship between different components of appearance in the process of age perception has been studied (Shkurko & Nikolaeva, 2015), and different 'contributions' of various components and elements of appearance to age perception have been identified (Gunn et al., 2009; Vorontsova, 2020a; Vorontsova, 2020b; Flament, Abric, Prunel, Cassier & Delaunay, 2021, 2021). We discovered (Vorontsova, 2022)

gender-specific patterns in the PA construction in the process of perception of male and female peers, depending on gender stereotypes and care practices associated with them. Thus, mature women look younger than their male peers. Younger-looking women equalize their opportunities and resources. Younger women look older than their male peers, which indicates the maturity associated with older PA. It is also shown that the age and gender of the subject of perception influence the construction of the age of male and female peers. The dynamics of the representation of appearance components in the structure of age perception of men and women in youth and old age are described (Vorontsova & Artamonova, 2022).

In this study, we focused on the characteristics of men's and women's attitudes toward their own appearance, which, in our view, is a kind of 'transition' between gender-related expectations and stereotypes and practices in caring for physical appearance, designing appearance, and organizing expressive behavior, which together enable women to look younger than men.

V. A. Labunskaya (2021) emphasized that gender-based research is one of the most important approaches to understanding attitudes toward appearance. V. A. Labunskaya analyzes modern studies and points out that there are the following gender-related differences: men are less satisfied with their bodies than women; women are not satisfied with their bodies, weight, and shape; women strive for thinness, men – for muscularity.

In a number of studies, the gender-related aspect of the study of various parameters of attitudes toward appearance has been described. Thus, the influence of sexual orientation on body dissatisfaction in adult men and women was studied (Beren, Hayden, Wilfley & Grilo, 1996). The effect of body dissatisfaction in men and women related to comparisons with media body images was examined (Van den Berg et al., 2007). Body image and self-esteem depending on age and gender were investigated (Mellor, Fuller-Tyszkiewicz, McCabe & Ricciardelli, 2010). The impact of race and gender on the assessment of appearance, orientation toward appearance, and the measure of dissatisfaction with body size was emphasized (Smith, Thompson, Raczynski & Hilner, 1999). The effects of age, gender, ethnicity, and body mass index on body image were documented (Öberg & Tornstam, 1999; Demarest & Allen, 2000; Ålgars et al., 2009).

A considerable amount of work has examined various aspects of PA, its assessment and attitudes toward it in adolescence. Predictors of body dissatisfaction in teenage girls and boys have been identified (Paxton, Eisenberg & Neumark-Sztainer, 2006). Relationships between body mass index, body dissatisfaction, weight, and shape were examined (Calzo et al., 2012). The impact of body weight, peer appearance culture, and internalization of appearance ideals was identified (Lawler & Nixon, 2011).

H. L. Quittkat, A. S. Hartmann, R. Düsing, U. Buhlmann and S. Vocks (2019) conducted a survey of a large German-speaking sample (N = 1327) on body dissatisfaction, the importance of appearance, and body image in men and women between the ages of 16 and 88. The authors found that body dissatisfaction and the importance of appearance are

higher in women than in men. In women, body dissatisfaction does not depend on age; age predicts a lower level of the importance of appearance in men. Women demonstrate their willingness to spend more time in their lives to achieve an ideal appearance. Women of all ages evaluate their body higher than men.

We have found no empirical evidence for the implementation of an integrated approach to study men's and women's attitudes toward their own appearance at different ages (including old age) and their association with PA in large Russian-speaking samples. This enabled us to formulate aims and objectives of empirical research and to justify its relevance. The study was conducted in order to solve the following issue: Identify the impact of gender- and age-related socio-psychological factors on the construction of age perception in the process of social cognition.

This study **aimed** to investigate the characteristics of attitudes toward own appearance and PA in 35-75-year-old men and women. The **hypothesis** of the study was that the parameters of attitudes toward own appearance and PA would differ considerably in men and women at different ages. We also hypothesized that the parameters of attitudes toward appearance determine PA differently in men and women at different ages.

The study was based on the methodology of Russian psychology of social cognition (Andreeva, 2000; Bodalev, 1982, 2015), the socio-psychological approach to appearance developed by V. A. Labunskaya (Labunskaya, 2017, 2019, 2021) and the "multifactorial model of attitudes toward appearance" developed within this approach, in which "its assessments and self-assessments appear to be a cognitive-emotional component of attitudes; satisfaction and concern represent an emotional-motivational component, the desire to transform appearance, associated with perfectionist reactions to appearance, is classified as a behavioral component of attitudes toward appearance (Labunskaya et al., 2019, p. 85); gender-related methodology and the idea of the gender-related approach (Grigorieva, 2018; Kletsina, Ioffe, 2019; Kletsina, 2020; Semenova & Semenova, 2014).

Methods

Study sample

In total, 523 subjects (207 men and 316 women) aged from 35 to 75 years took part in the study as objects of perception (main sample); 140 subjects were subjects of perception ('assessors') in various rounds of presenting photographs to assess the age of objects of perception. The main sample of the study was divided into two subgroups by age in accordance with the age periodization by D. B. Elkonin (Elkonin, 1971): (a) the "maturity" subgroup included participants from 35 to 59 (142 men and 226 women, mean age = 49 years) and (b) the "old age" subgroup included respondents from 60 to 75 years (65 men and 90 women, mean age = 65 years). The study was conducted in 2020-2022. All participants consented to the use of their photographs for psychological research and subsequent publications.

Diagnostic tools

1. The Photo-video Presentation of Appearance procedure by T. A. Vorontsova (Shkurko, 2018) was used to determine the PA of study participants who were photographed (portrait / full-length) and presented for age assessment to 'assessors' (ordinary people, non-experts, at least 20 individuals in one series of photographs for age assessment). A person's PA is the arithmetic mean of all age assessments that are assigned to the object of perception by 'assessors'. Based on this procedure, the difference between the chronological age and PA (CA-PA, or so-called "years saved" (Zimm et al., 2013)) was calculated for each study participant. This indicator represents the age segment by which a person looks older (if it takes negative values) or younger (if it takes positive values) than his/her chronological age.

2. A set of diagnostic tools developed by V. A. Labunskaya to diagnose the attitude toward appearance (Labunskaya & Serikov, 2018; Labunskaya et al., 2019), including:

2.1. The questionnaire to diagnose Attitudes Toward Own Appearance: Satisfaction and Concern developed by V. A. Labunskaya and E. V. Kapitanova was used to determine the degree of satisfaction with own appearance (SA); the degree of concern for own appearance (CA); and the desire to improve own appearance (IA).

2.2. The Scales for Diagnosing Ideas About Assessments of Appearance by Parents and Friends, Fellows, and Teachers by V. A. Labunskaya was used to diagnose ideas about assessments of appearance by male friends (AAMF); female friends (AAFF), parents (AAmother, AAfather), and a chief (AAC). On the basis of the data from the scales, the average values for appearance assessment by significant others (AVAA) were calculated.

2.3. The questionnaire to diagnose Value and Importance of Appearance in Various Spheres of Life developed by V. A. Labunskaya was used to determine the value and importance of appearance in the spheres of communication / friendship (Cm/Fr); academic performance (AP); career (C); family/romantic relationships (Fm/RR); lifestyle (L); happiness (H). On the basis of the data from the questionnaire, the average values for importance of appearance (AVIA) were calculated.

2.4. The questionnaire for the Evaluation/Content Interpretation of Appearance and Its Correspondence with Gender/Age Constructs by V. A. Labunskaya was used to diagnose assessments of the following components of appearance and integral assessments of appearance: facial appearance (FA); bodily appearance (BA); appearance design (AD); expressive behavior (EB); the degree of acceptance of own reflected appearance (DAORA); age-appropriate appearance (AAA); gender-appropriate appearance (GAA); gender role-appropriate appearance (GRAA); professional role-appropriate appearance (PRAA); age-related attractiveness of appearance (ARAA); attractiveness of appearance for an opposite-gender partner (AAOGP); sexual attractiveness of appearance (SAA); satisfaction with appearance (SA) and the integral assessment of own appearance (IAOA).

2.5. The Appearance Perfectionism Scale by K. Srivastava was used to diagnose the level of perfectionism (AP) associated with own appearance.

The reliability of the research results was assured by the use of mathematical statistical methods: descriptive statistics, Spearman correlation analysis, Student's t- test, Levene's test for equal variances, Mann-Whitney U test.

Results

Comparative analysis of the CA-PA indicator ("years saved") and the parameters of men's and women's attitudes toward own appearance in maturity and old age

At the first stage of data processing, we carried out a comparative analysis of the CA-PA indicator and the parameters of the attitude toward own appearance in the male and female subsamples using the Student's t-test. The appropriateness of Student's t-test was checked using the Levene's test for equal variances; otherwise, the Mann-Whitney U test was used. We found that in the male subsample the arithmetic mean of the CA-PA indicator was 0.82 years, and in the female subsample – 2.66 years; the differences are significant (t = -4.458, p = 0.000). In other words, study participants assess women as much younger than men, and this pattern is not only typical of men and women of the same age as has previously been discovered (Vorontsova, 2022), but also of men and women of different ages, from 35 to 75. Comparisons of the CA-PA indicator for men and women separately by age groups (35–59 and 60–75 years old) showed that there were significant differences between men and women aged 35–59 (t = -5.278, p = 0.000, M male = - 0.41, M female = 2.08). Notably, no significant differences men and women aged 60–75 years were found (t = -0.857, p = 0.000, M male = 3.49, M female = 4.12). Table 1 presents the descriptive statistics of the CA-PA indicator among men and women in the age groups studied. Table 2 shows the results of a comparative analysis of the parameters of men's and women's attitudes toward their own appearance in maturity and old age, according to the Student's t-test.

Table 1
Descriptive statistics of the CA-PA indicator in men and women in maturity and old age

Indicator	Sample size	Minimum	Maximum	Average	Standard deviation
Men (35-75 years)					
CA-PA	207	-18	19	0.82	4.828
Men (35-59 years, maturity)					
CA-PA	142	-18	9	-0.41	4.317

Indicator	Sample size	Minimum	Maximum	Average	Standard deviation
Men (60-75 years, old age)					
CA-PA	65	-6	19	3.49	4.832
Women (35-75 *years*)					
CA-PA	316	-10	14	2.66	4.494
Women *(35-59 years, maturity)*					
CA-PA	226	-10	14	2.08	4.454
Women *(60-75 years, old age)*					
CA-PA	90	-7	14	4.12	4.276

The analysis of data presented in Table 1 enables us to conclude that in male and female subgroups the greatest difference between chronological age and PA is observed in old age (on average, 3.5 years for men and 4 years for women). This conclusion is also confirmed by the existence of a correlation between age and the CA-PA indicator: in the subgroup of men (N = 207) r = 0.341 at p = 0.000, in the subgroup of women (N = 316) r = 0.236 at p = 0.000.

Table 2

Comparative analysis of the parameters of men's and women's attitudes toward their own appearance in maturity and old age, Student's t- test

Indicator	M, males	M, females	t	p	M, males	M, females	t	p
	Maturity				*Old age*			
CA	4.24	4.78	-2.910	0.004	No significant differences			
IA	6.06	6.95	-3.854	0.000	* The Mann–Whitney U test: group 1 midrank = 61.34, group 2 midrank = 83.72, Z = -3.134, at p = 0.002			
AAMF	7.00	7.42	-2.068	0.039	6.67	7.31	-2.078	0.039

Indicator	M, males	M, females	t	p	M, males	M, females	t	p
	Maturity				*Old age*			
AAmother	* The Mann–Whitney U test: group 1 midrank = 174.65, group 2 midrank = 148.81, Z = -2.539, at p = 0.011				No significant differences			
AP	4.41	4.80	-2.863	0.004	No significant differences			
FA	55.93	61.15	-3.748	0.006	No significant differences			
AD	52.35	58.20	-4.245	0.000	No significant differences			
EB	49.65	52.26	-2.391	0.017	No significant differences			
DAORA	32.20	40.64	-6.781	0.000	No significant differences			
GRAA	23.35	21.69	2.613	0.009	No significant differences			
ARAA	14.16	12.62	2.795	0.005	No significant differences			
AAOGP	28.54	30.01	-2.067	0.039	No significant differences			
SAA	26.38	28.31	-2.677	0.008	No significant differences			
IAOA	416.25	440.38	-2.915	0.004	No significant differences			

Note: *M – arithmetic mean; t – Student's t-test; p – significance level; * – Levene's test for equal variances showed the inappropriateness of using the Student's t-test (the Mann-Whitney U test was used); Z – Mann-Whitney test statistic.*

A comparative analysis of the parameters of attitudes toward own appearance in men and women in maturity revealed significant differences in all the studied components of attitudes toward appearance:

1. In assessments of individual components and in integral assessments of appearance, women had significantly higher assessments of their own facial appearance, appearance design, expressive behavior; they had higher values of acceptance of their reflected appearance, assessments of the attractiveness of appearance for an opposite-gender partner, and sexual attractiveness of appearance, and integral assessment of appearance. However, the assessment of age-related attractiveness of appearance and the assessment of gender role-appropriate appearance are significantly lowered.
2. Significant differences were found in the ideas about assessments of own appearance. Women believed that their appearance was rated higher by their male friends, and men – by their mothers.
3. Women were significantly more concerned about their appearance.
4. Women had higher rates of desire to improve their appearance and appearance perfectionism.

At the same time, in old age, only two significant differences were found – in 'ideas about assessments of own appearance by male friends' (women were more likely than men to record positive assessments of their appearance by male friends) and the desire to improve own appearance (in women, it is significantly higher than in men).

Relationships between the CA-PA indicator ("years saved") and the parameters of men's and women's attitudes toward own appearance in maturity and old age

At the next stage of data analysis, we conducted Spearman correlation analysis of the CA-PA indicator and the parameters of attitudes toward own appearance separately in subsamples of men and women aged 35–59 years (maturity) and 60–75 years (old age). Table 3 presents the results.

Table 3

*Significant relationships between the CA-PA indicator ("years saved") and the parameters of attitudes toward own appearance in men and women in maturity and old age, according to the Spearman (correlation coefficient / significance level; * – significant relationships at the significance level of ≤ 0.05; ** - significant relationships at significance level of ≤ 0.01)*

Women		Men	
Maturity	*Old age*	*Maturity*	*Old age*
Cm/Fr (0.140*/0.049)			
Career (0.172*/0.015)			
Family (0.195**/0.006)			
AVAA (0.159*/0.025)			SA (0.352**/0.005)
FA (0.161*/0.016)	AAMF (0.281**/0.008)	SA (0.173*/0.047)	AAMF (0.295*/0.022)
BA (0.271**/0.000)	AAC (0.218*/0.048)	AAfather (-0.189*/0.047)	AVAA (0.267*/0.039)
EB (0.159*/0.016)	AAA (-0.221*/0.036)		Cm/Fr (0.343**/0.007)
AAA (-0.138*/0.038)			IAOA (0.267*/0.032)
AAOGP (0.184**/0.006)			
SAA (0.220**/0.001)			
SA (0.191**/0.004)			
IAOA (0.182**/0.006)			

We found that the CA-PA indicator in the male and female subsamples had a number of relationships with the parameters of attitudes toward own appearance, which are mediated by their age:

1. The CA-PA indicators in mature women (35–59 years) are directly proportional to the value and importance of appearance for communication and friendship, career, family relationships, including the average value of the importance of appearance; with indicators of appearance assessments (facial appearance, bodily appearance, expressive behavior, attractiveness of appearance for an opposite-gender partner, sexual attractiveness, and integral assessment of appearance); with satisfaction with appearance, and inversely proportional to the indicator of age-appropriate appearance. That is, women aged 35–59 years who assess their appearance as not appropriate for their age have a high value and significance of appearance, especially in the areas of communication and friendship, career and family relationships; have positive assessments of their appearance, especially their facial appearance, bodily appearance, expressive behavior, attractiveness and sexual attractiveness; they are also satisfied with their appearance, looking much younger for their age in the eyes of others.

2. The CA-PA indicators in elderly women are to a lesser extent determined by the parameters of attitudes toward own appearance. Inversely proportional relationships with the assessment of age-appropriate appearance and directly proportional relationships with the indicators of appearance assessment by others (male friends and a chief) were recorded. Elderly women, who look much younger for their years, recognize the discrepancy between their appearance and their age and record high assessments of their appearance by men and their chiefs (if they were currently working, then real assessments, if not, then retrospective ones).

3. The CA-PA indicators in men aged 35–59 have a directly proportional relationship with the indicator of satisfaction with own appearance and an inversely proportional relationship with the father's assessment of appearance; at the age of 60–75 – also with the indicator of satisfaction with own appearance, with the assessment of appearance by significant others (especially male friends), with the indicator of the importance of appearance for communication and friendship, as well as with the integral assessment of appearance. The analysis carried out reveals a particular role of men's satisfaction with their own appearance in the process of construction PA. Those subjects who are satisfied with their appearance are identified by others as looking much younger for their age. Unlike women, the "saved years" of elderly men are more closely related to the parameters of attitudes toward their own appearance. The subjects with a high integral assessment of appearance, as well as the assessment of appearance by significant others (especially male friends), look younger for their age.

Discussion

The study showed that mature women look significantly younger than men of the same age; in old age, the difference between chronological age and PA between men and women is insignificant (both, on average, are 3.5–4 years younger for their age). This conclusion confirms the pattern found in men and women of the same mature age (Demidov, Dibedev & Kutenev, 2012; Vorontsova, 2022). The limitation of the previous study was the limited range of models for age assessment (male and female peers); in this study the sample comprised more than 500 subjects.

We also found significant gender-related differences in the attitude toward own appearance in mature men and women, which, in our opinion, can explain the difference we discovered in their PA. Women have more positive assessments of individual components of appearance (facial appearance, appearance design, expressive behavior) and integral assessments of appearance (a high degree of acceptance of the so-called "reflected appearance" (V. A. Labunskaya's term means an individual's acceptance of own reflection in the mirror, photographs, videos, etc.), highly assess sexual attractiveness of appearance, in general, have a high integral assessment of their appearance); women are more concerned about their appearance, high rates of desire to improve their appearance and appearance-perfectionism. Previously, we explained the difference in perceptions of the age of peers – men and women – by gender expectations and stereotypes of the subjects of perception (in other words, we have seen the reasons for gender asymmetry in age perception in the eyes of observers). And now we have identified another most important factor in the construction of PA – this is the attitude toward own appearance of the object of perception. Thus, high concern about own appearance, the desire to improve it, a higher level of perfectionism associated with own appearance in women (compared to men), positive fixation on own appearance (positive assessments of appearance components and integral assessments) set the strategies and practices of appearance organization in women and result in women looking much younger than men. At the same time, we believe that observed differences show the effect of the same gender-age stereotypes and expectations, but at the level of the object of perception. Thus, I. S. Kletsina and E. V. Ioffe (2019) write that concern about own appearance is the norm for female role behavior. I. S. Kletsina (2020) emphasizes that in a traditional society the status of an aging woman is significantly lower than that of an aging man. Scientists (Berman, O'Nan, Floyd, 1981; Kletsina, 2020) document the existence of a "double standard of aging" (women are held to higher standards regarding aging than men), which, apparently, encourages women to undergo constant transformations and self-care practices that target younger appearance. The French philosopher P. Brückner (2021) points out that there is a gender stereotype that "a woman ages, a man matures", or "a woman becomes ugly with age, and a man becomes more beautiful", which effect can be observed, among other things, in our data. Thus, with all the positive assessments of appearance described above, women, compared to men, have a lower assessment of

the age-related attractiveness of own appearance (t = 2.795, p = 0.005). They are more concerned about external signs of aging than men and believe that with age they become less attractive. Men, on the contrary, believe that they do not lose their attractiveness with age. It was also found that men had more positive perceptions of their mothers' assessments of own appearance, compared to women. The results of our study coincide with those of H. L. Quittkat and colleagues (2019) obtained in a German sample: both our study and the study of our German colleagues show that women have a more positive assessment of own appearance and a pronounced behavioral component of attitudes toward appearance. Meanwhile, we do not observe differences in satisfaction with appearance and its value and importance in different areas, while our German colleagues record higher dissatisfaction with bodily appearance and the importance of appearance among women. The differences in results may be due to the fact that Western colleagues first record indicators of attitudes toward the physical components of appearance, while we rely on the understanding of appearance as a phenomenon related to "different stages of life based on dynamic and variable relationships of the following three components: 1) physical appearance, 2) social appearance, and 3) expressive behavior (Labunskaya & Drozdova, 2017 p. 202).

We also observed the relationship between the "years saved" indicator and the parameters of attitudes toward own appearance in men and women. Thus, these relationships are mediated by the life stage. This conclusion confirms the most important provisions of the social psychology of appearance (Bodalev, 1982, 2015; Labunskaya et al., 2019) on the relationship between the perception and assessments of appearance (own and others') and the stage of life of both the subject and the object of perception. We find the following particularly important and interesting:

1. The most significant correlations between the indicators studied were found in mature women, some of which were related to the parameters of attitudes toward appearance, which have significant differences in women and men. These are assessments of facial appearance, expressive behavior, attractiveness of appearance, sexual attractiveness of appearance, and integral assessment of own appearance. Women who show high levels of these indicators look younger for their age, which also explains why mature women look younger than mature men. The data obtained once again confirm the role of the face as "the most important tool of communication" (Bodalev, 1982, p. 17), as a key object of cognition, a means of communication and organization of activities in various contexts (Anan'eva, Barabanshchikov & Demidov, 2019, 2021).

2. Even if we analyze only strong relationships (at a significance level of ≤ 0.01), the degree of discrepancy between the PA and the real age of a mature woman increases with high indices of value, importance of appearance in the sphere of family relationships, positive assessments of own bodily appearance, attractiveness of appearance for an opposite-gender partner, sexual attractiveness of appearance, satisfaction with appearance and high integral assessment of own appearance;

elderly women – with high assessments of appearance by male friends; elderly men – with high satisfaction with own appearance and high indices of value and significance of appearance for communication and friendship. The results confirmed empirically the "multifactorial model of attitudes toward appearance", developed by V. A. Labunskaya and colleagues in 2019, which cornerstone is the value and importance of appearance.

3. A particular role of satisfaction with appearance was discovered for the indicator of "years saved" among mature and elderly men (CA-PA&SA = 0.173, p = 0.047 in the sample of mature men, CA-PA&SA = 0.352, p = 0.005 in the sample of elderly men).

The **limitation** of the study may be the so-called 'survivorship bias' associated with studies of elderly samples (Blackburn, Epel, 2016), since age limits for elderly subjects in our study go beyond the average life expectancy of Russian men, which, according to pre-pandemic UN 2019 forecasts (Thomas et al., 2019) was 66.81 years.

Further research should aim to identify additional factors of PA in elderly male and female samples, as the results suggest that other psychological factors may affect the PA of individuals at this stage of life, and also to study gender-related aspects of the mechanisms for the process of age construction of unfamiliar others based on the perception of their appearance.

Highlights

1. The perceived age of mature men and women differs significantly: women look much younger than men (women's "years saved" indicator is 2.5 years higher than that of men); in old age, the differences in "years saved" between men and women are insignificant; on average, they look 3.5–4 years younger for their chronological age.

2. Significant gender differences were discovered in men's and women's attitudes toward their own appearance, explaining the differences in the perceived age of men and women. Women have a positive assessment of the individual components of appearance and their integral assessment; they are more concerned about their appearance, are more committed to improve their appearance, have a higher degree of appearance-perfectionism and a lower assessment of the age-related attractiveness of their appearance.

3. The relationship between men's and women's "saved years" indicators and the parameters of their attitudes toward appearance, which are mediated by their stage of life, is described; it has been shown that, compared to elderly women, the age perceived by women in maturity is more determined by their attitudes toward appearance. The role of men's satisfaction with their own appearance in the construction of their age in the social cognition process has been identified.

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Socio-demographic Factors in the Structure of Relationships Between Self-assessments of Appearance and Assessments of Subjective Well-being

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Abstract

Introduction. The solution to the problem of the relationship between self-assessments of appearance and assessments of subjective well-being (SWB) can answer the question of the direction in which these phenomena are determined by each other. The research results show the need to consider factors that change the structure of the relationship between self-assessments of appearance and assessments of subjective well-being. This study is the *first effort* to identify the types of structures of relationships between self-assessments of appearance and assessments of subjective well-being when including such socio-demographic characteristics as gender, age group, level of education, and economic status. *Hypothesis*: The types of relationships between self-assessments of appearance and assessments of subjective well-being may differ depending on the impact of a combination of socio-demographic factors. **Methods.** The study used the Socio-demographic Questionnaire, the Self-assessments of Appearance questionnaire by V. A. Labunskaya (2019), and the Subjective Well-Being Scale modified by V. M. Sokolova (1996). *Russian-language sample* comprised of 163 subjects: (a) 64.5 % – 18–25 years old (mean age = 20.9); (b) 35.5 % – 26–36 years old (mean age = 31.4); 64.5 % of respondents were women; 52.2 % had incomplete higher education; 54.6 % considered themselves to be in the group of 'rather poor than rich'. *Mathematical procedures*: frequency, correlation, and factor analyses, t-test for two independent samples (IBM SPPS Statistic 23.0). **Results.** Four types of relationships were identified. The strongest factor was the aggregate of self-assessments of appearance, associated with belonging to the age group of

26–36-year-olds and with the 'rather rich than poor' economic status. **Discussion.** First, self-assessments of appearance show varying sensitivity to socio-demographic factors and their combination. Secondly, self-assessments of appearance in combination with socio-demographic characteristics are a stronger factor of the direction of associations compared to SWB assessments. Thirdly, there is independence and autonomy of self-assessments of appearance and SWB assessments in young people with certain socio-demographic characteristics.

Keywords

self-assessments of appearance, appearance attractiveness, satisfaction with appearance, appearance concern, subjective well-being, structure of relationships, socio-demographic characteristics, gender, education, economic status

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Introduction

In 1982, A. A. Bodalev developed the theoretical principles of psychology of appearance in his work Perception and Understanding of Man by Man, which formed the basis of this study. In particular, the provision on the relationship among perceptions and assessments of appearance and the life stage, life events, life satisfaction, quality of life, and therefore subjective well-being. According to A. A. Bodalev, "...an individual's perception of self and others is included in his/her life and undergoes changes together with him/her" (Bodalev, 1982, p. 109). In the present study, this position is developed in connection with the study of the issue of "determinants mediating the relationship between self-assessments of appearance and assessments of subjective well-being (SWB)" (Labunskaya, 2019, 2021, 2022).

Factors in assessments of SWB and self-assessments of appearance

An analysis of works devoted to the study of well-being showed that some concepts were used in psychological and interdisciplinary research, including quality of life

(Rasskazova, Neyaskina, Leont'ev, Shiryaeva, 2019), life satisfaction, happiness (Lebedeva, Leont'ev, 2022; Merenkova, Solodkova, 2020), psychological well-being (Pavlotskaya, 2016), personal well-being (Baturin, Bashkatov, Gafarova, 2013), psycho-emotional well-being (Podolsky, Karabanova, Idobaeva, Heymans, 2011; Troshikhina, Manukyan, 2017), subjective well-being of large social groups (Kovalyova, 2020). Despite the variety of concepts and definitions, each of them refers to such a construct as 'well-being', which is widely represented in society and, along with the concept of 'quality of life' (Balashova, 2012, p. 57; Polivanova, 2020, p. 26), is used to assess economic development. Research is being conducted to examine subjective satisfaction/dissatisfaction with the level of economic well-being. (Kuzmenkova, Kuskov, 2019). We believe that the most important conclusion that determines the view on the types of 'well-being' is the conclusion of D. A. Leont'ev (2020b, p. 86) that "... the concept of well-being covers both the quality of life and subjective well-being", that it includes subjective scales through which an integral assessment of the ratio of positive and negative emotions, "cognitive assessments of life" is formed (Leont'ev, 2020a; Osin, Leont'ev, 2020).

R. M. Shamionov (2008) was the first to refer to the socio-psychological research of well-being. He proposed a definition of SWB, the core of which is "an individual's own attitude towards his/her personality, life and processes that are important to him/her... characterized by the experience of satisfaction" (Shamionov, 2008, p. 11). The approach to understanding SWB as a systemic phenomenon remains prevalent to this day. In general, SWB is considered as an integrative psychological education, which includes "personal characteristics of a person related to the assessment of various aspects of an individual's own life (intrareflective component of SWB) and the world around (interreflective component of SWB), as well as the experience of satisfaction with them" (Brooke, Ignatzheva, Volosnikova, Semenovskikh, 2021, p. 96).

The systematization of SWB factors has been presented in a number of generalizing works (Karapetyan, 2017; Leont'ev, 2020; Pavlotskaya, 2016; Polivanova, 2020; Rasskazova et al., 2019; Sokolova, 1996; Shamionov, 2008). Currently, research into subjective indicators of quality of life and well-being is in the forefront (Lebedeva, Leont'ev, 2022).

In our research, the study of the relationship between SWB and objective-objective factors is of interest. Thus, E. G. Troshikhina, V. R. Manukyan (2017), having conducted a correlation analysis, confirmed the inclusion of anxiety and stable emotional states in the structure of the psycho-emotional well-being of an adult, and M. A. Egorova, A. A. Zarechnaya (2022) drew attention to the fact that modern works have documented the relationship between SWB and the school psychological climate, the safety of the educational environment. They identified "mental school boredom" as an indicator of student psychological distress. Under conditions of limited communication space and health threats, SWB of young people is interconnected with a focus on social contacts (Yaremchuk, Bakina, 2021). It has been established that the lower SWB of foreign students (Chinese) is not only associated with adaptation difficulties, but also with worries about future employment (Danilenko, Xu, 2016). Studies have described the relationship

between value orientations and SWB among student youth (Muravyova, Popkova, 2010) and at the stage of adulthood (Bergis, 2018). At the same time, high SWB rates are observed among those who focus on self-development and are satisfied with family, personal, and professional relationships. (Bergis, 2018). The severity of such a component of SWB as happiness is associated with a number of life-meaning orientations of students. One of the main factors in students' experience of happiness is the meaningfulness of life (Garanina, Andronova, 2022).

A. Yu. Malenova, A. A. Malenov, E. E. Fedotova (2019) note similarities and differences in the structure of students' SWB depending on their gender and, at the same time, note that, regardless of gender, students have an average level of experience and manifestations of various emotional states; girls have higher life satisfaction levels. V. N. Oslon, L. M., Prokopyeva, U. V. Kolesnikova (2022) provide new empirical data on SWB in adolescents and young people aged 13–17 years living in 22 regions of the Russian Federation. They established relationships among lifestyle activity, subjective assessment of health, the degree of comfort of the educational environment and SWB, which decreases in boys in the situation of passing the Basic State Examination and Unified State Examination, but increases in girls. At the same time, the authors of this study reported that girls, regardless of age, residence area or disability, were less satisfied with all indicators.

Another study (Pavlenko, Bochaver, 2020) points out that the main influence on high school students' SWB is exerted by the age-related task of self-determination, the choice of images of their own future, and its implementation in everyday life. In a sample of children aged 10 to 12, relationships between family, school, friends, general satisfaction with life and SWB level were identified. It has been shown that there are no significant gender- and age-related differences in assessments of family, school, friends, and therefore SWB by children of this age (Bruk, Ignatzheva, 2021). The relationship and contribution of needs to SWB at various stages of socialization (children, adolescents, young people) are discussed as a hypothesis in the work by E. N. Volkova (2019), suggesting that certain achievements together with SWB indicate successful socialization.

Based on the analysis of numerous studies, L. V. Karapetyan (2017) concluded that the study of subjective well-being and ill-being in connection with socio-demographic factors and in connection with the study of psychological factors influencing SWB represent distinct groups of works. Her research found that the SWB did not decline due to age-related changes and that the relationship between age and SWB level was sinusoidal over different periods. The study pointed out that there were no significant differences between women and men in SWB, but highlighted that women's emotional well-being was higher than that of men, especially over 35 years of age. In addition, L. V. Karapetyan (2017) concluded that as education levels increase, SWB assessment levels may increase slightly, which contradicts the data of E. N. Kozlova and N. S. Komarova (2015), indicating that in individuals graduating from several higher education programmes, SWB deteriorates, while in individuals without education, SWB improves.

The level of SWB, as a rule, is influenced by complexes of external (objective) factors in combination with a complex of internal (subjective) factors, which enables us to confirm a brief review of research.

The interpretation of SWB as an individual's attitude to the most important modes of his/her life, accompanied by the experience of satisfaction, as a construct that includes emotional-motivational, cognitive-emotional components, is accepted by many researchers who turn to the search for factors that determine subjective well-being and ill-being at the individual-personal level, on various stages of life.

A long-term trend in the study of SWB is to consider socio-demographic factors as determinants of SWB and to compare SWB levels in groups that differ in their gender, age, and education.

The above factors are discussed in the context of the problem of self-assessments of appearance and SWB. The emergence of this research line is not accidental, as over the decades the relationship between several SWB indicators and self- assessments of appearance and body image has been studied. An overview of such studies is presented in a number of our publications (Labunskaya, 2019, 2021, 2022a, 2022b). In the psychology of appearance, works prevail in which the emphasis is placed on the physical component of appearance in connection with the study of various components of SWB. Studies have shown that body esteem is associated with subjective well-being, the severity of depressive symptoms (Kokoszka et al., 2022), that women experience emotional dysregulation due to dissatisfaction with their body (Kiryukhina, Polskaya, 2021), that self-esteem is associated with satisfaction with appearance, which interacts positively with intrinsic motivation and negatively with extrinsic motivation (Earl, 2023). T. Chevallereau et al write about a decrease in SWB in women as a result of experiencing a high level of meta-dehumanization, anger, and sadness in response to a partner's focus on appearance (2021). The works indicate that the perception of health and self-esteem are variables included in the construct of 'subjective well-being'. Thus, the results of a study (Rahmawati Sholeha & Ayriza, 2019) indicate an intense joint influence of self-esteem and body image on SWB, for example, among adolescents. Adolescents' perceived body image and level of physical activity are significantly associated with perceived well-being (Sollerhed, Lilja, Holmgren, & Garmy, 2021). Others (Khavylo, Sitseva, Eremina, 2021) believe that satisfaction with body image acts as a component of a person's SWB, and consider the specifics of girls' SWB in connection with body satisfaction (Pilishvili, Danilova, 2018). It is argued that there is a relationship between assessments of appearance and SWB (Epanchintseva, Kozlovskaya, Averkova, 2021). Body image and self-esteem were shown to mediate the relationship between exercise and SWB (Shang, Xie, & Yang, 2021).

A review article (Bij de Vaate, Veldhuis, & Konijn, 2020) questioned the extent and circumstances in which types of self-presentation influence individual well-being and body image. As a result of the analysis of the studies performed, the authors came to the conclusion that the impact of self-presentation and secrecy on well-being and body image is ambiguous. The ambiguity of the conclusions about the relationship between life

satisfaction and the attitude of young people towards their SWB is evidenced by the study of L. V. Popova (2021). A study (Gao et al., 2023) was conducted to identify mediators that may moderate the significant relationship between worry, appearance anxiety, and social anxiety, indicating that so-called 'self-compassion' can significantly reduce the severity of these relationships. There is also research suggesting that heavy use of appearance-focused social media is directly associated with lower scores of satisfaction with the physical component of appearance and SWB (Jarman et al., 2021).

Thus, the above-mentioned research explores the mutual influence of assessment, self-assessment of appearance and individual components of SWB in different age groups, and raises the question of the role of gender in the level of satisfaction with physical components of appearance. However, to date, no studies have examined the relationships between integral self-assessments of appearance, self-assessments of its components and integral assessments of SWB, its components. The impact of complex socio-demographic characteristics of young people on the relationship between self-assessments of appearance and assessments of SWB remains poorly studied. The direction in which these connections are determined (i.e. whether self-assessments of appearance determine SWB or whether SWB assessments determine attitude towards appearance) is questionable.

Based on the findings concerning the specifics of the study of SWB, as well as conclusions documenting various connections between assessments of appearance and SWB, **this study aims** to determine the impact of a complex of socio-demographic factors on the structure of relationships between self-assessments of appearance, appearance attractiveness, satisfaction with appearance, appearance concern, and assessments of SWB of appearance components.

The objectives of the study include determining the structure of the relationships between self-assessments of appearance and assessments of SWB when a set of socio-demographic characteristics is included in the factor analysis.

The study tested **the hypothesis** that the structure of relationships between self-assessments of appearance and assessments of SWB can be transformed as a result of the influence of a complex of socio-demographic factors.

Methods

Empirical research methods

1. Socio-demographic questionnaire to identify gender; age; education (secondary and incomplete higher; higher); economic status determined on the basis of identification with groups: (rather poor than rich; rather rich than poor). The table contained 1–2 points for each socio-demographic criterion; age groups were created using conversion procedures to assign the rank to the age group.

2. In order to study self-assessments of appearance, the following diagnostic tools were used:

2.1. The Self-assessments of Appearance questionnaire developed by V. A. Labunskaya et al (2019). Based on this questionnaire, self-assessments of the following components of appearance were diagnosed: facial appearance; bodily appearance; appearance design; then the integral self-assessment of the appearance was calculated (we summed up the scores for each type of self-assessment as follows: facial appearance + bodily appearance + appearance design; the sum of scores is divided by the number of types of self-assessments). This study examines the types of self-assessments of appearance components and the integral self-assessment of appearance. The questionnaire also includes a scale for 'self-assessment of attractiveness of appearance'. The instructions indicate that 1 point is an extremely negative self-assessment of the appearance attractiveness, and 10 points is the highest positive self-assessment.

2.2. Ten-point scales of satisfaction and concern for appearance (Labunskaya et al., 2019), ranging from low to high levels of satisfaction with appearance and appearance concern.

2.3. To diagnose SWB, the Subjective Well-Being Scale by A. Perrudet-Badoux, G. Mendelsohn & J. Chiche (1988), modified by V. M. Sokolova (1996), was used. The general (integral) assessment of SWB was derived from assessments of its following indicators: 1) tension and sensitivity; 2) signs accompanying the main mental symptoms, such as depression, somnolence, absent-mindedness, etc.; 3) mood changes; 4) importance of the social environment; 5) self-assessment of health; and 6) degree of satisfaction with daily activities. Then we placed each study participant in a scale of "extremely low assessments of well-being – extremely high assessments of well-being" and determine the level of severity of SWB. According to the Scale developers, the more points a research participant scores, the higher the integral assessment of SWB, the more pronounced his/her ill-being is. This primary data processing method is taken into account in our research.

Thus, in the study, self-assessments of appearance components, integral self-assessment of appearance, self-assessment of appearance attractiveness, self-assessment of satisfaction and concern with appearance were examined as self-assessments of appearance; we also examined the general (integral) assessment of SWB and its six components listed above (a total of 14 variables).

Mathematical procedures

We used descriptive statistics, frequency, correlation, factor analyses, and t-test for independent samples (IBM SPPS Statistic 23.0).

Study sample

A total of 163 subjects participated in the study (see Table 1).

Table 1
Distribution of study participants according to their socio-demographic characteristics

Socio-demographic characteristics of study participants		N	%
Gender	1. (M)	58	35.5
	2. (F)	105	64.5
Age group	1. (18–25 years)	105	64.5
	2. (26–36 years)	58	35.5
Education	1. Secondary	78	47.8
	2. Incomplete higher education; higher education	85	52.2
Economic status	1. Rather poor than rich	89	54.6%
	2. Rather rich than poor	74	45.4%

In the process of solving the proposed problem, the complex socio-demographic characteristics of the study participants were taken into account.

Results

The indicators R and P (Table 2) show that there are significant inversely proportional relationships between the general (integral) assessment of SWB, its components, and self-assessments of SWB.

Table 2

Correlations between self-assessments of appearance and assessments of SWB (Spearman)

VARIABLES		Appearance concern	Satisfaction with appearance	Self-assessment of facial appearance	Self-assessment of bodily appearance	Self-assessment of appearance design	Integral self-assessment of appearance	Self-assessment of appearance attractiveness
General (integral) assessment of SWB	R	-.093	-.053	-479**	-.480**	-.456**	-.418**	-.473**
	P	.235	.499	.000	.000	.000	.000	.000
Tension, sensitivity	R	.248**	-.303**	.140	.053	.142	.311**	.161*
	P	.001	.000	.075	.504	.070	.000	.040
Signs accompanying the main mental symptoms, including depression, somnolence, absent-mindedness	R	.084	-.298**	-.136	-.154	-.127	.037	-.133
	P	.289	.000	.083	.050	.105	.643	.090
Mood change	R	.033	-.204**	-.265**	-.251**	-.249**	-.140	-.290**
	P	.679	.009	.001	.001	.001	.074	.000
Importance of social environment	R	-.022	-.123	-.239**	-.207**	-.233**	-.180*	-.240**
	P	.780	.117	.002	.008	.003	.022	.002
Self-assessment of health	R	.070	-.247**	-.162*	-.163*	-.138	-.003	-.166*
	P	.377	.001	.038	.038	.078	.967	.034
Satisfaction with daily activities	R	.078	-.352**	-.076	-.040	-.075	.111	-.055
	P	.320	.000	.333	.616	.342	.159	.487
	N	163	163	163	163	163	163	163

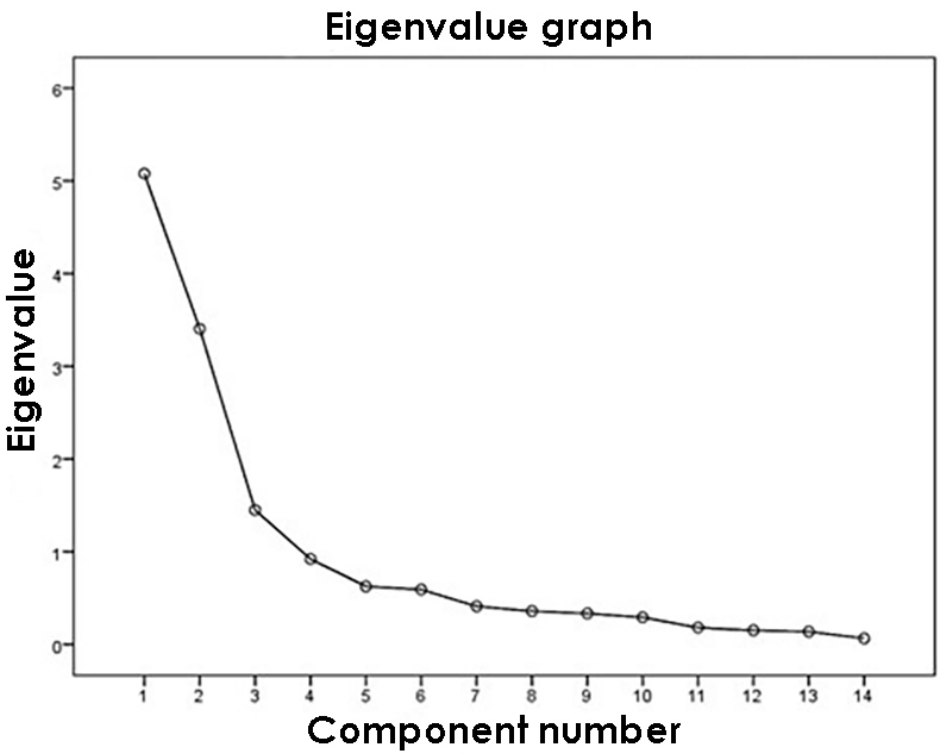
Note. ***. The correlation is significant at the 0.01 level (2-tailed). *. The correlation is significant at the 0.05 level (2-tailed).*

With an increase in the severity of such a component of SWB as 'tension and sensitivity', there is an increase in appearance concern, integral self-assessment of appearance, and self-assessment of the attractiveness of appearance.

We state the high adequacy of the application of factor analysis to the indicators under consideration (Kaiser–Meyer–Olkin (KMO) sampling adequacy criterion = 0.810 at P = 0.000).

Taking into account the graph of eigenvalues (see Fig. 1), a factor-based structure, including 4 factors, was chosen.

Figure 1
Eigenvalue graph



Note. *Component designation: 1 – appearance concern, 2 – satisfaction with appearance; 3 – self-assessment of facial appearance; 4 – self-assessment of bodily appearance; 5 – self-assessment of appearance design; 6 – integral self-assessment of appearance; 7 – self-assessment of appearance attractiveness; 8 – general (integral) assessment of SWB; 9 – tension and sensitivity; 10 – signs accompanying the main mental symptoms, including depression, somnolence, absent-mindedness, etc.; 11 – mood changes; 12 – importance of the social environment; 13 – self-assessment of health; 14 – degree of satisfaction with daily activities.*

The four factors explained 69.039 % of the total variance. Table 3 presents the results of the factor analysis. In order to determine the structure of the relationship between self-

assessments of appearance and assessments of SWB, the minimum factor weight of the variables was designated as 0.3 and the sequence of arrangement of factor weights was specified: from maximum values to minimum.

Table 3
Rotated component matrix[a]

Variables	Component			
	1	2	3	4
Self-assessments of appearance attractiveness	.919			
Self-assessments of facial appearance	.910			
Self-assessments of bodily appearance	.870			
Self-assessments of appearance design	.849			
Integral self-assessment of appearance	.796		.512	
Economic status	.434			
General (integral) assessment of SWB	-.415	.833		
Signs accompanying the main mental symptoms, including depression, somnolence, absent-mindedness		.831		
Self-assessment of health		.790		
Satisfaction with daily activities		.769		
Mood change		.736		
Importance of social environment		.725		
Self-assessment of satisfaction with appearance			-.803	

Variables	Component			
	1	2	3	4
Age group	.556		.713	
Education			.658	
Self-assessment of appearance concern			.646	
Tension, sensitivity		.432	.458	-.404
Gender				.818

Note. *Factor extraction method: a principal component method. Rotation method: varimax with Kaiser normalization. a – rotation converged in 5 iterations.*

The first factor (see Table 3) determines the largest share of the total variance (30.548). The following variables have the highest loadings: self-assessment of the attractiveness of appearance, self-assessment of facial appearance, followed by self-assessments of other components of appearance, and integral self-assessment of appearance. They are joined by the following variables: age group and economic status. This factor has two poles: the negative pole includes a single variable – the general (integral) assessment of SWB. Considering the structure of this factor, it can be called 'Self-assessments of SWB, age group, and economic status'.

If we look at the average values of the variables, we can clarify which age group and economic status we are talking about. Study participants belonging to the second age group (26–36 years) (T = –7.147 at P = 0.000; M1 = 5.75; M2 = 7.95), identifying themselves with the group of 'rather rich than poor' (T = –4.789 at P = 0.000; M1 = 5.5.84, M2 = 7.35) have higher self-assessments of appearance.

Age-related differences are observed in assessments of SWB. In the group of 26–36-year-olds there was a lower overall (integrated) assessment of SWB (T = 3.701 at P = 0.000; M1 = 5.76 M2 = 4.31); in the group of subjects identifying themselves with those who are 'rather poor than rich', there was also a lower overall (integrated) assessment of SWB (T = 2.183 at P = 0.030; M1 = 5.62, M2 = 4.78).

The second factor explains 23.623 % of the total variance, indicating less intensive explanatory power of this factor compared to the first one. The structure of this factor differs significantly from the structure of the first factor. It included only variables related

to subjective well-being – the overall (integral) assessment of SWB and assessments of all its components. This factor can be called 'Assessment of subjective well-being'.

The third factor explains only 9.046 % of the total variance of the included variables, among which self-assessment of satisfaction with SWB has the highest negative loading. This indicator forms a negative pole for this factor. A positive pole includes socio-demographic characteristics (age group, level of education), self-assessment of appearance concern, integral self-assessment of appearance, and the 'tension and sensitivity component' of SWB. Based on the structure of this factor, it can be called "Satisfaction with appearance – concern, age group, level of education".

Study participants belonging to the second age group (26–36-year-olds) have higher levels of appearance concern (T = –5.356 at P = 0.00; M1 = 5.09, M2 = 6.43), integral self-assessments of appearance (T = -17.185 at P = 0.000; M1 = 4.80, M2 = 8.10), assessments of such components of SWB as 'tension and sensitivity' (T = –7.272 at P = 0.000; M1 = 4.42, M2 = 6.24) compared with representatives of the first age group (18–25-year-olds), who have significantly higher satisfaction with appearance (T = 7.633 at P = 0.000; M1 = 6.39, M2 = 4.02). Study participants who have secondary education demonstrated higher satisfaction with appearance (T = 5.941 at P = 0.000; M1 = 6.52, M2 = 4.65) and lower appearance concern (T = –2.935 at P = 0.004; M1 = 5.18, M2 = 5.93), lower integral self-assessments of appearance (T = –5.725 at P = 0.000; M1 = 5.13, M2 = 6.75).

With an increase in the severity of a SWB component such as "tension and sensitivity", there is an increase in concern about appearance, an integral self-assessment of appearance, and self-assessment of appearance attractiveness.

The fourth factor has low explanatory power – 5.822 %. This factor demonstrates an inversely proportional relationship between assessments of 'tension and sensitivity' and the gender of the study participants. This variable forms a positive pole with a high factor weight. Considering the fact that there are no differences between male and female study participants in assessments of 'tension and sensitivity' (T = –0.568 at P = 0.571; M1 = 4.93, M2 = 5.12), this factor can be called 'Gender'.

The most powerful factor is a combination of self-assessments of appearance, associated with belonging to a certain age group (26–36-year-olds) and to a certain economic status ('rather rich than poor'). This cumulative factor increases the assessment of well-being.

Discussion

Thus, the combination of belonging to a certain age group and a certain economic status changes the structure of the relationship between self-assessments of appearance and assessments of SWB. The transformation of the relationships between satisfaction with appearance, appearance concerns and assessments of SWB results from the combination of belonging to an age group and the level of education. Young people with secondary

education, belonging to the age group of 18–25-year-olds, are more satisfied with their appearance and less concerned with it. They feel more prosperous than study participants belonging to the age group of 26–36-year-olds, despite the fact that the latter have a higher integral self-assessment of appearance. In general, the representatives of this group have higher education. It can be assumed that entering the age group of 26–36-year-olds and receiving higher education increases appearance concerns, reduces satisfaction with it in the context of a positive self-assessment of appearance and reduces subjective well-being assessments.

These results are in contradiction with data of L. V. Karapetyan (2017), who stated that there was no decline in the SWB due to the increase in age. The results partly coincide with the conclusions of her work that there are no significant differences in the levels of SWB between men and women. Compared to men, women have a higher emotional well-being by the age of 35 years. The results of our study are consistent with the data of E. N. Kozlova and N. S. Komarova (2015) on the increase in the SWB level among those who do not have higher education, but do not correspond to the conclusions of L. V. Karapetyan (2017) on the increase in SWB scores with increasing education level. The data on the relationship between SWB and self-assessments of the physical component of appearance (see the first factor, Table 3) coincide with the conclusions that body self- assessments is associated with SWB (Kokoszka et al., 2022) and that SWB is strongly influenced by body image (Rahmawati Sholeha & Ayriza, 2019).

If the relationship between concern about VO and tension and sensitivity is quite understandable, then the positive relationship between tension, sensitivity, integral self-assessment of appearance, and self-assessment of its attractiveness can be interpreted as the impact of self-assessments of appearance on the increase in tension associated with assessments of appearance by others, sensitivity to them, in connection with anxiety regarding the discrepancy between self-assessments and assessments of appearance. The validity of this conclusion is confirmed by the negative relationships among tension, sensitivity, and self-assessments of satisfaction with appearance. These results are partially consistent with findings of a relationship between generalized anxiety and body dissatisfaction, which is mediated by the combination of gender and appearance anxiety (Pritchard, Brasil, McDermott, & Holdiman, 2021).

The contribution of the study to solving the problem of "predictors of the relationship between self-assessments of appearance and assessments of SWB and its limitations" lies, first of all, in the fact that for the first time, in a Russian sample of young people (18–36 years), the relationships between self-assessments of appearance and assessments of SWB were examined; socio-demographic characteristics were studied as mediators of these connections. What is new is the data on the greater influence of self-assessments of appearance on SWB in combination with socio-demographic factors compared to the impact of SWB on self-assessment of appearance.

Our research enabled us to formulate new hypotheses:

1. Indicators of attitudes toward appearance (self-assessment of appearance, satisfaction with appearance, appearance concern, self-assessment of appearance attractiveness) show different sensitivity to socio-demographic factors and their combination.
2. Self-assessment of appearance combined with socio-demographic characteristics is a stronger factor in relationship direction than SWB assessment at different stages of life.
3. Self-assessments of appearance and assessments of SWB can be independent and autonomous phenomena.

The **limitations** include, firstly, the absence of an indication of marital status on the list of socio-demographic factors. In addition, it is important to increase the number of study participants to monitor the dynamics of SWB and attitudes toward appearance. Among the limitations are the use of only factor and correlation analyses in the study.

From **a practical perspective**, this study contributes to understanding the role of self-assessments of appearance in the formation of assessments of SWB, the creation of differentiated practice-oriented programs that take into account socio-demographic characteristics, different levels of sensitivity to SWB components and their interaction with SWB.

A promising direction is to conduct research that considers life dynamics of self-assessments of appearance and assessments of SWB, the relationship between them, and the inclusion of ethnocultural factors in socio-demographic characteristics as mediators.

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The Degree of Outrage Over Corruption Among Russians with Different Levels of Attitude Toward Social Dominance

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Abstract

Introduction. Status relationships and status perceptions are the main driving forces for behavior, self-perception, and the individual picture of the world. This empirical study aims to investigate the relationship between moral outrage over corruption among Russians and their attitudes toward social dominance. In addition, the social dominance orientation (SDO) scale was approved and validated. **Methods.** A total of 509 subjects participated in an online survey (mean age 41.34 years, SD = 10.67; 57.6 % males, 42.4 % females). The study used the Social Dominance Orientation scale, the 5-point scale to measure awareness of corruption (General Social Survey), the 4-point scale to measure outrage over corruption, and the Short Dark Triad questionnaire. The data were processed with the SPSS 19.0 software. **Results.** The results of the study showed a positive relationship between the degree of moral outrage over corruption and the approval of the social hierarchy among Russians. The exploratory factor analysis of the data from the Social Dominance Orientation scale made it possible to distinguish the following three factors: (a) "the idea of social equality (anti-egalitarianism)", (b) "the idea of social dominance (egalitarianism)", and (c) "the idea of rivalry (competition)". The correlation analysis showed significant correlations between personality traits of respondents (the parameters of the dark triad) and their attitudes toward social dominance. **Discussion.** The findings of this study are confirmed by the results of previous studies on the impact of social dominance orientation on the low level of awareness of corruption, which in turn contributes to the desire to maintain the social hierarchy and strengthens corrupt intention. Furthermore,

according to the results of foreign studies, psychological predictors for corrupt intention are competitive world beliefs and dangerous world beliefs. This requires additional verification and is the objective of our future research.

Keywords

social dominance orientation, corruption, moral outrage over corruption, perception of corruption, attitude toward social dominance, social justice

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Introduction

Thirty years ago, J. Sidanius and F. Pratto (Sidanius & Pratto, 1993) developed the theory of social domination, which postulates the superiority of one group over others as a kind of social consensus that minimizes group conflicts. The authors of the concept defined social dominance orientation (SDO) as the degree to which individuals wish and support group hierarchy and the dominance of 'superior' groups over 'inferior' ones.

As further studies have shown, men have higher social dominance orientation scores than women (Licciardello, Castiglione, Rampullo & Scolla, 2014; Tan, Liu, Huang, Zhao & Zheng, 2016). In addition, individuals with higher SDO scores show a stronger negative attitude toward others in terms of gender (Pratto, Sidanius, Stallworth & Malle, 1994; Kugler, Cooper & Nosek, 2010), ethnicity (Pratto et al., 1994), social class (Guimond, Dambrun, Michinov & Duarte, 2003), and sexual orientation (Huang & Liu, 2005).

During the COVID-19 pandemic, social dominance orientation proved to be related to the mental health of the population (Shi et al., 2021). Thus, individuals with high social dominance orientation scores experienced a higher level of depression than those with low SDO scores. At the same time, the lifestyle changes perceived by the participants reduced the relationship between SDO and depression. Individuals with high SDO scores are less likely to engage in behaviors aimed at preventing the spread of COVID-19 (Clarke, Klas & Dyos, 2021). SDO negatively correlated with support for government restrictions to reduce the spread of coronavirus infection (wearing masks and physical distancing).

According to research by Van Hiel & Kossowska (2006), social dominance orientation is negatively associated with psychological well-being. Data from a large-scale survey conducted in the United Kingdom by Lalot, Jauch & Abrams (2022) showed that a greater degree of right-wing authoritarianism is related to a greater social dominance orientation. Similar data were found by other researchers (Nicol & Rounding, 2013).

A study by R. Mesler (Mesler et al., 2022) demonstrated that social dominance orientation is a predictor of rule-breaking behavior. Moreover, intra-group identity contributes to strengthening the relationship between SDO and rule-breaking.

In a 2018 study by O. A. Gulevich and colleagues, two closely related sub-factors (anti-egalitarianism and dominance) were identified during the authors' survey and confirmatory factor analysis of the social dominance orientation questionnaire, which incorporated only 10 of the 16 statements in the questionnaire into a model. The authors assumed that the remaining 10 statements in the model correspond better to the data than the model, which initially contained 16 statements.

Socio-psychological research on corruption shows the relationship between corruption perception and various factors determining citizens' ideological views and attitudes toward social solidarity. Thus, Modesto & Pilati (2020) considered the following 3 levels of causes contributing to corruption:

- The micro-level includes gender, age, personality characteristics (such as hedonism, self-control, narcissism, and conscience), as well as beliefs and creativity (some studies confirm the hypothesis that creative people have higher rates of dishonest behavior (Gino & Ariely, 2012; Shu & Gino, 2012; Vincent, Emich & Goncalo, 2013; Gino & Wiltermuth, 2014; Kennedy & Kray, 2022).
- The meso-level of the model includes conformity, group norms, social identity, as well as the four-eyes principle (4EP), which reduces dishonest behavior in the presence of another. We should note that this principle is effective if the management of an organization (company) adheres to anti-corruption behavior and shows patterns of this behavior by personal examples.
- The macro-level contains cultural and political factors. The liberal economic model increases corruption, and the impact of democratic institutions on reducing corruption is only significant in countries where the GDP per capita is over 2,000 dollars.

According to Stupnianek & Navickas's data (2019), belief in a just world can be a predictor of more just and less corrupt behavior. People who think they get what they deserve are less likely to be corrupt. On the contrary, people who believe that they do not get what they deserve are more likely to act unfairly and corruptly. Recent studies of the impact of belief in a just world on corruption (Modesto & Pilati, 2020) have shown the importance of considering such a factor mediating the correlation as awareness of punishment for a corruption offense when analyzing predictors of delinquent behavior.

Social dominance theory complements the theory of belief in a just world and system justification theory (Jost & Hunyady, 2003) in terms of justifying the social status of certain groups in society, and the attitude of the elite toward corrupt behavior as the use of power in their own interests.

Tan and colleagues (Tan et al., 2016b) have convincingly shown that the justification of the common system is negatively associated with the perception of corruption and corrupt intentions, as well as the fact that institutional trust mediates these relationships.

In another article (Tan, et al., 2016c), the authors continued to develop ideas on the impact of meritocratic ideology on weakening the perception of social injustice and proved that meritocratic ideology was negatively associated with the perception of corruption, and was positively associated with corrupt intention, as it encouraged individuals to express their willingness to participate in unfair acts.

Thus, the review of English-language sources on the theory of social dominance orientation confirms the high relevance of its research in relation to other social phenomena.

Global research highlights the lack of understanding of the relationship between the perception of social dominance and the motivation for corrupt behavior, as well as the relevant measures against corruption offences. Russian research in the field of social psychology of corruption (Zhuravlev & Yurevich, 2012; Berkovich, Dukhanina, Maksimenko, & Nadutkina, 2019; Maksimenko, Deyneka, Krylova, & Dukhanina, 2020; Dukhanina, Deyneka, Krylova, & Maksimenko, 2020; Krylova & Maksimenko, 2021; Krylova & Maksimenko, 2022) have also demonstrated a notable lack of new methodological tools and empirical works.

This study **aimes** to investigate the relationship between moral outrage over corruption among Russians and their attitudes toward social dominance.

We suggest that among those Russians who are less tolerant of situations related to social dominance and who are more satisfied with fair relations between social groups, the degree of moral outrage over corruption is higher. The study also sought to identify the relationship between respondents' personality traits and their attitudes toward social dominance and corruption. In addition, the Social Dominance Orientation (SDO) scale was approved and validated in this study (Annex 1).

Methods

Respondents

The study was conducted anonymously in the third decade of January 2023 in the online survey mode of the survey design service Anketolog.ru by collecting the responses of respondents through the Yandex.Toloka service.

A total of 509 subjects participated in an online survey (mean age 41.34 years, SD = 10.67; 57.6 % males, 42.4 % females). The residence (urbanization level), education level, and subjective income of the respondents were also taken into account.

In our study, 11.3 % of respondents resided in Moscow; 21.2 % – in St. Petersburg and other megacities and million-plus cities; 36.3 % – in large cities with less than 1 million of inhabitants; and 31.3% – in district centers.

According to the level of education, the majority were respondents with higher education (57 %); 41.8 % of respondents had secondary and incomplete higher education; 1.2 % of respondents had an academic degree.

The level of subjective income was very high or high for 3.6 % of respondents, average for 54.0 % of respondents, and low for 31.0 % of respondents; 11.4 % of respondents indicated that they made ends meet.

Measures

The study used a 16-point Social Dominance Orientation (SDO) scale (Sidanius & Pratto, 1999) (Annex 1), the 5-point scale to measure awareness of corruption (General Social Survey) (Davis & Smith, 1991) (Annex 2), the 4-point scale to measure outrage over corruption (Li, Triandis, & Yu, 2006) (Annex 3), and the Short Dark Triad questionnaire (Paulhus, Williams, 2002) to measure three psychological personality traits: Machiavellianism, narcissism, and psychopathy in adaptation (M. S. Egorova, M. A. Sitnikova, & O. V. Parshikova, 2015).

Data processing

The data were processed with the SPSS 19.0 software. We used frequency analysis, regression analysis, exploratory factor analysis, Spearman correlation analysis, and determination of statistically significant differences (Mann-Whitney criterion).

Results

Table 1 provides descriptive statistics for the 16-point SDO scale.

Table 1
Social dominance orientation

Items	M	SD
1. Some groups of people are simply inferior to other groups	3,18	1,11
2. In getting what you want, it is sometimes necessary to use force against other groups	2,81	1,21
3. It's OK if some groups have more of a chance in life than others	2,57	1,22
4. To get ahead in life, it is sometimes necessary to step on other groups	3,66	1,04
5. If certain groups stayed in their place, we would have fewer problems	2,86	1,09

6. It's probably a good thing that certain groups are at the top and other groups are at the bottom	2,36	1,09
7. Inferior groups should stay in their place	2,11	1,03
8. Sometimes other groups must be kept in their place	2,65	1,10
9. It would be good if groups could be equal	3,71	1,04
10. Group equality should be our ideal	3,62	1,07
11. All groups should be given an equal chance in life	4,08	0,97
12. We should do what we can to equalize conditions for different groups	3,78	1,02
13. Increased social equality	4,11	0,97
14. We would have fewer problems if we treated people more equally	4,04	1,00
15. We should strive to make incomes as equal as possible	4,06	1,06
16. No one group should dominate in society	3,90	1,07

Note. *A 5-point Likert scale was used. The highest mean scores are shown in red, the lowest – in green.*

Russians associate higher SDO scores with the possibility of providing equal opportunities to all social groups (4.08), reducing income inequality (4.06), and treating everyone equally (4.04). At the same time, the low degree of agreement among the respondents concerns statements about the unchanged status of lower groups (2.11) and the increase in life chances of some groups (2.57). This can be explained by the socialist views of the respondents.

Table 2 provides descriptive statistics for the 5-point scale to measure awareness of corruption (General Social Survey).

Table 2

Awareness of corruption (scale)

Items	M	SD
1. Corruption always exists in different eras	4,18	0,96
2. Most people who have opportunities to be corrupt will be corrupt	3,85	1,03
3. At present, corruption is a very common phenomenon and spreads to almost every industry	4,24	0,95
4. The problem of corruption is very severe in today's Russian society	4,26	0,95
5. The corruption phenomenon has appeared in universities and become more and more serious	3,84	1,04

Note. *A 5-point Likert scale was used. The highest mean scores are shown in red, the lowest – in green.*

The survey respondents described the problem of corruption in modern Russian society as very serious (4.26) and very widespread, considering that almost all sectors of the economy and the social sphere are affected by it (4.24).

Table 3 provides descriptive statistics for the 4-point scale to measure outrage over corruption.

Table 3
Awareness of corruption (scenario)

Items	M	SD
1. The behavior of taking a bribe and helping a friend with false certification is wrong	4,08	1,07
2. This type of corrupt behavior is very common in society	4,05	,91
3. This corrupt behavior harms the public	4,22	,93
4. This corrupt behavior harms the interests of other candidates	4,34	,91

Respondents expressed outrage at corruption offences and stressed that corruption is mainly discriminating against other participants in the competitive process and damages society.

The factor-exploration analysis of the survey data with a principal components analysis (with varimax rotation) enabled us to distinguish three factors (Table 4).

Table 4
Factor analysis for social dominance orientation

Items	Factor analysis		
	The idea of social equality (anti-egalitarianism)	The idea of social dominance (egalitarianism)	The idea of rivalry (competition)
1. Some groups of people are simply inferior to other groups			,717
2. In getting what you want, it is sometimes necessary to use force against other groups			,718
4. To get ahead in life, it is sometimes necessary to step on other groups			,802

Items	Factor analysis		
	The idea of social equality (anti-egalitarianism)	The idea of social dominance (egalitarianism)	The idea of rivalry (competition)
5. If certain groups stayed in their place, we would have fewer problems		,697	
6. It's probably a good thing that certain groups are at the top and other groups are at the bottom		,674	
7. Inferior groups should stay in their place		,792	
8. Sometimes other groups must be kept in their place		,807	
9. It would be good if groups could be equal	,793		
10. Group equality should be our ideal	,824		
11. All groups should be given an equal chance in life	,812		
12. We should do what we can to equalize conditions for different groups	,839		
13. Increased social equality	,825		

Items	Factor analysis		
	The idea of social equality (anti-egalitarianism)	The idea of social dominance (egalitarianism)	The idea of rivalry (competition)
14. We would have fewer problems if we treated people more equally	,847		
15. We must strive to reduce income inequality	,758		
16. No one group should dominate in society	,757		
Total variance, %	6,436	2,679	1,195

"The idea of social equality (anti-egalitarianism)" was the first best weighting factor (6.436). It is characterized by the deviation of estimates of ideal income equality, attitudes to groups and everyone, and the absence of dominant groups in society. It includes statements such as "we would have fewer problems if we treated people more equally" (0.847), "we should do what we can to equalize conditions for different groups" (0.839), "increased social equality" (0.825). Therefore, the idea of social equality and equal conditions prevails among the Russians surveyed.

The second factor (2.679), ***"the idea of social dominance (egalitarianism)",*** combines agreement with statements on unwillingness to change anything in the hierarchy and the idea of maintaining the status quo as a problem-free situation. It included the following statements: "sometimes other groups must be kept in their place" (0.807) and "inferior groups should stay in their place" (0.792).

The third factor (1.195), ***"the idea of rivalry (competition)",*** is a set of responses to items stating the need to make efforts to get ahead in life, even using force to achieve results. It includes statements such as "to get ahead in life, it is sometimes necessary to step on other groups" (0.802), "in getting what you want, it is sometimes necessary to use force against other groups" (0.718), "some groups of people are simply inferior to other groups" (0.717).

The results of the correlation analysis indicate that moral outrage is closely related to the gender and age of the respondents. Thus, women and elderly people are more likely to say that "this corrupt behavior harms the interests of other candidates" ($p < 0.001$). At the same time, elderly respondents expressed more outrage at corruption as a phenomenon that harms society ($p < 0.001$) and religious respondents expressed less moral outrage ($p < 0.01$) (no gender differences were found in this type of moral outrage). Moral outrage had no correlations with the subjective level of income, urbanization, and education of the respondents.

Moreover, we found a significant relationship between social dominance orientation and moral outrage (the hypothesis was confirmed). Respondents who do not agree with the statement of the normality of the situation when some groups have more opportunities in life than others largely support the judgments on corrupt behavior that that is detrimental to the interests of others ($p < 0.001$) and society ($p < 0.001$). The same negative relationship was found for the statement that the inferior groups should be kept in their place ($p < 0.001$). We found positive relationships for moral outrage and judgments like "all groups should be given an equal chance in life" ($p < 0.001$), and "we should strive to make incomes as equal as possible" ($p < 0.001$).

Social dominance orientation expectedly correlated with the dark triad parameters. Thus, such a psychological trait as machiavellianism positively correlated with the items of the rivalry factor (competition), such as "to get ahead in life, it is sometimes necessary to step on other groups" ($p < 0.001$) and "in getting what you want, it is sometimes necessary to use force against other groups" ($p < 0.001$). Narcissism positively correlated with the statement that "it's OK if some groups have more of a chance in life than others" ($p < 0.001$) and negatively correlated with the statement on the need to increase social equality ($p < 0.001$). Psychopathy positively correlated with the statement that the inferior groups should be kept in their place ($p < 0.001$) and negatively correlated with the statement that "we would have fewer problems if we treated people more equally" ($p < 0.001$) and the statement on the need to increase social equality ($p < 0.001$).

Discussion

As V. Rosenblatt (Rosenblatt, 2012) showed, social domination orientation leads to a low level of people's awareness of the use of official positions for personal purposes (abuse of power), which further contributes to a great desire to maintain the social hierarchy and leads to organizational corruption. The results of Tan, Liu, Zheng & Huang (2015) confirmed their hypothesis that social dominance orientation was positively related to corrupt intentions. They believed that individuals who scored high in SDO (subscale "idea of social dominance / egalitarianism") want to advance up the career ladder and receive benefits disproportionate to their contribution to the organization. At the same time, they expressed their willingness to commit corruption offences in order to achieve this.

Although power is generally seen as a potentially corrupt force, which reduces morality and increases the likelihood of corruption intention, studies have shown that power increases the tendency to think about morality, increases respect for principles and rules (Fleischmann & Lammers, 2020). We believe that values are the key factor and that the desire for power is not always corrupt, but often leads to a richer, mature, and more diverse form of morality.

Vilanova, Milfont & Costa (2022) explained the high level of corruption in Brazil and proposed a model that included ideological factors (social dominance orientation and right-wing authoritarianism) and the underlying worldviews (competitive world beliefs) and (dangerous world beliefs) as predictors of corrupt intentions.

All the previous results indirectly confirmed and supplemented the data obtained and provided further research hypotheses.

Conclusion

Thus, in the study of the relationship between the moral outrage of Russians over corruption and the attitude toward social domination, a positive relationship between the level of moral outrage over corruption and the approval of the social hierarchy can be established. The exploratory factor analysis of the findings of the social dominance orientation questionnaire enabled us to identify the following three factors: (a) "the idea of social equality (anti-egalitarianism)", (b) "the idea of social dominance (egalitarianism)", (c) and "the idea of rivalry (competition)". Furthermore, we found significant correlations between personality traits of the respondents (parameters of the dark triad) and their attitude toward social dominance. The preliminary validation of the social dominance orientation questionnaire was also performed. To do this (after double converting and data collection), the data were factorized to verify the design (factor validity). The structure of the three factors, similar to that of the authors of the diagnostic tool, confirmed the validity of the factors. Furthermore, the reliability of the Social Dominance Orientation scale was checked.

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Annex 1

Social Dominance Orientational scale

Please indicate the extent of your agreement or disagreement (from 1 to 5) with the following statements selecting only one option in each line, where 1 – strongly disagree, and 5 – strongly agree

Items	Strongly disagree	Dis-agree	Unde-cided	Agree	Strongly agree
1. Some groups of people are simply inferior to other groups	1	2	3	4	5

Items	Strongly disagree	Dis-agree	Unde-cided	Agree	Strongly agree
2. In getting what you want, it is sometimes necessary to use force against other groups	1	2	3	4	5
3. It's OK if some groups have more of a chance in life than others	1	2	3	4	5
4. To get ahead in life, it is sometimes necessary to step on other groups	1	2	3	4	5
5. If certain groups stayed in their place, we would have fewer problems	1	2	3	4	5
6. It's probably a good thing that certain groups are at the top and other groups are at the bottom	1	2	3	4	5
7. Inferior groups should stay in their place	1	2	3	4	5
8. Sometimes other groups must be kept in their place	1	2	3	4	5

Items	Strongly disagree	Dis-agree	Unde-cided	Agree	Strongly agree
9. It would be good if groups could be equal	1	2	3	4	5
10. Group equality should be our ideal	1	2	3	4	5
11. All groups should be given an equal chance in life	1	2	3	4	5
12. We should do what we can to equalize conditions for different groups	1	2	3	4	5
13. Increased social equality	1	2	3	4	5
14. We would have fewer problems if we treated people more equally	1	2	3	4	5
15. We should strive to make incomes as equal as possible	1	2	3	4	5
16. No one group should dominate in society	1	2	3	4	5

Annex 2

Awareness of corruption (scale)

Items	Rarely	Some-times	Unde-cided	Often	Very often
Corruption always exists in different eras	1	2	3	4	5
Most people who have opportunities to be corrupt will be corrupt	1	2	3	4	5
At present, corruption is a very common phenomenon and spreads to almost every industry	1	2	3	4	5
The problem of corruption is very severe in today's Russian society	1	2	3	4	5
The corruption phenomenon has appeared in universities and become more and more serious	1	2	3	4	5

Annex 3

Awareness of corruption (scenario)

After reading the scenario, please indicate the extent of your agreement or disagreement (from 1 to 5) with the following statements selecting only one option in each line, where 1 – strongly disagree, and 5 – strongly agree.

Imagine that you have a friend (A) who wishes to pursue his studies abroad. A charitable organization, X, has offered an overseas scholarship. It has 5 places every year, and more than 50 candidates want it. Therefore, the selection will be based on the number of hours contributed to volunteering activities. The five highest candidates will receive this scholarship. Now you are the president of the volunteers association of your university. Your friend gives you 150,000 rubles and hopes you aid him in receiving the scholarship. Although he did not participate in the volunteer activities of your association, he wants you, as president of the volunteers association, to provide him a false certification indicating that he has participated in volunteer activities for many hours. If you help your friend and give him the false certification, the probability that he will receive the scholarship will be greatly improved.

Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1. The behavior of taking a bribe and helping a friend with false certification is wrong	1	2	3	4	5
2. This type of corrupt behavior is very common in society	1	2	3	4	5
3. This corrupt behavior harms the public	1	2	3	4	5

Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
4. This corrupt behavior harms the interests of other candidates	1	2	3	4	5

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Author Contribution

Aleksandr Aleksandrovich Maksimenko contributed to the experimental design of the study, translated the text of diagnostic tools measuring social dominance orientation, corruption awareness, and moral outrage over corruption, carried out the survey, prepared the text of the manuscript, and carried on correspondence with the RPJ editorial board.

Dina Vladimirovna Krylova developed the research concept, interpreted the results, and prepared the text of the manuscript.

Ol'ga Sergeevna Deyneka developed the research concept, interpreted the results, and prepared the text of the manuscript.

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Conflict of Interest Information

The authors have no conflicts of interest to declare.