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Systematic review

Perspectives in Studying Self-Consciousness in Special Education

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Abstract

Introduction. Studying self-consciousness in individuals with disabilities is associated with certain diagnostic, interpretation, and organization difficulties. Elaboration of a unified methodological basis to investigate personality traits in individuals with developmental abnormalities represents a scientific challenge.

Theoretical Basis. When studying mental states and cognitive or other impairments, methodology for exploring individual inner world and self-representations should rely upon explanatory, phenomenological, and interactive research viewpoints.

Results and Discussion. This paper introduces the 'embodied self' concept, that partially unifies three basic methodological approaches and contains some elements of self-models and a narrative component integrating biopsychic, emotional, and cognitive-behavioral factors. This offers the components important to researchers in the field of self-consciousness in special education, including biogenetic component, self-model, implicit 'sense of self', cognitive component of the 'explicit self-concept', behavioral component of self-representations, and narrative component of self-representations. A system approach to the study of self-consciousness in individuals with disabilities is related to intrinsic mechanisms of the development of self-consciousness, specific characteristics of individuals' activities towards themselves and their behavior, self-orientation as the behavioral result of self-consciousness. Special educationalists may be interested in such mechanisms of self-consciousness in individuals with developmental abnormalities as self-acceptance/self-rejection, identification/de-identification, reflection/de-reflection, and consolidation/delimitation.

Conclusion. The approaches to studying self-consciousness in individuals with disabilities require the techniques relevant to aims of special educationalists' work with individuals of various ages with various dysontogenetic abnormalities. The development of new methods and techniques of psychological interventions influencing adaptation-related components of self-consciousness may help create the differentiated environment for person-oriented interaction in the context of psychological support of individuals of different ages with developmental disorders.

Keywords

self-representation, embodied self, reflection, de-reflection, consolidation, delimitation, identification, de-identification, self-acceptance, self-rejection

Highlights

- Narrative representations alone are insufficient to explore self-consciousness of individuals with impaired development due to substantial specificity of verbal self-expression in many studied individuals.
 - A systematic approach to studying self-consciousness in individuals with disabilities is associated with research problem-solving in the context of the development of their personality adaption and integration potential.
 - Theoretical background for diagnostics should include narrative and behavioral components presented as a complex of biopsychic, emotional, and cognitive-behavioral factors.
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Introduction

Self-consciousness is one of the most socially significant categories characterizing a person and a subject in the context of the investigation of self-representations of a person and his/her social behavior evolvement. A mature self-consciousness and capability of an individual to self-exploration shape his/her ability to be in a dialogue with himself/herself and others, to exist in a system of double openness, toward her/himself and the world. Development of the skill to refer to her/himself, to obtain the information about her/himself not from external sources only, but from her/himself allows a subject to put into irreversible relations with the life, to admit its charges and contextual expectations which form the mode of being (Stolin, 1983; Pantileev, 1993; Chesnokova, 1977; Längle, 1990, 1992/1999; Newen, 2015).

The relevance of studying behavioral and regulative components of personality in subjects with disabilities is indisputable, particularly with light development disorders, when they could be adequately adapted in a social environment, provided a comprehensively psychological-pedagogic follow-up. It is of interest as well to research socialization and integration mechanisms of social behavior in children, teenagers, and adults with various developmental disorders (Troshin, 1915; Vygotskii, 1983; Lubovskii, 2017, 2018; Lebedinskaya & Lebedinskii, 2018; Levchenko, Prikhod'ko, & Guseinova, 2017).

Psychological investigation of self-consciousness in persons with developmental disorders presents several diagnostic and interpretation difficulties arising from the particularities of their introspection experience, contents of self-reports, and verbal representations of individuals with disabilities, if with a light degree of impairments.

Investigating a person's self-consciousness merely as a narrative can bring us into an epistemological trap (Parnas, Sass, & Zahavi, 2013), because substantially limited abilities of such a diagnostics subject own to the specificity of his/her verbal means of self-expression and the lack of adequate psychodiagnostic tools that could help to overcome analyzing, intellectual,

and psychological limitations of the subject and to obtain access to deep mechanisms of the involvement of his/her Self, can create in researcher an illusion of lack of the self-consciousness or of which is understood by that term in the theory of narrative Self (Dennet, 1992; Schechtman, 2007; Newen, 2018a, 2018b; Galbusera & Fellin, 2014; Parnas & Gallagher, 2014; Parnas & Bovet, 1995).

In our opinion, the character of diagnostic problems and further directions of their overcoming can depend on the researcher's methodological attitude.

Theoretical Basis

An approach to studying a human being's self-representations in the context of the diagnostic and prognostic investigation of specificity of his/her mental state and cognitive or other impairments can be based on three researcher positions: from the 1st, the 2nd, or the 3rd person (Galbusera & Fellin, 2014).

An explanatory paradigm of the 'third person' in the context of the cognitive theory for social perception comprises theoretical assumptions as follows:

- a) researcher has no direct access to mental states of other people;
- b) there is a so called 'mental gap' between a researcher and a subject of the study;
- c) to pass judgment on the mental state of another person, a diagnostician has to make supplemental cognitive efforts, because according to the concept of the inner world, we do not acquire knowledge about another person in direct experience, but that knowledge represents rather a set of subjective mental assumptions made based on symptomatic analysis of behavioral expressions demonstrated by the person;
- d) assumptions about the state of the others draw on observation results;
- e) researcher's attitude suggests that diagnosticians using a kind of detached observation seek to match the mental state of the diagnostic subject against several categorical descriptions in the context of well-established theories and categories;
- f) the experience of a person subject to diagnosis is perceived immediately and evaluated from the expert point of view of the researcher, who, based on generalized theoretical assumptions, tries to determine the mental state of a person subject to diagnosis as an objective and contextual one (Gallagher, 2001, 2008a; Galbusera & Fellin, 2014).

A simulation approach 'in the first person' necessitates the basis of phenomenological point of view for a diagnostician seeking to recognize a subject's mental state. In its classical interpretation the phenomenology does not consider a person in a digitally and quantified way, but identified her/him as a changing flow of interplaying phenomena, as something integer, a 'thing in itself'. Diagnostics is focused on the consciousness, which could be understood through a profound exploring of the embedded first-person experience of a subject (Parnas & Gallagher, 2014). Such concepts as follows gain importance: Self, self-experience, self-awareness, subjective reality, personal agency. A first-person perspective appeals the investigator to meet itself, to open her/himself to her/him own experience of another person, to get embedded and to model the mental state of another person in order to understand her/him from within, and not to try to explain her/him when observing, using well-established psychological theories (Gallagher, 2001, 2008a, 2012; Gallagher & Daly, 2018). Proponents of that approach see the main evidence for mental health in well-developed reflection and empathy because they

suggest that one of the best ways to access to another person's experience is its presentation through imagined identification (Wiggins & Schwartz, 2013).

Thus, in attempt to imagine intuitively the psychic state of a subject, investigator can grasp what it is like, 'to be like her/him' or to be 'her/him' (Stanghellini, 2007, 2010). This theory does not help to resolve the problem of the 'mental gap' between a cognizing subject and a cognized subject. It is focused on the total generalizing of a diagnostician own experience with the shift of gravity center toward grasping the experience of diagnosed subject's in contrast to 'mentalizing' and interpretations from 'the third person' perspective (Reddy & Morris, 2004). The 'in first person position' does not pay due attention to contextualized content and interactions as necessary structural and content components of social understanding (Gallagher, 2008b, 2013, 2018).

Interactive theory from the second person perspective approach offers an alternative to the 'first-person' or 'third-person' perspectives explanation of social cognition, underpinned by theoretical assumptions related to a conception of no mind-body gap in a subject; it admit no mental gap between I and Other, as well. Proponents of the theory of interaction recognize the significant role of the body in the interaction process, and at that give up on the Cartesian dualism with its body-mind dichotomy. In their view, the ability to understand another person is based on a pre-reflective intentional connection where personal emotions and intentions present in every expressive behavior, meaningful to diagnosticians since the very beginning of the interaction (Thompson, 2007; Gallagher, 2012). In this event, self is embodied and intrinsically integrated into the body, and according to proponents of the theory, while interacting with another person, we can see and recognize his/her states without having to theorize to that regard. Pre-reflective involvement in social cognition is possible already in very young children, when a child learns to understand another person not through reflection but interacting with her/him at a pre-reflective level (Fivaz-Depeursinge & Philipp, 2014; Fivaz-Depeursinge & Corboz-Warnery, 1999; Reddy, 2008).

According to the interactive approach, the self-consciousness is a result of the integration of the embodied basic affective flow, arising in association with an intentional object/subject, where self is at the same time an actor and a center of attraction for thought. Processing requests from the environment and seeking for an adequate behavioral response to them a subject faces with many diversified multi-contextual situations where a behavioral realization need to involve meaningful aspects of Self as an actor, as well as a set of affective dispositions constituting an integral part of the Self (Newen, 2015, 2018a, 2018b).

Results and Discussion

In our opinion, no one of above-described approaches is comprehensive enough to help researchers to cope with a great number of diversified tasks facing them in the field of personality psychology of people with special needs: describing and characterizing structural components and contents of self-consciousness as a regulator of social cognition which influences social adaptive strategies; integrating persons with abnormal development into society; generalizing and categorizing quality peculiarities revealed in persons' self-awareness; outlining directions and methods for assistance psychological and psychological follow-up of personality development in subjects with disabilities; elaborating of long-term programs of psychological support

for persons with developmental abnormalities of all ages, and implementing of special methods adapted for diagnostics and psychological correction.

From this perspective, a system synergetic approach accounting for all advantages and limitations of existing theoretical and methodological points-of-view could serve as a methodological starting point.

Personality psychology of people with special needs at the current stage with its 'third person' approach suffers a lack of conceptual generalizing typologies, or conceptions considering specific characteristics in common patterns of personality development abnormalities in various disorders. At that, a body of data is collected about specific patterns of abnormal personality development in subjects with disabilities due to nosological entities of various groups. These data are to be systematized and need a paradigm basis for their study, which has yet to be established. Any categorization principle, any conceptual basis simplify the task facing a diagnostician: to group out phenomena of interest, based on existing classification criteria. At that, detailed and diversified empirical data of quality peculiarities of phenomena in the studied content of self-consciousness in persons with impaired development represents a unique ground for methodological synthesis and functional models building helping to realize a research vector 'from practice to theory'.

A 'first-person perspective' approach with its focus on phenomenology gives more space for diagnosis work, helps develop special research methods considering the specificity in self-consciousness in persons with the impaired development and allows researchers to reveal specificity in abnormalities of self-consciousness formation in persons of different ages in the context of different nosological groups.

Special methods can be elaborated based on such an approach, on conceptions of verbal and behavioral expression specificity (e.g., verbal materials for the methods comprise the specific verbal material obtained using content-analysis from the subjects of diagnostics, set of situations typical for their everyday life and so on) (Kuzmina, 2016). But it should be mentioned that a diagnostician is limited in his/her attempts to get impressions, empathically or with reflection, about a disabled person, to comprehend at maximum the representing experience of a diagnosis subject, and these limitations stem out of a philosophical principle of 'analogy', which reads that phenomenological perception helps a researcher to reach a position where other people could experience the same psychic states that we do, by analogy with our own experience (Stanghellini, 2007). In this connection reflective intentions of a nominally healthy person toward a developmentally disabled person are limited by predetermined conditions of the conceptual difference between 'Self-models' (Metzinger, 2009, 2011, 2014) in a diagnostician and a subject of diagnostics, associated with differences in psychic processes in normal and impaired development.

Reference to the phenomenological diagnostics with its detailed descriptions and quality analyses helps to outline directions of psychological assistance but does not disclose mechanisms of the process realization of that assistance. Such an approach could help to figure out 'what' one could make using specific characteristics revealed as a result of diagnostics, but does not help to grasp 'how' to implement these plans because, in order to do that, a diagnostician must get out of the phenomenological openness and get feedback from the diagnosed subject right in the course of the interaction process.

Dynamic changes in self-awareness, manifested in behavioral changes, in particular, in new acts, actions, and reactions of a person that do not correspond to his/her usual behavior, can be revealed using an interactive approach precisely, as implemented in social interactions with their dynamic relationships, where mostly phenomenological information collected during the diagnosis will be refined and specified.

A conceptual unit, based mostly on phenomenological and interactive approach but partly unifying all three above-mentioned methodological attitudes could be a concept of 'embodied Self', whereby the ability to self-cognition is defined as the ability of an individual to represent his/her states as belonging to himself/herself, particularly (but not exclusively) psychological states where such a self-representation is associated with conscious experiences (Newen & Voegeley, 2003).

Self-consciousness in the context of 'embodied self' includes 1) explicit self-awareness; 2) implicit self-awareness; 3) direct self-representation, not supported by any conscious experience. The specific weight of explicit (consciously available) and implicit (partly of not consciously available) elements in the structure and content of Self, as well as significance of a direct self-representation combined with some conscious experience are not yet well defined. But according to naturalistic theory, the theoretical concept of 'embodied Self' being the basis both of explicit and implicit self-consciousness could allow a subject to predetermine himself/herself, to exercise anticipation, prognostics, and behavior based on the past experiences (Newen, 2018a).

Considering that there are various aspects of selfhood: selfhood as a biological being; a specific self-relation, namely, the ability to form self-representations using a 'self-aimed' way (i.e. with direct, subjective means); and 'self-model' as the ability to admit the unity of different sources of information about oneself, brought together by a biological system, it is worth to suggest a concept of 'embodied Self' (Newen, 2018a), as a supplement to the 'Self-model' and brain structures (Metzinger, 2014), to properly explain phenomena of self-consciousness as well as a number of associated events. A realistic concept of a human being as an 'embodied self' is crucial to his/her ability to act here and now, or properly plan his/her behavior.

In our opinion, research of self-consciousness in the context of special education must follow such directions:

- studying self-awareness, first of all, in a dialogical relatedness of the outer world and the inner world of a subject, as its significance for the social behavior control following integrating and adaptive goals of his/her socialization;
- using phenomenological, interpretative, interaction methodological attitudes and models as available not only to a diagnostician but to the diagnosis subject, too (e.g., phenomenological approach using verbal representation 'from the first person', presuming mostly narrative translations of introspective experience, cannot be a ground for psychological investigation of persons with severe language impairments, cognitive deficits, Autistic Spectrum Disorders, and aural disorders because of their markedly disturbed verbal representations);
- to undertake longitudinal studies of the self-consciousness development in persons of various ages (adults including) within different nosologic groups in order to investigate specific development of self-representation forming paths at the background of the existing disorder;
- to reveal peculiar characteristics of self-consciousness in persons with health disability while defining safe and impaired contextual zones of self-concept formation as

a self-perceiving subject (Self-model), self-producing subject (sense of Self, Self-concept), self-actor (Self-representation).

Based on the conception of 'embodied Self' which includes all elements of Self-models and narrative constituents, presented in the unity of biopsychic, emotional and cognitive-behavioral factors (Newen, 2018a), we consider it helpful to identify the following constituents of 'embodied Self', important for special education:

1. A *biogenetic component* pre-determined by the nosology of one or more primary development disorders, i.e. by a medical diagnosis.

2. *Self-model*, related to the subject ability to reflect reality properly, to process from outside incoming information including that related to oneself.

3. An *implicit 'sense of self'*, associated with the ability of a subject to experience emotionally and not verbally oneself or another as an actor. Self-model and implicit sense of self provides a pre-reflexive level of social understanding that is formed earlier in ontogenesis than reflective understanding related to the meanings and verbal representation level. Pre-reflective understanding, e.g., in intellectually deteriorated persons, presents as a more safe element of self-consciousness than reflection. In attempts to form reflective skills in persons with intellectual underdevelopment using pedagogic ways, one can block out the pre-reflective understanding being the main basis of interaction, but fail, due to intellectual deteriorations of a subject, to build a full-scaled reflection. As a result, suggestibility can be formed as an element of peculiar characteristics of self-consciousness based on the underdeveloped ability to grasp the semantic context of address and reflective-suggestive components of external influences (Kuzmina, 2016).

4. A *cognitive component of the explicit 'Self-model'*, associated to the ability to form a conscious image of Self, a Self-presentation, Self-conception, both in the context of a present situation, and referentially linked with prognostic constituents of consciousness (formation of a future, present and past images of Self).

5. A *behavioral component of self-representations*, associated with the ability to act and behave based on personal analysis of a situation (situation evaluation, decision-making, development of a plan to implement the decision, and implementing actions not only in the context of psycho-physiological foundations but taking into account moral rationales as well).

6. A *narrative component of self-representations*, associated with the ability to express in a clear to others way the existing conception of one's own self, one's own behavior, and moral and ethical evaluation of actuality, i.e. the ability to maintain a verbal dialogue.

From the practice point of view, in order to form a social-personal adaptive potential in individuals with developmental abnormalities in the context of the psychological follow-up, one must focus, in our opinion, on studying self-consciousness developments mechanisms, that are implemented in subject's activity directed toward her/himself and can lead to the building of his/her self-orientations as a behavioral result of the self-consciousness functioning.

Special psychologists are interested in mechanisms of the disabled persons' self-consciousness development as follows:

1. **Self-acceptance/self-rejection** (those mechanisms are intrinsically associated with a critical attitude of a subject toward his/her actual state or some other his/her peculiar characteristics, within the range from a total self-acceptance, noncritical attitude toward himself/herself and improperly inflated self-esteem up to overcritical attitude to himself/herself, exaggerated

self-exactingness, self-rejection. Those mechanisms manifest themselves the most brightly, for example, in late-onset deficiency disorders).

2. **Identification/de-identification** (those mechanisms, on the one hand, are associated with a subject ability to admit a social role and corresponding behavior, to identify her/himself with certain social groups, including other people with the same kinds of disability; on the other hand, to de-identify her/himself with such social stigmata with negative connotations as 'patient', 'handicapped', 'moron' and so on. Those mechanisms manifest themselves the most brightly, for example, in problems of adaptation).

3. **Reflection/de-reflection** (those mechanisms, on the one hand, are associated with his/her ability to address to her/himself, to his/her experiences, to reinterpret them, and on the other hand, with the ability to reorient the attention focus from her/himself into meanings, values, perspective, and contexts. Those mechanisms manifest themselves the most brightly, for example, in professional self-definition, perspective planning of the line of life, in overcoming his/her fixation of fears for future independence, potential social failure, or fears about the health deterioration).

4. **Consolidation/delimitation** (those mechanisms are associated, on the one hand, to the specificity of relationships of a subject with significant others where his/her boundaries are markedly violated or not built, where s/he loses his/her intentions toward the communication with interesting people, especially when marked disontogenic manifestations and limited analyzer's functions are presented; on the other hand, those mechanisms are associated with the ability of a subject to separate from the family, to avoid parasitic dependency, to build his/her own space of relationships in order to implement his/her own intentions toward communication and to build a responsible (sometimes over-responsible) independent position ('My own self'). Those mechanisms manifest themselves the most brightly, for example, where family education disorders exist, such as a supporting and condoning overprotection, or development in a child of an exaggerated moral responsibility).

From the perspective of the socially adaptive strategies realization, the most worthy of note is the behavior of a subject with impaired self-cognition related to the ability to analyze his/her own behavior: 1) to percept (situation and his/her own state), 2) to feel (identify his/her own emotional experience), 3) to understand (discriminate individual reasons for an act), 4) to interpret (his/her own behavior and behavior of others toward her/him).

From diagnostics perspective the following points are of interest:

1) self-observation as the ability to see oneself as an actor of behavior performance, in interactions with others and with oneself;

2) self-perception as the possibility to gain impressions, self-image, to structure one's own image;

3) self-esteem as the ability to compare one's own individual characteristics with an etalon in consciousness relating its value, positive or negative personal and social significance;

4) self-assertiveness as the ability to reach (and the need to reach) a certain social, psychological and physical state;

5) self-control as the ability to control one's own behavioral manifestations in conformity to situation and goals and objectives pursued by a subject;

6) self-adjustment as the ability of a subject to act upon his/herpsychic using his/her own

effort in order to change its significant characteristics (e.g., emotional state and pathocharacterological manifestations).

Self-orientations in that context can be considered as a result of implementing mechanisms of self-consciousness development in the context of the personal activity of a subject with limited health abilities and as a basis of intentions in such a subject toward the world. They can be presented with various types, as follows:

- 1) worldview-related self-orientations (image of self and the world, moral standards, conceptions, beliefs, values, and meanings);
- 2) behavior-related self-orientations (identification of situations, decision-making, strategy developments to implementing a decision, behavioral acts);
- 3) reflective self-orientation (adjustment of worldview-related and behavior-related self-orientations as part of the process of self-cognition, self-addressing, and conceptualization of acquired experience).

Conclusion

Thus, investigating self-consciousness in the field of special education comprises a range of promising directions linked, first of all, with the applied relevance for personal education, i.e., disclosing of personality adaptive potential in people with health disabilities and its realization in social interactions and social behavior.

Future scientific research should be directed to the development of a paradigm basis and a methodological approach to the investigation of self-structures, and the description of necessary and sufficient conditions for the development of personal activity in a subject with regard to her/himself and his/her behavior. To chose a research vector relevant to scientific goals in the context of special education of personality, we need an integrated approach based on the synthesis of fundamental conceptions of social understanding (phenomenological, interactive, and theoretical ones).

In the present theoretical research, we tried not only to form, validate, and underpin methodologically as a promising research direction a systemic approach to self-consciousness research in disabled persons but to assess as well the potential of its practical implementation, which could help to increase our understanding about the pathogenesis of personality abnormal development and to forecast personality specificities in persons with disabilities.

The aforesaid systemic approach can serve as a mounting base to elaborate practice diagnostic methods and directions for psychocorrection in patients of various nosological groups, being treated using to special education, which demonstrated the need for new methods and ways to investigate self-consciousness and its adaptation-related constituents in individuals with various disontogenetic characteristics (e.g., verbal or non-verbal situation-based diagnostic tests) (Kuzmina, 2016). The present approach can be used to elaborate differentiated persons-centered interfaces in the context of psychological follow-up of disabled persons of different ages.

Data collected while elaborating and testing methods and ways of self-consciousness in the context of integrating approach, representing descriptions of hallmarks of self-conceptions in disabled persons could be included in a list of criteria for differential diagnosis in the special needs psychology field.

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Behavioral Genetic Studies of Structural Brain Characteristics

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Abstract

Introduction. This paper provides an overview of current research in individual differences in structural brain characteristics. The impact of individual differences in structural brain characteristics on individual differences in psychological characteristics is considered within the concept of endophenotypes, which represent an intermediate link between the gene and the complex phenotypic characteristic.

Theoretical Basis. This paper analyzes the impact of genetic and environmental factors on individual differences in structural brain characteristics measured by magnetic resonance imaging and diffusion tensor imaging. The review presents the results of twin studies, genome-wide association studies, and candidate genes studies.

Results and Discussion. In general, genetically informative studies of structural brain characteristics indicate that a small number of structures (i.e., corticospinal pathways or the volume of the lateral ventricles) have moderate heritability estimates varying from 20 to 50 %. In contrast, the heritability estimates are over 50 % for the majority of structural characteristics. The contribution of genetic factors to individual differences in structural brain characteristics changes during ontogenesis. A general genetic contribution to individual differences in structural brain characteristics and behavioral phenotypes is examined using multivariate analysis methods. The review (a) presents the results of new types of molecular genetic studies, primarily using the genome-wide association analysis, which examines hundreds of thousands of DNA markers simultaneously, (b) discusses studies of such genetic factors as copy number variations as well as whole-genome studies, and (c) shows that the current transition process to the format of multicenter consortia and the associated growth of the studied samples provides new opportunities for studying the contribution of genetic factors to individual differences in structural brain characteristics.

Keywords

behavioral genetics, twin method, GWAS analysis, candidate genes, heritability, tomographic methods, brain volume, endophenotype, intelligence, schizophrenia

Highlights

- Genetic factors make an important contribution to all the structural brain characteristics.
- At the genetic level structural brain characteristics are associated with a number of behavioral characteristics (intelligence, schizophrenia, bipolar disorder, etc.).

► The transition from twin studies to the large-scale studies based on international collaborations helps identify new genetic mechanisms that underlie individual differences in structural brain characteristics.

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Introduction

Genetically informative research represents one of the most important sources of information about the nature of individual differences. Despite the fundamental importance, the high cost and laboriousness were limitations for studies of this type for a long time. The development of data analysis methods and new technologies for studying brain activity, as well as the formation of large-scale research collaborations that unite large groups of researchers from different laboratories and countries, lead to an increasing interest in such studies.

In 1972, I. Gottesman (Gottesman & Shields, 1972) proposed the concept of endophenotypes. In classical genetics, a phenotype is any observable or measurable variable characteristic (i.e., height, weight, eye color, personality traits, learning abilities). The endophenotype refers to such characteristics, which individual differences are formed under the influence of genetic factors and are associated with psychological characteristics in the normal state or in mental disorders. Endophenotypes are considered as an intermediate link between genes and human behaviors. In other words, this is a link in the 'gene – endophenotype – psychological characteristic' chain. A wide range of different characteristics – from brain morphology to electrophysiological phenomena – can be endophenotypes for either behavioral characteristic (Malykh, Egorova, & Meshkova, 2008).

A variety of characteristics which are recorded using various neuroimaging methods, such as magnetic resonance imaging (MRI), diffusion tensor imaging (DTI), etc. are used as endophenotypes of psychological characteristics in genetically informative studies (i.e., those studies that take into account the impact of genetic factors on the studied characteristics) of structural brain characteristics. The most popular method for studying the etiology of individual characteristics of the human brain morphology is the MRI method, which helps obtain three-dimensional images of internal structures based on differences in nuclear-resonance properties in different tissues of the body. Diffusion tensor imaging (Glahn et al., 2012; Brun et al., 2009; Kochunov et al., 2010) is another method for analyzing brain morphology. This method helps fix the bundles of nerve fibers connecting various brain regions as well as associations between the axons of the white matter. The diffusion tensor imaging (DTI) method was proposed to evaluate the anisotropy (direction) in the diffusion of water molecules in the brain tissue (Chiang et al., 2009).

Despite the fact that the role of structural brain characteristics as endophenotypes of psychological characteristics has been questioned in recent years (Iacono, Malone, & Vrieze, 2017), a combined analysis of structural MRI of 21199 individuals showed that structural characteristics

of the brain are important predictors of a number of mental illnesses, first of all schizophrenia, bipolar disorder, and attention-deficit/hyperactivity disorder (Thompson et al., 2020). Moreover, a number of studies have shown that structural characteristics of the brain are associated with individual differences in psychological phenotypes such as intelligence (Hilger, Ekman, Fiebach, & Basten, 2017), emotional sphere (Marstaller, Burianová, & Reutens, 2016; Adrián-Ventura, Costumero, Parcet, & Ávila, 2019) and even demographic characteristics (Llera, Wolfers, Mulders, & Beckmann, 2019).

This review analyzes genetically informative studies of individual characteristics of the structural brain characteristics associated with various psychological phenotypes.

Theoretical Basis

Tomographic studies of structural brain characteristics using the twin method

To assess the relative contribution of genetic and environmental factors to the individual differences of neurophysiological characteristics, specialists in behavioral genetics use methods to study family members with varying degrees of genetic similarity (Malykh, Kovas, & Gaisina, 2016). One of the most informative methods is to compare data obtained using neuroimaging methods when examining monozygotic (MZ) and dizygotic (DZ) twins. The method is based on the difference in genetic similarity between MZ twins growing from a single fertilized egg (100 % of similarity) and DZ twins developing from two different eggs fertilized at the same time. Comparison of MZ and DZ within-pair correlations helps evaluate the role of hereditary and environmental factors in the individual differences of a studied characteristic. If genetic factors contribute to individual differences in a particular characteristic, then correlation between MZ twins should be higher than those between DZ twins. The term 'heritability' is often used to describe the contribution of genetic factors to the variability in a characteristic. The twin method is also used to assess the etiology of associations between various characteristics on the basis of multidimensional models that help assess the contribution of genetic and environmental factors to the covariance of several phenotypic variables (Malykh et al., 2008).

A significant contribution of genetic factors to individual differences in the structural brain characteristics was already shown in one of the first studies on the lateral ventricular volume in healthy MZ and DZ twins (Basser, Mattiello, & Lebihan, 1994). Subsequent studies documented high rates of heritability for such general brain characteristics as intracranial volume ($h^2 > 81\%$) and total brain volume (66–97 %) (Baaré et al., 2001; Bartley, Jones, & Weinberger, 1997; Wright, Sham, Murray, Weinberger, & Bullmore, 2002; Carmelli et al., 1998; Pfefferbaum, Sullivan, Swan, & Carmelli, 2000). An important role of genetic factors (over 82 %) was also shown in the first family study of individual differences in the total volume of cerebral white and gray matter, which comprised both twins and siblings (Reveley, Reveley, Chitkara, & Clifford, 1984). Other studies have shown that 65 % of the volume of each hemisphere is determined by genetic factors (Geschwind, Miller, DeCarli, & Carmelli, 2002; Malykh et al., 2016); the heritability of the cerebellum volume was 88 % (Posthuma et al., 2000), the corpus callosum – 79–94 % (Pfefferbaum et al., 2000; Scamvougeras, Kigar, Jones, Weinberger, & Witelson, 2003).

A high level of heritability (up to 83 %) is also shown for gray matter density in Broca's and Wernicke's areas, frontal cortex, Heschl's gyrus, left occipital and left parietal lumbar regions, middle temporal cortex and tonsil (Cannon et al., 2006; Hulshoff Pol et al., 2006; Thompson et al., 2001). A number of works accentuate the importance of genetic factors in the individual

characteristics of the thickness of the cortex, especially in the frontal and parietal areas (Joshi et al., 2011; Lenroot et al., 2009; Rimol et al., 2010; Yoon, Fahim, Perusse, & Evans, 2010). The highest genetic contributions (up to 93 %) are observed for individual differences in the white matter density of the corticospinal tract, corpus callosum, superior longitudinal and occipitofrontal fascicles (Thompson et al., 2001; Peper, Zwiers, Boomsma, Kahn, & Hulshoff Pol, 2009).

Some studies involving elderly people (69–80 years) (Carmelli, Swan, DeCarli, & Reed, 2002) and children (Wallace et al., 2006) showed a significant influence of genetic factors on the dispersion of structural brain characteristics. Considering that twins share a smaller number of common environmental factors (i.e., live separately), the data obtained from these studies may be interpreted in the context of stable genetic control of the volume of the studied brain structures.

In addition to MRI studies, an important contribution of genetic factors was also shown in studies using diffusion tensor imaging (DTI). Thus, a DTI study involving twins and other siblings provided data on a significant role of heritability in the asymmetry of the inferior fronto-occipital fascicle (33 %), anterior thalamic region (37 %), and the uncinate fascicle (20 %). The contribution of common environmental factors was also shown: 10 % for occipital forceps and 15 % for the corticospinal tract (Jahanshad et al., 2010). Other twin studies employing DTI also showed significant heritability estimates for the corpus callosum (Brun et al., 2009; Pfefferbaum et al., 2000), the occipital lobes (Brun et al., 2009), as well as for the lateral orbitofrontal gyrus, the cerebellum, a number of subcortical structures, the brainstem and the uncinate gyrus, the right temporal white matter, and the superior frontal gyrus (Yoon, Perusse, Lee, & Evans, 2011).

A 2012 meta-analysis of 62 genetically informative studies of the morphology of brain structures showed that, in general, genetic factors contribute significantly to individual differences in general parameters, including intracranial volume, total brain volume, cerebral cortex volume, total and local volumes of gray and white matter, etc. (Blokland, de Zubicaray, McMahon, & Wright, 2012). Moreover, according to the meta-analysis results, there is a significant variability in the heritability estimates of the subcortical structures, the ventricles of the brain, characteristics of the corpus callosum, the cerebellum volume, etc.

In general, the genetic analysis of structural brain characteristics shows that moderate heritability (20 to 50 %) is characteristic of a small number of structures (i.e., corticospinal pathways or the lateral ventricular volume), while the heritability estimates are over 50 % for the majority of structural characteristics (Strike et al., 2015). The construction of multidimensional twin models also makes it possible to assess the severity of genetic correlations showing the contribution of genetic factors to the covariance of characteristics at the phenotypic level. Thus, pronounced genetic correlations between the characteristics of gray and white matter of different areas of the cerebral cortex were observed for the following brain structures: correlations from 30 to 60 % – for connections of the occipital regions with other areas of the cortex, from 80 to 95 % – for the volume of gray and white matter in the frontal, parietal, and temporal areas (Schmitt et al., 2008). A common genetic factor was determined for the subcortical structures, which explained up to 60 % of phenotypic covariance (Schmitt et al., 2010). The presence of high genetic correlations between the characteristics of various brain structures may indicate that the same genetic factors may be associated with the variability of a wide range of characteristics in the brain.

Age-related changes in the heritability of structural brain characteristics

Age-related brain changes occur throughout life. Thus, MRI studies in a wide age range (from 4 to 20 years) showed an increase in the volume of cerebral gray and white matter in the period from 4 years to early adolescence. In early adolescence, the volume of gray matter starts to decrease (except for gray matter in the temporal region, which increases until late adolescence), while the volume of white matter continues to increase (Paus et al., 1999; Durston et al., 2001). By the age of six, the total brain volume of a child reaches 95 % of the adult brain volume (Paus et al., 1999). Thus, despite the fact that by the age of 6 years, the total brain size almost reaches its constant volume, the ratio of gray and white matter varies from adolescence to adulthood (Paus, 2005; Toga & Thompson, 2005; Raz et al., 2004). In adulthood, a decrease in the total brain volume is associated with a decrease in the volume of gray matter (Bartzokis et al., 2001). At the same time, the volume of white matter continues to increase up to 45 years.

Interestingly, in a portion of the sample of healthy subjects, total brain volume increases up to the age of 40 (van Haren et al., 2008). In general, adulthood is associated with the following significant changes in the structural features of the brain: an increase in the volume of white matter, a nonlinear pattern of a decrease in the total volume of the brain, as well as the volume and density of gray matter.

Behavioral genetic studies show that genetic influences may vary at different ages. For example, heritability of intelligence increases during development (Plomin & Craig, 1997; Haworth et al., 2009). The ratio of genetic and environmental factors of the variability of brain structures may also change during ontogenesis. In the first year of life the heritability estimate of total brain volume is 69 % (Gilmore et al., 2010), increasing to 94 % by 9 years (Peper et al., 2009), and to 96 % by 96 years (van Soelen et al., 2010). Such high estimates are observed until the age of 27 years (Bartley et al., 1997) and decrease to 90 % by 30 years (Baaré et al., 2001), to 69 % by 49 years (Winkler et al., 2010), and up to 46 % by 64 years (DeStefano et al., 2009). The genetic contribution to cerebellar size variability also increases from 70 % at 8 years (Yoon et al., 2011) to 89 % at 11 years (Wallace et al., 2006) and 96 % at 12 years (van Soelen et al., 2012). After a maximum at 12 years, the role of genetic factors decreases: up to 80 % at 17 years (Bartley et al., 1997), and up to 52 % at 47 years (Batouli, Trollor, Wen, & Sachdev, 2014). A similar pattern is observed for heritability of the volume of gray and white matter, intracranial volume, some brain lobes, and ventricular volume. Figure 1 shows research results.

The DTI studies evaluating fractional anisotropy (characterizing the number and orientation of the conducting pathways (paths) of brain white matter) also demonstrated age-related differences. Thus, a large-scale genetically informative study (705 twins and their siblings, adolescents, and adults) showed that the contribution of genetic factors to the variability of white matter characteristics was more pronounced in adolescents than in adults (Chiang et al., 2011).

We should note that at the moment, the results of studies of the volume of other brain structures in different years of life are contradictory, which may be explained by measurement errors in these small-sized areas (Batouli et al., 2014).

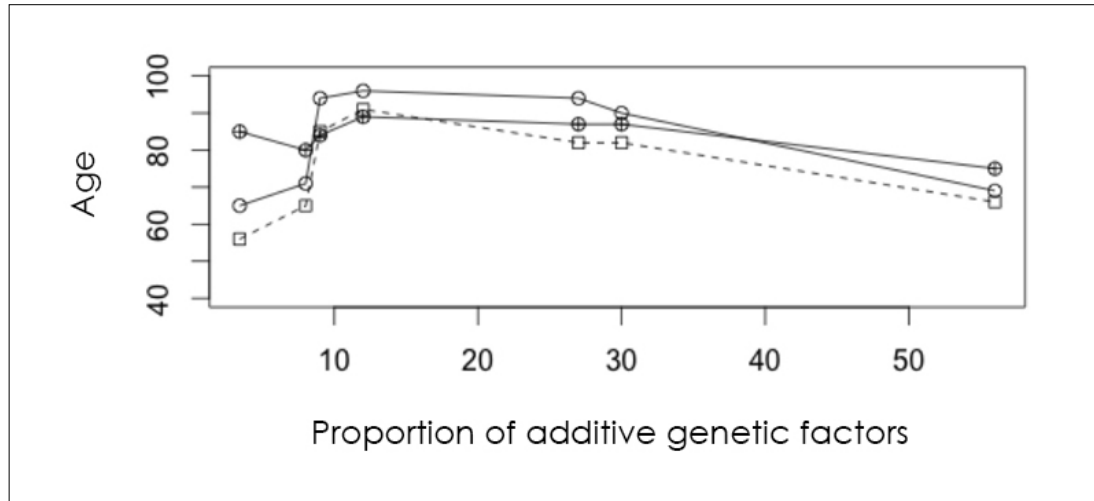


Figure 1. Change in the contribution of additive genetic factors to the variability of the total brain volume and the volume of gray and white matter (modified data of Batouli et al., 2014)

Legend: round hollow dots correspond to the total brain volume; square dots correspond to the gray matter volume; round dots with crosses correspond to the white matter volume.

Molecular genetic studies of structural brain characteristics

Despite the fact that for a large number of structural brain characteristics the contribution of genetic factors to individual differences was established in a series of twin and family studies, the specific molecular genetic mechanisms that contribute to this variability are still not fully understood (Brans et al., 2008). Currently, more and more genetically informative studies are aimed at identifying specific genes that contribute to the variability of neurophysiological characteristics. These characteristics are associated with a large number of genetic factors with small effect sizes (the so-called Quantitative Trait Loci). To date, there are methods for mapping of genome regions associated with quantitative characteristics using molecular markers (i.e., single-nucleotide polymorphisms, SNPs). This method represents the analysis of genetic associations to determine associations between one or many DNA polymorphic variants and any (i.e., neurophysiological) characteristic (Malykh et al., 2016).

One of the approaches to the analysis of genetic associations is the selection of candidate genes isolated on the basis of theoretical biological mechanisms of studied characteristics. To date, researchers identified a number of candidate genes associated with differences in brain structural characteristics. BDNF, APOE, MECP2, HFE, MTFHR, NRG1 genes are among the most often studied ones.

The brain-derived neurotrophic factor (BDNF) plays a crucial role in the development of the central nervous system, participating in the proliferation and synaptic growth of brain neurons, as well as in the modulation of synaptic signals (for example, in the case of long-term potentiation of hippocampal neurons). A valine-to-methionine substitution at codon 66 (Val66Met allele) in the BDNF gene is associated with changes in the structural and functional characteristics of the hippocampus, which, in turn, affects human working memory. Another important participant in the metabolic processes associated with the growth, degeneration, and regeneration of nerve cells is plasma apolipoprotein E (apo E). It is associated with the normal catabolism of triglyceride-rich

lipoproteins. The ApoE4 allele has been shown to be associated with genetic risks of Alzheimer's disease (Lu et al., 2011). Different variants of the MTHFR gene are associated with pathological development of the neural tube. There are MTHFR alleles that are associated with increased plasma homocysteine levels, as well as nervous tissue damage and brain atrophy (Brans et al., 2008). The HFE gene regulates the absorption of iron ions.

Jahanshad et al. (2012) showed that the integrity of nerve fibers, as measured by DTI-derived fractional anisotropy, is associated with variations in this gene. These data may indicate the important role of iron ion metabolism in the development and degeneration of nerve tissue. The MECP2 gene encodes a protein related to methylated DNA and is involved in cell differentiation processes during embryonic development. Joyner et al. (2009) showed the presence of an association between this gene and cortical surface area (not thickness). The neuregulin gene (NRG1) and the neuregulin receptor gene (ErbB4) are associated with a wide range of manifestations of pathogenesis in patients with schizophrenia and bipolar disorder. It is assumed that at the structural level, these processes are associated with changes in the integrity of the white matter in the anterior limb of the internal capsule (ALIC). Changes in the NRG1–ErbB4 signaling pathway detected in groups of subjects with different symptoms are encoded by the s4673628 (Zuliani et al., 2011), rs6994992 (McIntosh et al., 2007), and rs839523 alleles (Konrad et al., 2009).

It is probable that structural brain characteristics are associated with the combined effect of a large number of genes. Thus, there are data indicating that certain genes make the greatest contribution to the variability of the temporal cortex volume (Kohannim et al., 2012).

When studying structural brain characteristics, a large number of studied genes lead to the problem of multiple comparisons and the high probability of type I errors. Special corrections and statistical procedures are used to solve this problem (i.e., Family-Wise Error Rate – FWER, Worsley et al., 1996; and False Discovery Rate – FDR, Genovese, Lazar, & Nichols, 2002). Modeling based on real genetic data shows that the use of corrections for multiple comparisons can reduce the number of type I errors to 5 % (Meyer-Lindenberg et al., 2008). However, the need remains for replication of the obtained data in independent studies. Thus, a number of studies indicate an association of the FOXP2 gene, associated with the evolution of human speech, and the characteristics of various brain structures (foremost, the inferior frontal gyrus, caudate nucleus, and cerebellum). However, initial data were obtained in MRI studies in groups of 14 to 96 subjects. However, data replication in a sample of 1301 individuals did not indicate an association between the variability of neuroanatomical parameters and the SNP FOXP2 (Hoogman et al., 2014). There are evolutionary and experimental prerequisites to consider genes associated with primary microcephaly (ASPM, MCPH1, CDK5RAP2, and BRCA1 genes) the basis for individual differences in brain size in a normal population as well as linguistic and cognitive abilities. However, a study involving 1776 subjects from 789 twin families showed no association between these genes and the characteristics under investigation (Bates et al., 2008).

Due to certain limitations of the candidate gene method, in recent years, genome-wide association analysis (GWAS) has been used in genetically informative studies of brain structure, which examines hundreds of thousands of DNA markers simultaneously in their associations with various characteristics. GWAS studies focus on the study of single-nucleotide polymorphisms (SNPs) – a type of variability in the DNA sequence in different individuals associated with the substitution of one nucleotide by another in a specific DNA locus (for example, adenine (A) for thymine (T)) and characterized by the presence of different alleles (usually two) in the population (for example,

allele A and allele T). Given these effect sizes, large samples of subjects are required to obtain statistically significant results.

Currently, the most complete meta-analysis of associations between structural brain characteristics and specific genes was carried out by a team of researchers from the ENIGMA consortium (Thompson et al., 2020). In the initial work of the consortium, the data for 30717 subjects from 50 cohorts were analyzed. The entire sample was divided into 2 equal parts for conducting a genome-wide (GWAS) analysis of associations between certain loci and the structural characteristics of brain regions. The mathematical model of associations was tested in a subsample of 13171 subjects and verified in a second subsample of 17546 subjects. The study revealed 8 main loci associated with the volume of such structures as the caudate nucleus, the hippocampus, the putamen lenticular nucleus, as well as with the intracranial volume. Significant relationships identified in the study explained from 0.17 to 0.52 % of phenotypic variability of volumes in various brain regions. Interestingly, the analyzed loci were associated with individual structures, and not with multiple effects on various brain regions. The effect size of the KTN1 gene was maximum for differences in the putamen volume. This gene encodes a kinectin receptor protein that binds kinesin and is also involved in organelle transport processes. Expression of the DCC gene in the brain is most pronounced during the first two trimesters of prenatal development, which suggests its connection with the regulation of the volume of brain structures in the early stages of nervous system growth. It is known that the DCC gene (rs62097986; 18q21.2; $n = 28.036$; $P = 1.01 * 10^{-13}$) encodes netrin (a receptor associated with axon growth and migration, as well as with the growth of the striatum). The expression of BCL2L1 is maximum at 24–38 weeks after conception, during the period of the most active apoptosis in the putamen. BCL2L1 (rs6087771; 20q11.21; $n = 25.540$; $P = 1.28 * 10^{-12}$) encodes an antiapoptosis factor that inhibits the programmed death of immature neurons in the brain. DLG2 is maximum active in the middle of intrauterine development during the growth of the striatum. The DLG2 gene (rs683250; 11q14.1; $n = 26.258$; $P = 3.94 * 10^{-11}$) encodes the density of protein 93 in the post-synaptic region (Hibar et al., 2015). Genetic variants in this locus are associated with learning processes and cognitive flexibility (in some studies also with schizophrenia).

In later studies, the data collected by the ENIGMA consortium were combined with data from two other large-scale projects: the CHARGE consortium and the UK biobank. Thus, the researchers were able to identify more than 200 individual loci that contribute to the variability of characteristics of 70 different brain structures (Thompson et al., 2020). Moreover, despite the fact that the contribution of a single locus to the total phenotypic variability ranged from 0.1 % to 1 %, the combination of the detected loci into one model made it possible to explain up to 20 % of the total variance. In general, for genetic loci associated with brain morphology, there is an association with regulatory genes, as well as with regulatory elements specific for humans compared to other mammals. To access the data obtained by the ENIGMA team, an interactive site <https://enigma-brain.org/enigmavis/> has been created, which provides researchers with more detailed information about brain structures and the contribution of specific genetic loci.

Results and Discussion

Structural brain characteristics as endophenotypes of behavioral phenotypes

Within the concept of endophenotypes, structural brain characteristics may be considered both as intermediate characteristics associated with mental illness and in the context of the study of

normal psychological characteristics. For example, according to modern meta-analytical studies, the total brain volume and the volume of gray and white matter are associated with general intelligence (Gignac & Bates, 2017). Certain studies of associations between intelligence and the total volume of gray and white matter, indicate moderate ($r = \pm 0.30$) phenotypic correlations. The use of multidimensional models in genetically informative studies help establish common genetic contribution in such characteristics as individual differences in brain volume and test scores for verbal and nonverbal intelligence (Posthuma, 2002; Malykh et al., 2016), as well as gray matter volume covariance of the frontal lobes and intelligence (Strike et al., 2015; Carmelli et al., 2002). In addition, the identified general genetic factors are observed in the covariance of verbal and nonverbal intelligence with such brain structures as gray matter of the frontal, occipital, and parahippocampal regions, as well as the white matter fascicles of the superior occipital-frontal fasciculus and corpus callosum (Hulshoff Pol et al., 2006). At the same time, twin studies also provide information on the role of environmental factors in the individual differences of the characteristic. For example, general environmental influences were found for individual differences in the characteristics of control functions and the volume of the frontotemporal regions of the brain (Carmelli et al., 2002). Meanwhile, we should take into consideration that the effects of environmental and genetic factors may be multidirectional, thereby reducing phenotypic correlations (Strike et al., 2015).

Table 1 shows the results of the main genetically informative studies of the covariance between intelligence and structural brain characteristics.

<u>Covariance of phenotypes</u>	<u>MZ/DZ sample</u>	<u>Age</u>	r_p	r_g	r_e	<u>Article</u>
Total cortical volume and FSIQ	25/23	>12 years	–	0.48	–	Pennigton et al., 2000
Cortical gray matter volume and factor g	24/31	19–69	0.25	0.29	–	Posthuma, 2002
Cortical white matter volume and factor g			0.24	0.24	–	
White matter of corpus callosum and verbal intelligence (VIQ)	54/58	19–69	0.14	0.15	–	Hulshoff Pol et al., 2006
Parahippocampal white matter and PIQ			0.23	0.40	–	

Table 1
Genetically informative studies on associations between structural brain characteristics and cognitive abilities (IQ)

<u>Covariance of phenotypes</u>	<u>MZ/DZ sample</u>	<u>Age</u>	r_p	r_g	r_e	<u>Article</u>
Cortical gray matter volume and Raven's progressive matrices	48/64	9	0.22	0.36	−0.16	van Leeuwen et al., 2009
Cortical thickness in the LH medial frontal regions and the RH occipital regions and the FSIQ	77/84	30	0.8 0.34	0.56 1	−0.66 0.22	Brans et al., 2010
Total brain volume and the FSIQ	11/21	19–56	0.27	0.50	−0.17	Brouwer et al., 2014
Cortical white matter volume and the VIQ			0.29	1	−0.41	
Cortical thickness in the LH paracentral lobule and the FSIQ	23/28	12	−0.29	−0.32	−0.24	Brouwer et al., 2014
Cortical thickness of the cuneus and the FSIQ			−0.28	−1	0.39	

Table 1

Genetically informative studies on associations between structural brain characteristics and cognitive abilities (IQ)

<u>Covariance of phenotypes</u>	<u>MZ/DZ sample</u>	<u>Age</u>	r_p	r_g	r_e	<u>Article</u>
Putamen volume, thalamus volume, and the FSIQ	50/56	19–55	0.01 0.26	0 0.29	0.08 0.08	Bohlken et al., 2014
Gray matter thickness, cortical surface area, and general cognitive abilities	131/96	51–60	0.08 0.21	0.09 0.24	0.10 0.21	Vuoksimaa et al., 2015

Note: FSIQ (full scale intelligence) – general intelligence; VIQ (verbal intelligence) – verbal intelligence; PIQ (performance intelligence) – non-verbal intelligence; r_p – phenotypic correlations; r_g – genetic correlations; r_e – environmental correlations.

In addition to genetic and environmental factors as such, a genotype-environmental interaction may play an important role in the formation of individual differences. A number of studies indicate an interaction of socio-economic status (SES) and genetic factors that affect the integrity of fibers of the white matter measured using the diffusion tensor imaging: heritability estimates were higher among participants with a higher SES (Malykh et al., 2016). Another example of a genotype-environmental interaction is represented by the studies of differences in the heritability of the DTI indices in participants with different IQ levels. According to the results obtained by Blockland et al. (2012), over 80 % of the observed individual differences in fractional anisotropy in the posterior limb of internal capsule, corpus callosum, radiate crown, and thalamus were associated with genetic factors in a group of high-IQ participants. At the same time, the contribution of genetics did not exceed 40 % in low-IQ participants. Despite the fact that the specific mechanisms of this interaction are still unclear and require further study, the association of individual differences in SES and intelligence with the heritability of structural brain characteristics may depend on the expression of certain genes. For example, it is known that the expression of the brain-derived neurotrophic factor BDNF gene associated with neuronal growth and cognitive function may change under the influence of learning (Kesslak, So, Choi, Cotman, & Gomez-Pinilla, 1998). Genetic factors may also play an active role in the transformation of the physical and social environment, which can be manifested in the effect of genetic correlations (Hoogman et al., 2019). In particular, due to the contribution of genes that affect individual differences in the characteristics of white matter, the axonal conductivity

of neural signals in the thalamus and corticospinal tract may change, which may indirectly affect the development of intelligence. Thus, genetic effects may be mediated by other characteristics, such as gender, age, SES, and IQ, etc. (Hackman & Farah, 2009; Zavala et al., 2018).

Genetically informative studies are also actively used in investigating the etiology of psychopathological characteristics. In a number of studies exploring the brain mechanisms of schizophrenia, patients demonstrated a progressive decrease in the volume of the frontal and temporal lobes of the cerebral cortex and a decrease in the total brain volume. It turned out that in the covariance between the risks of schizophrenia and changes in the structural brain characteristics, additive genetic effects play a pronounced role (66 % for the total brain volume, 76 % for frontal lobes, and 79 % for temporal lobes) (Batouli et al., 2014; Malykh et al., 2016). The general genetic factor obtained from multidimensional modeling by structural equations also explains a significant amount of the variability of associations between schizophrenia and the concentration of gray matter in the frontal and temporal regions (Brans et al., 2008). A decrease in the volume of white matter is associated with a genetic risk of bipolar disorder (77 %), despite the fact that the specific genetic mechanisms of such an association require further analysis (Gershon, Alliey-Rodriguez, & Liu, 2011). Modern large-scale studies of associations between structural brain characteristics and psychopathology have determined neurophysiological profiles of subcortical brain structures characteristic of individuals with such diseases as schizophrenia, bipolar disorder, ADHD, and major depressive disorder (MDD). The findings from 21199 individuals showed that schizophrenia, bipolar disorder, and major depressive disorder are associated with a decrease in the volume of the hippocampal regions, ventricles of the brain, thalamus, amygdala, and the nucleus accumbens. In so doing, the severity of changes is maximum for schizophrenia, approximately half that for bipolar disorder and four times less for major depressive disorder (Mufford et al., 2019). Changes in the amygdala and the nucleus accumbens are also characteristic of ADHD; a decrease in the volume of the putamen and the caudate nucleus is also observed (more detailed data are presented on the interactive site of the ENIGMA project).

The transition to the format of multicenter consortia provides new opportunities for modern researchers. Thus, by increasing the studied samples, there were obtained data on new groups of psychopathology, such as Tourette's syndrome (Mufford et al., 2019), insomnia (Grasby et al., 2020) or anorexia (Walton et al., 2019). Moreover, the SNP studies were extended by the studies of copy number variations as risk factors for the development of psychopathology and individual differences in the characteristics of both cortical and subcortical brain structures (Thompson et al., 2020). Currently, there is a gradual transition from genome-wide studies to whole-genome ones, which take into account even rare genetic variants (Medland, Jahanshad, Neale, & Thompson, 2014).

Conclusion

An increase in the number of genetically informative studies of brain structures and functions, as well as a significant increase in the studied samples are the most important trends in research at the intersection of genetics and neuroscience in recent years. The results of twin studies convincingly indicate a significant role of genetic factors in the formation of individual differences in many structural brain characteristics (total brain volume, thickness and surface area of the cerebral cortex, volume of gray and white matter, etc.). At the same time, the development of

molecular genetic methods helps approach the analysis of associations between neurophysiological characteristics with specific polymorphic variants of various candidate genes. An integrated approach to the study helps trace the path from genes to psychological phenotypes through individual differences mediating structural and functional characteristics of the brain. The transition to new types of molecular genetic studies, including studies of such genetic factors as copy number variations, genome-wide and whole-genome studies, offers new possibilities for determining the molecular-genetic mechanisms that underlie individual differences in structural brain characteristics and psychological characteristics.

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No conflict of interest

Subjective Assessment of Places by Saint Petersburg Local Residents

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Abstract

Introduction. To find a really comfortable place is a challenge. The subjective assessment of places is determined by individual senses and collective representations. Collective representations of comfort may differ considerably from individual senses. Representations substitute for senses, which interferes the process of their identification and transmission. This study identifies individual senses, differentiates them from representations, examines the process for assessing places, and describes factors influencing it. The hypothesis is as follows: Individual temperament and the sense of self are predictors of assessment. The additional hypothesis is that the category of 'pleasantness' is the resulting synthesis of individual assessment of places. The novelty of the approach lies in a complex empirical research that is offered through application of standardized psychological tests, as well as through acquiring data with the use of a neurodevice outside the laboratory, on the streets with the help of the author's 'Assessment of Places' questionnaire that is a unifying factor.

Methods. The study presents the data about subjective assessment of places and the results of the factor and regression analyses. The predictors were (a) scores of respondents in the Self-actualization Test, SAMOAL, a modified version of Personal Orientation Inventory by E. Shostrom, (b) Self-relation Test by S. R. Pantileev, (c) Sovereignty of Psychological Space test by S. K. Nartova-Bochaver, (d) Eysenck Personality Inventory, EPI, variant B, and (e) Life Satisfaction Index by J. Strelau. The pre-examination state of participants was measured using the HAM questionnaire (state of health-activity-mood). Places were associated with colors of Luscher Color Test. The data were processed using the Color Test of Attitudes, CTA, by A. M. Etkind. Sample characteristics: 31 local residents of Saint Petersburg, mean age 26.68 years (56.7 % females; 43.3 % males) were questioned on a walking route 1.5 km long with stops at 4 different places in Vasilievsky Island.

Results. The distribution of correlations depends on the novelty of places and the level of activity, which suggests that subjective parameters influence assessment. Regression equations were built for assessments. The impact of such predictors as a sense of self and temperament on subjective assessment of places was demonstrated.

Discussion. The categories of 'inviting' and 'excluding' places are considered as complex ones. The obtained equations support the following conclusions: (a) Comfortable and cosy places are considered inviting. (b) Dirty and increasing anxiety are considered excluding. Recommendations are made to pay more frequent visits to places with low-level external activity, where individuals can more easily comprehend their own senses.

Keywords

assessment of place, sense of place, pleasantness of place, sense of space, urban space, sense of self, sovereignty of psychological space, temperament, life satisfaction index, collective representations

Highlights

- By analogy with categorization and attribution processes, a mechanism of simplified assessment of places, which generates representations of places, facilitates living in a modern mega-metropolis.
- Representations of places may be individual or collective.
- The intensity of environmental factors, subjective sense of novelty, individual temperament and the sense of self influence individual senses arising at the moment of staying in a place.
- The individual complex sense of places is best represented by the categories of 'inviting' and 'excluding'.

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Introduction

The usual stress of never-endings modernization in modern cities makes a city resident permanently alert to perceive the changes. This situation is very energy-consuming for the brain. Therefore, it produces certain mechanisms to help facilitate this task. As a result of the environment perception, the detailed image and assessment of a place are formed. A place representation responds to a question 'What kind of place is it?' and represents an image. A place assessment responds to a question 'What kind of place is it?', implying 'What does it feel like to be here?' (individual senses and representations) and 'What should it feel like to be here?' (collective representations). This study aims to explore these two processes by investigating the mechanisms of assessing places.

It is postulated that at the moment of recollection, and being apart from a place in question a person substitutes their own assessment of a place with the internalized borrowed representations, in other words, a collective representation of the place. At the very moment of the direct sensations of place, individuals can focus on their own senses, which is easier to do on site in a place with subjectively high level of perceived novelty and low level of interfering activity of objects.

'The most general way to process social information is categorization, i.e., assigning perceived objects to a class of others similar objects known from previous experience' (Andreeva, 2000, p. 99). A collective representation, as a matter of fact, is the most simplified information unit (a category or several categories), comprising a set of believing about a place. 'Its general function is just the ordering and simplification of information' (Andreeva, 2000, p. 100). Imputation of some qualities to the places in order to make them fit perfectly to collective representations is similar to the

attribution process. As a result, a mechanism emerges that decreases energy expenditures but hinders the places from being perceived directly through individual senses, which interferes with harmonious development of a personality. Therefore, this mechanism is useful but needs further examination to understand how its activity could be reduced in favor of individual cognition of the space and construction of individual world.

Problem definition

Present-day urban dweller becomes an ever so active actor (actualizer) in the course of understanding their own individuality whose goal is to be able to express their. One of the ways to undergo such a personality transformation is to perceive and to be aware of sensation triggered by public urban places – this way, a person shall know more about themselves through knowing places; although this process is yet understudied. It is difficult for residents of a modern mega-metropolis to keep being in touch with themselves and to analyze new senses due to a fast-paced environment necessitating a continuous adaptation.

Meanwhile, present-day researchers note a low level of contentment of citizens with their residence places, which negatively affects their satisfaction with life. In particular, the above-mentioned study in Ulyanovsk demonstrated that 40 percent of people were totally or partly unsatisfied with their places of residence (Shinyaeva, Akhmetshina, & Klyueva, 2017).

The comfort issues for human being in the urban environment have been noted and discussed for a long time. As early as in the past century the sense of place and its interrelation with the concept of self-regulation was introduced by Korpela (1989). This was followed by extensive research dedicated to sensation of humans in the city environment, such as works of Al-barrak, Kanjo, & Younis (2017), Al-Barrak & Kanjo (2013), Newman & Brucks (2016). Experiments using measuring equipment, namely, pulsimeters, electroencephalographs, are often performed in laboratory settings where researchers demonstrate to participants pictures of city environments, in other words, in the artificial situation missing many environmental effects: there was no sensation of the environment activity, as in the work of K. Newman. Other groups performed research in student quarters using a portative EEG which is a ring with electrodes: the experiment conditions were aimed to help respondents to experience the environment as close to reality as possible; though, the information reflecting the participants' sense of space could be obtained only in the form of data about neuronal impulse consequences, with no subjective verbal assessment. We took it into account in our study: the neurodevice assessed two parameters, namely, excitement and relaxation, in a natural setting, i.e. in the street; the WAM screening of participants and standardized tests were performed beforehand; interviewing and assessment of places were performed at the very moment of staying in each place.

There are articles of international researchers as well (Ellard, 2015; Glaeser, 2011; Hall, 2014; Keedwell, 2017; Montgomery, 2015) working on the problem of how a person could attain the comfortable state in the modern city, and the amount of literature on the topic is growing, which also confirms its importance and social request for its studying.

Recently a lot of studies were performed stimulating a person accustomed to some city space to perceive it in a 'here and now' mode. Thus, M. Mukherjee, in the 2018 year, mounted a camera in an Indian city, Calcutta which kept recording a 360-grade video non-stop throughout 10 days; the video was demonstrated to residents and later on it was used in workshops or performances to deliberately shift the attention focus while being in the urban environment (Mukherjee, 2019).

A principally different approach consists in focusing on one aspect, e.g., on the issue how the perception of surrounding landscaped areas influences the total satisfaction with life in a city. According to Hadavi, Kaplan, & Hunter (2018), it is the awareness of individual perceptions that could markedly reduce the gap between demanded and offered projects on the environment design and would increase efficiency of decision-makings.

Research by Kasemets, Rammo, & Palang (2019) in Estonia is very promising. It was performed in a former military area and a former horticultural cooperative converted into permanent residences, focused on exploring the development of a sense of place via creating communities and using social mechanisms; they revealed the difference between a social and an ecological sense of place.

In Iran, Zabetian & Kheyroddin (2019) explored the thermal comfort as a factor influencing the sense of place in city spaces; they proved the hypothesis of interrelations between these phenomena and offered strategies aimed to optimize the thermal adaptation.

The same year a group of researchers (N. M. Ardoin et al.) from Stanford studied the sense of place, what it is like, how it develops in the modern fast-urbanizing and globalizing world. As the results showed, respondents from urban areas rated their association with biophysical aspects of their places of residence lower than respondents living in non-urban areas. This fact infers the need to encourage conceptualization of places at a more large geographic scale and, in particular, to encourage representations about urban spaces to expand city limits. The authors call for more active interaction with urbane nature, especially on the part of the residents of city districts (Ardoin, Gould, Lukacs, Sponarski, & Schuh, 2019).

In Turkey, Senturk & Gulersoy (2019) examined how residents formed bonds with surrounding space, that is, the authors explored the sense of belonging to a place, which is close to the understanding of that notion in Russia. They supposed in their work, that lengthening of the time of staying in a place deepens the attachment to it. That is why their study explored interrelations between the time of staying, sense of belonging, urban identity, and urban environment conservation.

As can be seen, the interest to the concept of 'sense of place' is increasing worldwide, and several factors have been identified associated with phenomena related to this concept. In Russia, the concept of 'sense of place' along with that of 'attachment to a place' is treated as the 'basic factor of human interaction and self-actualization': as a matter of fact, these concepts operationalize relations between the human and their habitats' (Reznichenko, 2014). S. I. Reznichenko underscores extensity of research on that topic for last decades, exploring its different aspects; at that, all review papers are in English: M. E. Patterson & D. R. Williams, 2005; L. Skannel & R. Guifford, 2010; S. K. Trintelman, 2009. The term 'sense of place' is not as well-established in Russian research as it does in overseas publications. Russian researchers describe rather the concept of 'personal living space' associated with notions of the home and family, as in works by Dmitrieva (2013), Kunitsyna & Yumkina (2012), Nartova-Bochaver, Bochaver, & Bochaver (2011), where authors explore the actual state of the space and residents' attitude to it.

In Russian, theoretical reviews in the urban space perception are summarized in two papers: Gabdulina (2012), Shteinbakh & Elenskii (2004); reviews of recent experiments are given in other sources: Drobysheva & Zhuravlev (2016), Zhuravlev & Kupreichenko (2012).

For the purposes of this study the concept of sense of self and the conscious approach were interpreted as they were defined in works of Eliseev (2000), Leont'ev (2013), Znakov (2016), Morosanova & Aronova (2007).

Aims and hypotheses of the study

The study aims to reveal personality traits and specific characteristics which are predictors for 'subjective assessment of places'.

From the researcher's point of view, it seems important to analyze how the present-day city residents are forced to adapt over and over again to ever-changing environmental conditions, and how they evaluate urban environment. Besides, it is important to develop recommendations that might help to experience urban environment as more comfortable.

Hypothesis of the study is that a resident of the modern metro-megapolis evaluates a place based on the activity of the environment, but its details depend on the level of the familiarity of a place to the subject. Temperament characteristics, such as extraversion, neuroticism, inhibition, excitement, stability, EEG data, as well as aut sympathy levels are factors influencing assessment of places. The hypothesis is based on conclusions of the author's recent study where the scale 'aut sympathy' in 'SAMOAL' worked as a predictor for assessment of places. To test the hypothesis the Self-relation Test by S. R. Pantileev was used in the present empirical study to examine the association of sensation with the sense of self.

The category of 'place' refers to an 'open system which boundaries are determined by the subject's field of functioning' (Reznichenko, 2014, p. 15).

The additional hypothesis is that the category of 'pleasantness' synthesizes all the senses of a person from a place.

Methods

An empirical research has been performed including subjective assessment of public urban places by residents of St. Petersburg in two stages. First, respondents filled standardized questionnaires (the Self-actualization Test, SAMOAL, a modified version of Personal Orientation Inventory by E. Shostrom; Self-relation Test by S. R. Pantileev; Sovereignty of Psychological Space test by S. K. Nartova-Bochaver; Eysenck Personality Inventory, EPI, variant B; Life Satisfaction Index by J. Strelau, an online test powered by Google Forms) (Zotkin, 2007; Kalina, 1998; Nartova-Bochaver, 2014; Nikishina & Vasilenko, 2004; Raigorodskii, 2001). Stage two included collecting the same subjects' responses to the author's Questionnaire administered on sites representing the public places in questions. Links for tests were sent individually, and respondents were instructed about the completing procedure in advance. Participants (31 persons) were St. Petersburg residents living here for 3 years and more, with the mean age 26.68 years: 56.7 % of females, 43.3 % of males. The walking route represented a path through Vasilievsky Island including four different places with a various temp of environment functioning. Participants evaluated one-by-one individually after staying on sites for 5 minutes. The route distance made 1.5 km. The research was performed in March within a week, in order to maximally avoid weather influence, and mostly in the dawn-to-dusk period, with the same instructions and the same checklist content for every respondent, and the same path of the route. The respondents were screened before the route pass using the HAM questionnaire (state of health-activity-mood).

To assess a place, participants should check a numeral from 1 to 10 in a paper sheet immediately following their stay in a place (for 5 to 7 minutes), rating the following scales: 'pleasant', 'depressive', 'calm', 'excluding', 'restless', 'safe', 'cosy', 'clean', 'cultural', 'spacious', 'active', 'novelty', 'bright', 'favorite', 'prestigious', 'comfortable', 'anxiety', 'inviting'. At the end of the staying in each place respondents chose one color out of 8 in the Luscher set of cards to use it in Etkind CTA

test as a characteristic of the place (Etkind, 1983). At the end of the route, respondents ranked colors in a series from the less unpleasant to the most unpleasant. That the collected data was processed, a new variable created, the 'indirect color': the number of a specific color associated with a place according to the color 'unpleasantness' was assigned to that place as a new variable. For example, the place no. 1, Pedestrian line, was associated with a yellow color card, and the yellow was ranked as the 1st, therefore, the place itself could be labeled as the least unpleasant. This analysis does not pretend to be thorough or all-sufficient, but it supplements the main analysis effectively.

The chosen adjectives generalize the more often encountered associations with residence spaces of various levels (one's own room or apartment, block of flats, courtyard (as a common area), district, or city), revealed in a recent study of the author. Associations in categories of courtyard, district, or city were analyzed using content analysis. The choice depended on the coverage area – each response could be assigned to only one unifying category without using additional ones, which suggests that the built model describes the entire space of variants.

To each evaluated place a rank of activity was assigned so that 1 meant the first level, implying the minimum activity in the place, i.e., minimum speed and temp of any events and minimum intensiveness of any objects' activity in the environment, and 4 implied the maximum one. The first, second, and fourth places were familiar to most respondents (i.e., they visited them before, once or more). The place no. 3, Courtyard of Arts, on the contrary, most of respondents (90 %) characterized as an unfamiliar one. The activity of environment as a generalizing characteristic describing all motions of various objects in the environment affects the human sensor system the most intensively, and therefore could be identified easier (Shilin, 2011).

Specifications of the experiment environment are summarized hereunder.

Place no. 1, Pedestrian line is a pedestrianized street, 6th and 7th lines of Vasilievsky Island between the avenues Srednii and Bolshoi Prospects. Except for few company cars (3 times from 31), there was no traffic here, but there was a lot of people walking slowly, street musicians, vendors, stump orators. That street has been evaluated by most respondents as cosy and homelike. Activity level rank was rated as 3 or 4.

Place no. 2, Bolshoi Prospect, is an avenue Bolshoi Prospect of Vasilievsky Island between pedestrian 6th and 7th lines, and 2nd and 3rd Vasilievsky Island lines. Even though this street is the main out of all examined directions, it appears to be a place with low-level activity. As a rule, the number of persons in surroundings was below the average, with a consistently low traffic. Rank 2.

Place no. 3, Courtyard of Arts, is a park in the courtyard of the Academy of Arts. This picturesque place turned out to be novel to most respondents, a calm spot with few people and occasional horses (there is a horse stable on the premises) and dogs. Rank 1.

Place no. 4, Embankment, is a part of the Embankment for the Menshikov Palace. The characteristic features of the place are relaxing scenery at the right (the snow-covered Neva River) and a bustling thoroughfare at left. Rank 4.

Results

Data was processed with the statistics program SPSS Statistics V.26 using Spearman's non-parametric correlation coefficients because of a rank character of all scales; the factor and regression analyses were also made.

We should pay attention to a number of correlations observed after data processing because this parameter demonstrates the data consistency level and their logic connection that can be seen in the Table 1. The greatest number of correlations between assessment of the same place has been noted for the place no. 3, Courtyard of Arts (minimal rank of activity, the 1st), the fewest – for assessments of the place no. 4, Embankment (the greatest rank, the 4th). Thus, the number of significant correlations was inversely associated with the rank of activity. The third place in question is considered to be unknown for most respondents, as well as for most residents in the whole city population, and many persons did perceive it as a novel one. The place no. 4, Embankment, appears to be the most familiar to the St. Petersburg’s dwellers, because this place is a part of the Neva River embankment close to a bustling thoroughfare. The number of correlations is evidently of importance, the greater number being associated with the more consistent and non-fragmentary data for the place.

The greater number of significant correlations ($p < 0.01$) was revealed in the 2nd and 3rd places having the least activity ranks, which may suggest that the data from the less active places is more coherent. Furthermore, dispersion in percentage inversely correlates with the ranks of places: the less is the rank of a place, the greater is the ratio of the number of more significant correlations to the entire number of correlations.

The most number of correlations with a greater value of the factor power ($F > 0.5$) was noted for the place no. 3, Courtyard of Arts, and the least – for the place no. 4, Embankment, which fits perfectly with the 1st conclusion. Besides, the dispersion of the number of correlations is inversely associated with the distribution of the ranks: the more was the rank of place (that is, the more active the place was), the fewer correlations with high levels of F were noted.

In all places were noted associations in such categories: ‘depressing’, ‘calm’, ‘excluding’, ‘anxiety’, ‘safe’, ‘cosy’, ‘clean’, ‘cultural’, ‘novelty’, ‘favorite’, ‘prestigious’ and ‘comfortable’. The most number of associations was noted in categories ‘inviting’, ‘excluding’, ‘calm’, ‘depressive’, ‘pleasant’, the least number – in categories ‘comfortable’, ‘prestigious’, ‘novelty’.

Place	Rank	Number of correlations, n.	Number of correlations at $p < 0.01$, n.	Number of correlations at $p < 0.01$ to the total number ratio, %	Number of correlations with the max. F (at $F > 0.5$), n.	Number of correlations with the max. F to the total ratio, %	Number of correlations with the max. F to correlation at $p < 0.1$, %
1	3	58	34	58.62	28	48.28	82.35
2	2	55	34	61.82	27	49.09	79.41
3	1	89	63	70.79	46	51.69	73.02
4	4	47	24	51.06	17	36.17	70.83

The categories of 'inviting' and 'excluding' have been noted as the main characteristics of an attitude to a place. An 'inviting' place (based on significant correlations for all places) – is a 'comfortable', 'favorite', 'cosy' one in the case of four places in question, a 'safe', 'calm' and 'pleasant' one in three places, an 'prestigious', 'clean', 'novelty' one in the case of two places, a 'cultural', non-'depressive', and non-'excluding' one in the case of 1 place, namely, in one place, namely, in the place no. 3, Courtyard of Arts. The characteristics associated with the category 'excluding' were non-'clean', non-'favorite', and 'anxiety' in 4 places in question, non-'cosy', non-'cultural' and non-'comfortable' in three places, non-'prestigious' and non-'safe' in one place, namely, in the place '1. Pedestrian line', and 'restless' and non-'inviting' in the place no. 3, Courtyard of Arts.

The factor analysis of all the assessments of places was performed for each place individually, and thereafter a regressive analysis of obtained factors was performed. Results of all standardized psychological methods were used as predictors. For the sake of the analysis convenience all assessments were divided in 4 groups: positive senses, characteristics of environment, collective representations and negative senses. Results are summarized in Tables 2–5. Data is classified depending on places. An adjusted R² is given at first lines of table cells. Every new predictor starts with a new figure, i.e., an equation coefficient. Negative coefficients are marked with the sign '-'. For example, assessment 'pleasant' for the 1st place was accounted for 34.4 %, then followed the predictor with a positive coefficient 0.265 in the Self-relation Test by S. R. Pantileev for the scale 'reflected self-attitude', negative coefficient 0.020 questionnaire SAMOAL 'independency' and the positive coefficient 0.033 – data from neurodevice for the scale 'relaxation'. Predictors which repeated in one table are highlighted in bold.

Table 2
Regression analysis in the group of 'positive senses'

	<u>Inviting</u>	<u>Comfortable</u>	<u>Cosy</u>	<u>Pleasant</u>	<u>Calm</u>
1. Pedestrian 7th line, Vasilevsky Island	No equation	No equation	No equation	Adjusted R sq. 34.4 % 0.265* Self-relation Test, reflected self-attitude (-) 0.020 * SAMOAL independence 0.033 * 1pl relax	No equation

	<u>Inviting</u>	<u>Comfortable</u>	<u>Cosy</u>	<u>Pleasant</u>	<u>Calm</u>
Table 2 Regression analysis in the group of 'positive senses'					
2. Bolshoi Prospect, Vasilievsky Island	Adjusted R sq. 28.6 % 0.260 * pl2 mediated color + 0.031 * inhibition Strelau	Adjusted R sq. 28.6 % 0.260 * pl2 mediated color + 0.031 * inhibition Strelau	Adjusted R sq. 28.6 % 0.260 * pl2 mediated color + 0.031 * inhibition Strelau	Adjusted R sq. 28.6 % 0.260 * pl2 mediated color + 0.031 * inhibition Strelau	Adjusted R sq. 28.6 % 0.260 * pl2 mediated color + 0.031 * inhibition Strelau
3. Courtyard of Arts	Adjusted R sq. 14.1 % 0.244 * pl3 mediated color	Non- adjusted R sq. 48.4 % (-) 0.038 * % of extraversion 0.311 * SAT openness	Adjusted R sq. 18.2 % (-) 0.097 * sovereignty of physical body	Adjusted R sq. 14.1 % 0.244 * pl3 mediated color	Adjusted R sq. 14.1 % 0.244 * pl3 mediated color
4. Embankment opposite to Menshikov Palace	Adjusted R sq. 30.3 % (-) 0.032 * satisfaction with life 0.019 * SAMOAL human nature	No equation	Adjusted R sq. 30.3 % (-) 0.032 * satisfaction with life 0.019 * SAMOAL human nature	Adjusted R sq. 30.3 % (-) 0.032 * satisfaction with life 0.019 * SAMOAL human nature	No equation

Table 3

Results of regression analysis in the group 'environment characteristics'

	<u>Clean</u>	<u>Specious</u>	<u>Active</u>	<u>Novelty</u>	<u>Bright</u>
1. Pedestrian 7th line, Vasilievsky Island	Adjusted R sq. 17.7 % (-) 0.106 * sovereignty of territory	Adjusted R sq. 17.7 % (-) 0.106 * sovereignty of territory	Adjusted R sq. 30.2 % (-) 0.027 * 'SAMOAL' autosympathy 0.092 * sovereignty of territory	No equation	Adjusted R sq. 32.6 % (-) 0.217 * Self-relation Test, inner conflicts + 0.042 * 1pl excitement
2. Bolshoi Prospect, Vasilievsky Island	Adjusted R sq. 44.5 % (-) 0.332 * Self-relation Test, reflected self-attitude 0.060 * 2pl excitement	Adjusted R sq. 44.5 % (-) 0.332 * Self-relation Test, reflected self-attitude 0.060 * 2pl excitement	Adjusted R sq. 69.8 % 0.522 * SAT openness (-) 0.030 * SAMOAL time values (-) 0.203 * Self-relation Test, self-management (-) 0.064 * sovereignty of habits 0.050 * sovereignty of objects	Adjusted R sq. 69.8 % 0.522 * SAT openness (-) 0.030 * SAMOAL time values (-) 0.203 * Self-relation Test, self-management (-) 0.064 * sovereignty of habits 0.050 * sovereignty of objects	Adjusted R sq. 44.5 % (-) 0.332 * Self-relation Test, reflected self-attitude 0.060 * 2pl excitement

Table 3
 Results of regression analysis in the group 'environment characteristics'

	<u>Clean</u>	<u>Specious</u>	<u>Active</u>	<u>Novelty</u>	<u>Bright</u>
3. Courtyard of Arts	Non-adjusted R sq. 27.3 % 0.111 * sovereignty of social relations (-) 0.045 * 3pl relaxation	Adjusted R sq. 14.1 % 0.244 * pl3 mediated color	Adjusted R sq. 27.3 % 0.111 * sovereignty of social relations (-) 0.045 * 3pl relaxation	Adjusted R sq. 14.1 % 0.244 * pl3 mediated color	Adjusted R sq. 40.2 % = - 0.144 (N.S.) + 0.396 * pl3 mediated color - 1.910 * R Strelau
4. Embankment	No equation	No equation	No equation	No equation	No equation

Table 4
 Regression analysis in the group of 'collective representations'

	<u>Favorite</u>	<u>Prestigious</u>	<u>Cultural</u>	<u>Restless</u>	<u>Safe</u>
1. Pedestrian 7th line, Vasilievsky Island	No equation	No equation	Adjusted R sq. 34.4 % 0.265 * Self-relation Test, reflected self-attitude (-) 0.020 * SAMOAL independency 0.033 * 1pl relaxation	No equation	Adjusted R sq. 34.4 % 0.265 * Self-relation Test, reflected self-attitude (-) 0.020 * SAMOAL independency 0.033 * 1pl relaxation

Table 4
Regression analysis in the group of 'collective representations'

	<u>Favorite</u>	<u>Prestigious</u>	<u>Cultural</u>	<u>Restless</u>	<u>Safe</u>
2. Bolshoi Prospect, Vasiliievsky Island	Adjusted R sq. 28.6 % = – 3.030 + 0.260 * pl2 mediated color + 0.031 * inhibition Strelau	Adjusted R sq. 37 % 0.347 * Self-relation Test, self-acceptance (–) 0.026 * SAMOAL time	Adjusted R sq. 37 % 0.347 * Self-relation Test, self-acceptance (–) 0.026 * SAMOAL time	Adjusted R sq. 69.8 % 0.522 * Self-relation Test, openness (–) 0.030 * SAMOAL time 0.033 SAMOAL values (–) 0.203 * Self-relation Test, self-management (–) 0.064 * sovereignty of habits 0.050 * sovereignty of objects	Adjusted R sq. 28.6 % = – 3.030 + 0.260 * pl2 mediated color + 0.031 * inhibition Strelau
	Non-adjusted R sq. 48.4 % = –0.008 (N.S.) – 0.038 * % of extraversion + 0.311 * Self-relation Test, openness	Adjusted R sq. 18.2 % = 0.443 (N.S.) – 0.097 * sovereignty of physical body	Adjusted R sq. 14.1 % 0.244 * pl3 mediated color	Adjusted R sq. 27.3 % 0.111 * sovereignty of social relations (–) 0.045 * 3pl relaxation	Adjusted R sq. 40.2 % 0.396 * pl3 mediated color (–) 1.910 * R Strelau

Table 4 Regression analysis in the group of 'collective representations'					
	<u>Favorite</u>	<u>Prestigious</u>	<u>Cultural</u>	<u>Restless</u>	<u>Safe</u>
4. Em-bankment	Adjusted R sq. 30.3 % (-) 0.032 * satisfaction with life 0.019 * SAMOAL human nature	No equation	No equation	No equation	No equation

Table 5 Regression analysis in the group of 'negative senses'			
	<u>Depressive</u>	<u>Anxiety</u>	<u>Excluding</u>
1. Pedestrian 7th line, Vasilievsky Island	Adjusted R sq. 34.4 % Non-0.265 * Self-relation Test, reflected self-attitude (-) 0.020 * SAMOAL independency 0.033 * 1pl relaxation	Adjusted R sq. 34.4 % Non-0.265 * Self-relation Test, reflected self-attitude (-) 0.020 * SAMOAL independency 0.033 * 1pl relaxation	Adjusted R sq. 34.4 % Non-0.265 * Self-relation Test, reflected self-attitude (-) 0.020 * SAMOAL independency 0.033 * 1pl relaxation

Table 5

Regression analysis in the group of 'negative senses'

	<u>Depressive</u>	<u>Anxiety</u>	<u>Excluding</u>
2. Bolshoi Prospect, Vasilievsky Island	Adjusted R sq. 70.2 % (-) 0.046 * SAMOAL, human nature 0.026 * satisfaction with life 0.048 * SAMOAL, creativity 0.219 * Self-relation Test, inner conflicts 0.061 * sovereignty of physical body 0.157 * Self-relation Test, self-acceptance	Adjusted R sq. 70.2 % (-) 0.046 * SAMOAL, human nature 0.026 * satisfaction with life 0.048 * SAMOAL, creativity 0.219 * Self-relation Test, inner, conflicts 0.061 * sovereignty of physical body 0.157 * Self-relation Test, self-acceptance	Adjusted R sq. 70.2 % (-) 0.046 * SAMOAL, human nature 0.026 * satisfaction with life 0.048 * SAMOAL, creativity 0.219 * Self-relation Test, inner conflicts 0.061 * sovereignty of physical body 0.157 * Self-relation Test, self-acceptance
3. Courtyard of Arts	Non- adjusted R sq. 48.4 % (-) 0.038 * % extraversion + 0.311 * Self-relation Test, openness	Non- adjusted R sq. 48.4 % (-) 0.038 * % extraversion + 0.311 * Self-relation Test, openness	Non- adjusted R sq. 48.4 % (-) 0.038 * % extraversion + 0.311 * Self-relation Test, openness
4. Embankment	Adjusted R sq. 29.4 % (-) 0.039 * 4pl relaxation 0.024 * % extraversion	No equation	Adjusted R sq. 29.4 % (-) 0.039 * 4pl relaxation 0.024 * % extraversion

Conclusions for the regression analysis

Most of negative characteristics in the factor analysis acquired down-crossed values, i.e., with a minus, which meant to be positive as a characteristic. Distribution of assessments into factors in different places was similar. Such differences were revealed: the 'novelty' and 'cultural' characteristics stood apart.

In the first factor three places, i.e., all the places in question except for the place no. 3, Courtyard of Arts, three assessments were unified: 'inviting', 'favorite', 'cosy', and in first two places four assessments were unified: 'inviting', 'comfortable', 'cosy', and 'favorite'. Thus, inviting places are most often 'cosy' and this characteristic may be identical to 'favorite', which confirms the conclusion of the correlation analysis.

Such assessments as 'prestigious' and 'cultural' were supposed to be used as markers of collective representations. In one factor they encountered twice, in the third and in the fourth places. In each place it is associated with different assessments. A summarizing conclusion is that categories which could be considered as assessments based on collective representations do not unify with each other separately from other senses of representations, but rather with them, which demonstrate the association between collective representations and individual senses.

Characteristics 'spacious' and 'clean' are associated in first two places. 'Spacious' is associated with 'comfortable', 'cultural', 'prestigious', 'bright' in the 4th place and with the 'novelty' in the third place. In a novel place the 1st factor unifies the 'novelty' with the category 'inviting', and that factor depends on the mediated color predictor only.

The characteristics 'depressive', 'unsettling', 'excluding' were unified in three places, and in the fourth place the 'unsettling' was unified with the 'novelty'.

At the very beginning participants put on a neurodevice which read brain impulses and recorded at each minimal unit of time the excitement or relaxation levels. The results were as follows: relaxation negatively correlated with depression – in three places the brain relaxation index was associated with 'depressive' assessment, as well as with other negative assessments ('restless', 'non-clean', 'excluding').

Conclusions for assessments groups

In the 'pleasant senses' group ('inviting', 'comfortable', 'cosy', 'pleasant', 'calm') the 'reflected self-attitude' and 'openness' scales demonstrated the most numeric expression of predictors of the Self-relation test. The more are values on the scale 'reflected self-attitude', the more pleasant the place is perceived. The more is the level of 'openness', the less is the comfort rating. According to the same logic sovereignty of psychological space is expressed with the scale 'sovereignty of physical body' in the 3rd place only and at the lowest level: the more the sovereignty of the body rating is, the less 'cosy' the place is rated. Mediated color serves as a predictor for all four assessments in the category 'pleasant senses' in the second place and for two assessments in the third place, which demonstrates importance of non-perceived senses in that group of assessments.

In that group one could see the average effect of temperament: the inhibition according to J. Strelau test in the second place, relaxation in the first place, and extraversion in the third one. Satisfaction with life influences the assessments inversely: the lower is satisfaction, the higher the positive rating will be. One could see that the scale 'human nature' of SAMOAL exerts low-level effects, implying the faith in power of human abilities: the more is the faith in the humankind, the higher are ratings in the category 'pleasant' (as one can see in the 4th place

example, 'Embankment'). Another scale of SAMOAL, 'independency', demonstrated an opposite effect: the higher are ratings in that scale, the less are ratings of assessment 'pleasant' (as in the 1st place, the 'Pedestrian line').

In the group of assessments 'environment characteristics' ('clean', 'spacious', 'active', 'novelty', 'bright') for the 4th place no equations were obtained, which means that the values depend rather on something else. Correlations were numerous with scales from the questionnaire 'sovereignty of psychological space': sovereignty of territory determines high ratings for characteristics 'clean', 'spacious', and environment activity level' for the 1st place, sovereignty of habits and things lie behind assessments of activity and novelty of the environment, sovereignty of social ties are associated with assessment 'clean' and 'activity level' in the 3rd place.

In the group 'collective representations', i.e. the characteristics 'favorite', 'prestigious', 'cultural', 'restless', 'safe', sovereignty of physical body influences ratings prestigious in the 3rd place, and sovereignty of habits and things determines high ratings for the characteristic 'restless' in the 2nd place, and sovereignty of social ties determines high ratings for the characteristic 'restless' in the 3rd place. Questionnaire SAT comprises scales 'autoguidance', 'reflected self-attitude' (one of more often presented as predictors scales), 'self-acceptance' and 'openness', as well. In the questionnaire 'SAMOAL' such scales as 'independency', 'time', 'values' and 'human nature' turned out to be predictors – scales implying the general representations of a person: their life values, time management, their compliance with values of a self-actualizing person, which is consistent with the group sense and partly confirms the author's assumption. Characteristics of temperament have associations as follows: extraversion correlates with 'favorite'; there are four correlations with excitement, and two – with inhibition and the Strelau scale.

The group of 'negative senses' ('depressive', 'unsettling', 'excluding') comprised a great number of predictors, only in one case there was no equation. All assessments correlated with the sovereignty of physical body in the 2nd place. Temperament: in the 3rd and 4th places one could see 5 correlations with extraversion out of 6 possible ones, in the 4th place there was a negative correlation with relaxation, there were correlations with the Strelau scales. In addition, scales of 'reflected self-attitude', 'inner conflicts', 'self-acceptance' and 'openness' in the questionnaire SAT influenced markedly negative assessments. In the self-actualization questionnaire predictors in that group were 'creativity', 'human nature' and 'independency'.

In summary, sovereignty of psychological space determines rather assessments, describing environment characteristics: 'clean', 'spacious', 'active', 'novelty', as well as the characteristic 'restless' in the representation category. Relaxation index was associated with the positive sensations of a place. Such Self-relation Test scales as 'reflected self-attitude', 'inner conflicts', 'autoguidance', 'self-acceptance' and 'openness' were more or less equally represented without specific spikes in the sensations groups, which suggested that the sense of self influenced all assessments of places. In all groups of assessments, scales of 'human nature', 'time' and 'autosympathy' out of the self-actualization questionnaire were presented extensively. One could note a broader representation of the relaxation predictor in all the assessments groups.

Place	Num- ber of fac- tors	Num- ber of regression equations	Adjus- ted Mean. R squar.	Number of pred- ictors	Ave- rage num- ber of pred- ictors	SRT	SPS	SAMOAL	Extraver- sion	Satisf.	Device	Color	Str.
1. Pedes- trian line	6	4	28.725	8	2	2	2	2	0	0	1 rel 1 exc	0	0
2. Bolshoi Prospect, Vasilievsky Island	5	5	50.02	18	3.6	6	3	5	0	1	1 exc	1	1
3. Cour- tyard of Arts	5	5	29.64	8	1.6	1	2	0	1	0	1 rel	2	1
4. Embar- kment	6	2	29.85	4	2	0	0	1	1	1	1 rel	0	0

Notes: SPS – sovereignty of psychological space; Extraversion – a scale in EPI (Eysenck inventory), Color – mediated color (in the Color Test of Attitudes (CTA) by Etkind), Satisf. – satisfaction with life, Device – neurodevice readings, Str. – Strelau Inventory.

Discussion

The data suggests that in unfamiliar places more correlations between assessments could be noted, because the brain is more motivated to discover and to explore the space more intensely, which influence the process of evaluating the place. In the places familiar to the subject most, a person's perceiving activity decreases dramatically and the assessment of places tends to be reduced to pre-existing representations about similar places; which is why the details of a person's assessment of this place might not reflect senses experienced by that person at the very moment in that place. That hinders the above-mentioned tendency of maximal awareness of one's senses. It might be easier to a person to understand their senses in places with low-level activity because in such places individuals can collect mere processable information about the environment.

It is surprising that the category of 'pleasant', which was assumed to be the main characteristic of a place and the 1st in the list, did not prove to have correlations in all places, that doesn't coincide with the additional hypothesis. The least number of correlations of that category with the 'novelty' agreed with the common experience, because of familiarity of the chosen route.

The obtained equations for 'inviting' and 'excluding' places show that an inviting place is a comfortable and cosy one, if it is unfamiliar or 'favorite'; an excluding place is a dirty, unloved, and increasing anxiety one. That is, in order to be inviting, a place does not necessarily need to be 'prestigious', 'novelty', or 'cultural' site, but it needs to be clean and not unsettling. On the other hand, in order not to be excluding, a place had better be 'cultural' and 'comfortable'. In other words, stereotypical or collective images correlate with a negative attitude, as it was indicated in earlier research (Proskuriakova, 2016; Proskuriakova & Yanicheva, 2016).

In the place no. 4, Embankment, the data are the least predictable. This might be explained through the fact that in a familiar place collective representations are involved to a greater extent, which is why results of standardized questionnaires account for them less, because the assessments relate more to individual senses and personal representations.

There are correlations with the data of neurodevice, scores of extraversion, and mediated music, which confirms correlations with temperament and non-conscious processes, even though with a minimal correlation coefficient. In three places the ratings of relaxation were involved, in two places – of the excitement. The mediated color has the most effects in the place no. 3, Courtyard of Arts, which is an additional argument in favor of the influence of non-conscious senses.

There was no correlation with neurotism, which contradicts the initial assumption of correlation with the assessment of a place as an 'anxious' one and other negative senses. This suggests that further research is needed. A subjective assessment of the person's level of neurotism would probably reveal a correlation with the 'anxiety' assessment.

On the other hand, there are numerous correlations of negative assessment with EEG-registered relaxation, which might imply the importance of the state of relaxation as a pre-condition for lack of negative assessments and, possibly, for lack of negative senses experienced in a place.

The adjusted mean R square value was similar for three places, and for the 2nd place only, on Bolshoi Prospect, its value was almost two times higher. I believe that the reason for this is that: data for factors in that place depended rather on another set of data. Dependence on predictors was the lowest and in the place no. 3, Courtyard of Arts. This fact needs to be further studied to identify possible underlying reasons.

The 'satisfaction with life' index serves as a predictor of negative assessments in the 2nd place and a predictor of positive assessments in the 4th place. In both cases, the subjects provided

both assessments – ‘excluding’ and ‘inviting’ ones. Therefore, the level of satisfaction with life may influence the assessment of a place as an ‘inviting’ one.

The main and additional hypotheses were partially confirmed by results. Indeed, the assessment of a place is associated with such factors as the environment activity level and the subjective sense of novelty. Individuals assess new places more scrupulously, relying more on their actual senses; whereas assessments of familiar places are less detailed which suggests that they were borrowed from collective representations. The findings have partially confirmed that the factors of temperament indeed serve as predictors, with extraversion being involved, and neuroticism not involved. The autosympathy level graded on the ‘SAMOAL’ scale with the same name was found to be a predictor for the evaluator ‘active’ in the first place only. Nonetheless, many scales of the questionnaire SAT, such as ‘reflected self-attitude’, ‘inner conflicts’, ‘autoguidance’, ‘self-acceptance’ and ‘openness’, which characterize the sense of self, were found to be valid as predictors, with the highest possible correlation coefficient, which also confirms our hypothesis. There are correlations with personal characteristics, such as sovereignty of psychological spaces, personal self-actualization and satisfaction with life levels, which have proven to be predictors in the above presented equations. The category of ‘pleasant’ is not a synthesizing one, since it is not presented in the analysis in all the places, although it partially shows the general attitude to the place. Instead, the categories of ‘inviting’ and ‘excluding’ are recognized as synthesizing.

Thus, the assessments of places has been found to be related to and depend on the subjects’ sense of self and their temperament, as well as on the sovereignty of psychological space, level of satisfaction with life and of self-actualization. There is a strong correlation of assessments of places with the senses experienced and individual representations. In most cases groundless assignments of in assessments to place seemed to depend on collective representations and other factors.

At the moment there is a pressing need for individual transformation of personality and recovering individuals’ ‘wholeness’ in the process of self-actualization. The conscious senses of one’s own actual feelings while visiting new places with low external activity could help achieve this goal. On the other hand, the existential impossibility to avoid assessment and senses of one’s environment might pre-determine certain fast-track mechanisms that allow a person to form an opinion about surrounding objects using many characteristics.

This is precisely why in an environment that strongly resembles a frequented one, as is in the case with St. Petersburg embankments, a person tends to perceive automatically this embankment as similar to all the previously visited ones and to save energy rather than invest it in trying to scan and assessment the environment more carefully. Clearly, this mechanism is similar to the way stereotypes are usually formed. The study confirmed this assumption during the experiments with the most frequented place in central St. Petersburg. We can conclude that each person, once aware of the mechanisms of the process, is capable of making an effort to find the balance.

In addition, the issues of evaluating place could be associated with tolerance to ambiguity, which is a concept explored by T. V. Kornilova and D. A. Leont’ev using different approaches (Kornilova, Chumakova, Kornilov, & Novikova, 2010; Leont’ev, Osin, & Lukovitskaya, 2016). They stipulate that new spaces are unpredictable and therefore could equally be either dangerous or surprisingly interesting. The greatest number of correlations and consistent data for the place no. 3, Courtyard of Arts, confirms the fact that this place was unfamiliar to most of the respondents (more than 90 %).

'Brunner's findings and results of experiments suggested that in the process of making sense-based decisions, the perceiving subject's involvement increases dramatically, as they keep evaluating the perceived reality which is always associated with various social factors and specific contexts' (Andreeva, 2000, p. 37). This underscores the active role of the subject and their ability to influence the sense, if only partially, i.e. to save resources and to categorize a familiar space within the known categories. That mechanism does not require additional conscious effort, but individuals can consciously select less busy places evoking a sense of novelty, and through the processing of familiarizing these places, they can attempt to be aware of their current senses while building their own inner world and the sense of themselves.

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Personality Characteristics of Women With Negative Sexual Attitudes

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Abstract

Introduction. Conceptual issues in studying personality characteristics of women that contribute to their successful self-realization as a subject of sexual behaviors are especially important today. A decrease in sexual segregation should have led to women's satisfaction with the significant easing of moral standards related to manifestations of their sexuality. However, there is an increase in the number of women seeking help for their sexual problems. This study examines a sample of women with negative sexual attitudes and investigates their specific personality characteristics.

Methods. A sample of 152 women (clients of crisis and counseling centers in Irkutsk) took part in this study. The study used the following techniques: (a) Eysenk Inventory of Attitudes to Sex (EIAS) to examine women's sexual attitudes and (b) Cattell Sixteen Personality Factor Questionnaire (16 PF, Form C) to identify personality profiles of women with different sexual attitudes. Fisher's F test was used to test the significance of differences.

Results. Six groups of women with positive and negative attitudes towards various aspects of the sexual sphere were identified. Sexual aversion was observed in 15.38 % of the respondents. Significant differences between women with negative and positive attitudes towards physical sexual contact were determined using the 'femininity/masculinity' factor. This factor is responsible for the severity of traditional female sexual behaviors, adherence to strict moral standards, which is consistent with low scores on the EIAS ('permissiveness', 'impersonal sex', 'sexual excitability', and 'sexual libido').

Discussion. Traditional feminine views of sexuality, desire to save a marriage, and intolerant attitudes towards everything shameful are prevalent among women with negative sexual attitudes. Rigidity in thinking, high-normative behaviors, subordination, shyness, self-restraint in emotional manifestations, and flight into internal illusions are prevalent in personal profiles of women with negative sexual attitudes.

Keywords

attitude, sexuality, sex, sexual behavior, female sexuality, femininity, sexual attitudes, relation to sex, gender individuality, normative behaviors

Highlights

- Traditional feminine views of sexuality, desire to establish personal relationships between partners, desire to save a marriage, and intolerant attitudes towards everything 'immoral' and 'shameful' prevail among women with negative sexual attitudes.
 - As a rule, women with negative sexual attitudes have low sexual sensitivity and excitability.
 - Women with extremely negative sexual attitudes demonstrate increased sensitivity, romanticism, anxiety, vulnerability, tendency towards depression, guilt, dissatisfaction with themselves, and anxiety as a personality trait.
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Introduction

Conceptual issues in studying personality characteristics that contribute to women's successful adaptation and self-realization as a subject of sexual behaviors are of particular importance today. Global changes in society that took place in the 20th century affected economic, political, and cultural spheres which determined changes in women's self-consciousness. Issues in gender differences between men and women are currently transformed into issues in gender individuality, as indicated by Il'in (2007). Peplau (2003), Hunger (1996), Ellis (2010), Sathyanarana Rao & Nagaraj (2015) note that sexuality has also undergone significant changes, and many of its psychological 'foundations' have changed.

Breaking gender stereotypes leads to transformations in marriage, family, and partnership relations, affects the sexual sphere, which changes women's relation to sex (Chalova, 2015, 2016). A decrease in sexual segregation should have led to women's satisfaction with the significant easing of moral standards related to manifestations of their sexuality. However, the picture is different in practice. Sexologists assert that along with an increase in the level of sexual culture and awareness of sex issues there is an increase in the number of women seeking help for their sexual problems (Gusakova, 2010; Deryagin, n.d.; Deryagin, Sidorov, & Solov'ev, 2003; Bass, 2016; Krishtal, n.d.). On the one hand, this speaks in favour of overcoming uneasiness in discussing this topic and increasing interest in issues of female sexuality. On the other hand, this indicates more deep mechanisms underlying female sexual problems than a simple lack of information on various aspects of sexual life (Kinsey, Pomeroy, Martin, & Gebhard, 1998; Chalova, 2015, 2016).

Modern slogans about women's equal rights, including issues of sexual self-determination, pose a challenge to women who have been brought up in an atmosphere of rigid gender stereotypes that transmit a woman's passive role. This requires the rearrangement of internal personality constructs, including existing sexual attitudes. Studies on women's reproductive attitudes, their relation to motherhood, preservation of virginity, and sexual deprivation show the duality of this issue and the presence of intrapersonal conflicts, which lead to difficulties in women's adaptation

to modern conditions (Markova, n.d.; Nashkoev & Il'ina, 2000; Nokhurov, 1988; Popova, 2006; Temkina, 2002; Renshaw, 2001). In particular, Amaro (1995) makes the point that modern women have distortions in sexual attitudes in the context of the risk of HIV infection.

Geer & Robertson (2005), Fisher, White, Byrne, & Kelley (1988), and Hispanic researchers García-Vega, Rico, & Fernández (2017) have convincingly shown that sexual attitudes not only determine women's behaviors, but also form their personal qualities.

The role of sexual attitudes in sexual fantasies is illustrated by Hsu, Kling, Kessler, Knapke, Diefenbach, & Elias (1994).

Rammsayer, Borter, & Troche (2017), Petersen & Hyde (2010), Meston & Ahorld (2010) described specific characteristics of sexual attitudes in women of different ethnic groups, taking into account the factor of age and education.

In general, little attention has been devoted to detailed and comprehensive studies of personality characteristics of women with different sexual attitudes. Therefore, the aim of this study is to examine personality characteristics of women with negative sexual attitudes.

The main hypothesis of the study was that women with negative sexual attitudes have specific personality characteristics. In particular, we assumed that negative sexual attitudes have positive associations with certain personality characteristics including shyness, anxiety, social withdrawal, highly normative behaviors, rigidity in thinking, sensitivity, and dreaminess.

Methods

The empirical study involved 152 women (clients of crisis and counseling centers in Irkutsk). The sample was formed in accordance with stratometric selection. The female respondents were selected taking into account their education, social status, and marital status: balancing of the stratometric layers was achieved at the level of 50–50 % in terms of education, 30–40 % in terms of age, 40–60 % in terms of income, and 50–50 % in marital status. The stratometric approach to sampling made it possible to achieve relative independence of the results obtained in the study from the formal characteristics of female respondents. The mean age of female respondents was 42 years.

The following psychological diagnostic techniques were used in the study: (a) Eysenk Inventory of Attitudes to Sex (EIAS) and (b) Cattell Sixteen Personality Factor Questionnaire (16 PF, modified version, Form C) (Eysenck & Wilson 2000; Rukavishnikov & Sokolova, 2002).

The women's sexual attitudes were examined using the Inventory of Attitudes to Sex which also made it possible to forecast satisfaction with marriage, deviations in sexual behaviors, and to diagnose femininity/masculinity.

The EIAS does not contain a scale directly assessing sexual attitudes. The analysis of attitudes was based on a generalization of the values of the 'permissiveness', 'sexual excitability', 'pornography', 'impersonal sex', 'physical sex', 'sexual shyness', 'chastity', and 'sexual aversion' scales which indicate subjects' attitudes to various aspects of the sexual sphere. This is entirely justified, because a sexual attitude is not only a willingness to sexual behaviors for satisfying a physiological need but a complex socio-psychological mechanism consisting of behavioral acts, attitudes, judgments, assessments, and individual viewpoints. In addition, the formation of a sexual attitude is influenced not only by biological but also environmental factors, including psychological, social, economic, cultural, ethical, legal, historical, religious, and spiritual, which manifest themselves in women's attitudes towards various aspects of the sexual sphere, estimated by the questionnaire.

The keys for each scale of the EIAS contain scores that enable us to divide the sample into

groups of subjects with clear positive and negative attitude to various aspects of the sexual sphere and those with not clear poles of sexual attitudes. In this regard, at the first stage of the study we determined women's positive and negative sexual attitudes according to the results of the 'pornography', 'physical sex', and 'sexual aversion' scales. The scores on these scales were distributed to opposite poles, up to the maximum score. Therefore, we identified women with pronounced positive and negative attitudes towards aspects of the sexual sphere studied by these scales.

According to the results on the 'permissiveness', 'sexual excitability', 'impersonal sex', 'sexual shyness', and 'chastity' scales, the data are in the range of low and medium scores, which is not of interest for our study.

Fisher's F test was used to test the significance of differences.

Results

We distinguished six groups of women who have positive and negative attitudes towards various aspects of the sexual sphere such as pornography, real sexual contact ('physical sex' scale), and sexuality ('sexual aversion' scale).

The first group included subjects who scored from 6 to 8 points on the EIAS 'pornography' scale. These were women with a pronounced positive attitude towards pornography, who derive pleasure from drawings or photographs depicting sexual scenes, or verbal descriptions of sexual scenes, usually in the most explicit form. Women of the first group had high scores on the 'sexual libido' scale (~21 points) and average scores on the scale of 'femininity/masculinity' (~26 points).

The second group included subjects who scored from 0 to 3 points on the 'pornography' scale. These were women with a pronounced negative, disapproving attitude to pornography. They were also characterized by low scores on the scales of 'permissiveness', 'impersonal sex', and 'sexual libido'. The scores on the 'femininity/masculinity' scale are low, which indicates pronounced feminine qualities in this group of women.

The respondents who scored from 3 to 6 points on the 'pornography' scale were excluded from the study, because their preferences were not clearly expressed. As a result, the sample was divided into three uniform groups as follows: 32.69 % of the subjects showed positive attitudes towards pornography, 34.62 % of the subjects showed negative attitudes towards pornography, and 32.69 % of the subjects showed intermediate attitudes towards pornography (Fig. 1).

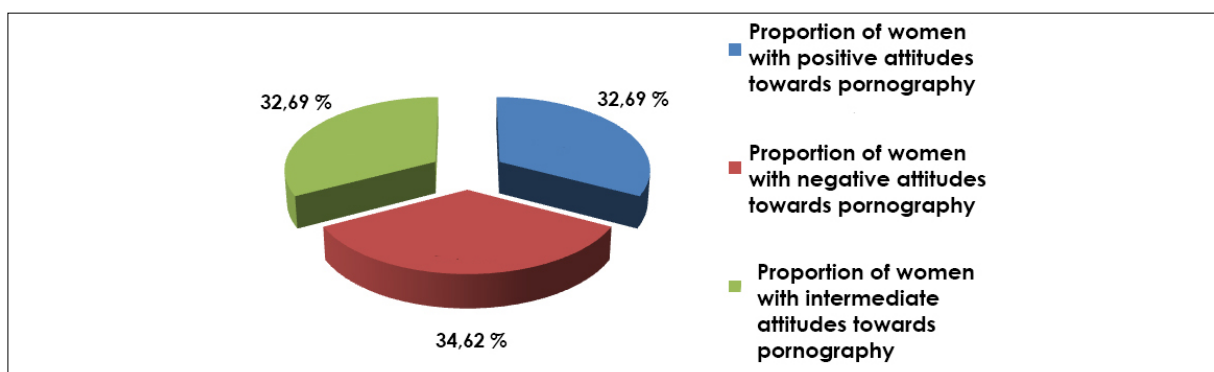


Figure 1. Proportion of women with different poles of attitudes towards pornography in the sample

The third group included the respondents who scored greater than 6.5 points on the 'physical sex' scale. These were women with a pronounced active desire for real sexual contact; they place sex above everything else and pay special attention to sexual intercourse at the expense of other aspects of love relationships.

The fourth group included subjects who scored less than 3 points on the 'physical sex' scale. These were women who avoided real sexual intercourse; spiritual communication was more preferable for them. Subjects who scored from 3 to 6.5 points on the 'physical sex' scale were excluded from the study because their preferences were not clearly expressed.

Thus, we found that 25 % of the female respondents showed a pronounced positive attitude towards sex and the desire for physical contact, 17.31 % of the subjects showed an extremely negative attitude towards physical contact, and 57.69 % of the subjects demonstrated intermediate attitudes towards physical sexual contact (Fig. 2).

The fifth group included the subjects who scored greater than 4.5 points on the 'sexual aversion' scale; these women react with disgust to certain types of sex, even with their regular partners.

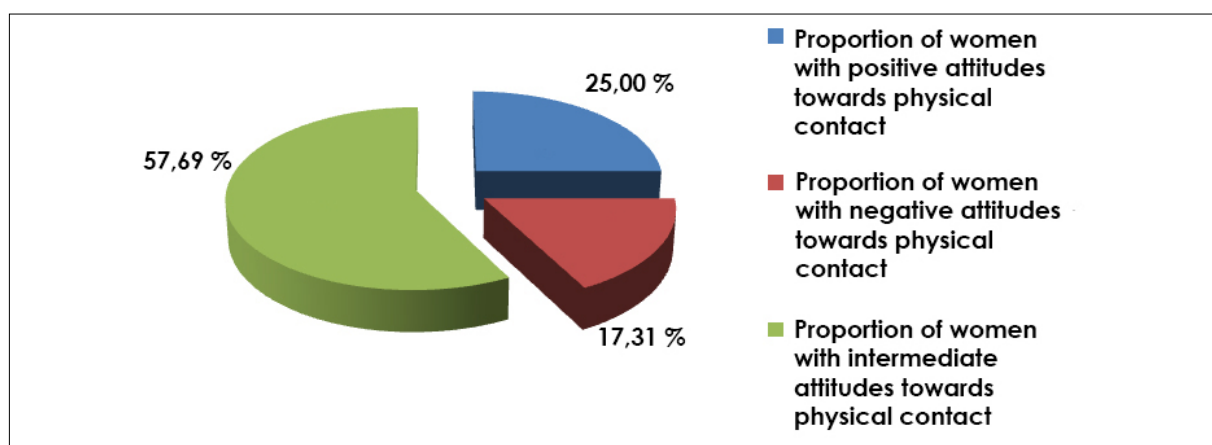


Figure 2. Proportion of women with different poles of attitudes towards physical sexual contact in the sample

The sixth group comprised the subjects who scored less than 2 points on the 'sexual aversion' scale.

After testing we found that the proportion of women with positive attitudes towards manifestations of sexuality is 26.92 %, 15.38 % of the subjects showed sexual aversion, and 57.69 % of the subjects showed intermediate attitudes towards manifestations of sexuality (Fig. 3).

At the next stage of the study, we examined sixteen personality traits in women from the six groups and analyzed an additional factor of self-appraisal: A – the level of interpersonal sociability; B – intelligence; C – emotional instability/emotional stability; E – subordination/dominance; F – self-restraint/expressiveness; G – the degree of acceptance of moral standards: consciousness/unscrupulousness; H – shyness/courage; I – sensuality/resoluteness; L – suspicion/credulity; M – dreaminess/practicality; N – straightness/diplomacy; O – calm/anxiety; Q1 – radicalism/conservatism; Q2 – conformism/non-conformism; Q3 – low self-control/high self-control, strong will; Q4 – relaxation/emotional tension; MD – self-appraisal.

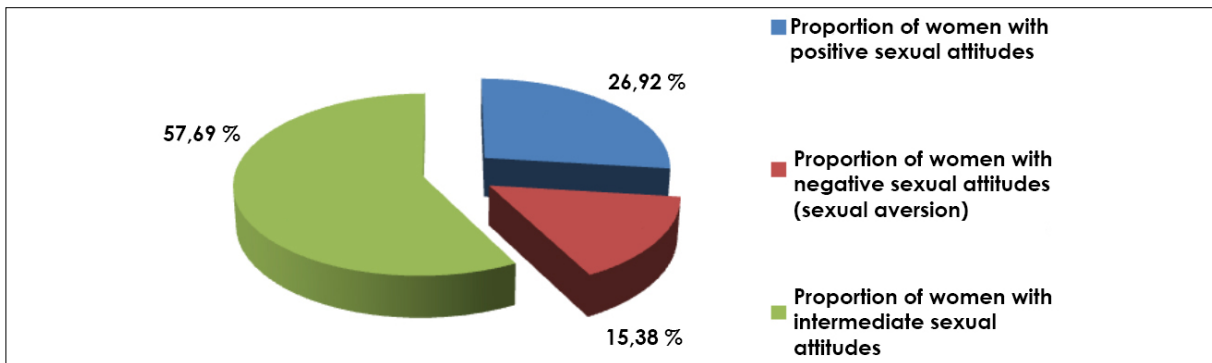


Figure 3. Proportion of women with different poles of attitudes towards manifestations of sexuality in the sample

The analysis of the distribution of the Cattell questionnaire factors in the averaged profiles of women with negative and positive attitudes towards pornography (Fig. 4) enabled us to conclude that compared to women who approve of pornography the following personality traits are more pronounced in the profiles of those with negative attitudes towards this aspect of the sexual sphere: openness (A), emotional stability (C), consciousness (G), radicalism (Q1), independence (Q2), shyness (H), and compliance (L). We also observed lower scores on the intelligence scale (B) and higher self-esteem (MD). Taking into account the data from the EIAS we assume the correspondence to feminine behaviors in sexual issues. This is consistent with data from Husain & Qureshi (2016), who studied the impact of attitudes towards pornography on women’s family relationships.

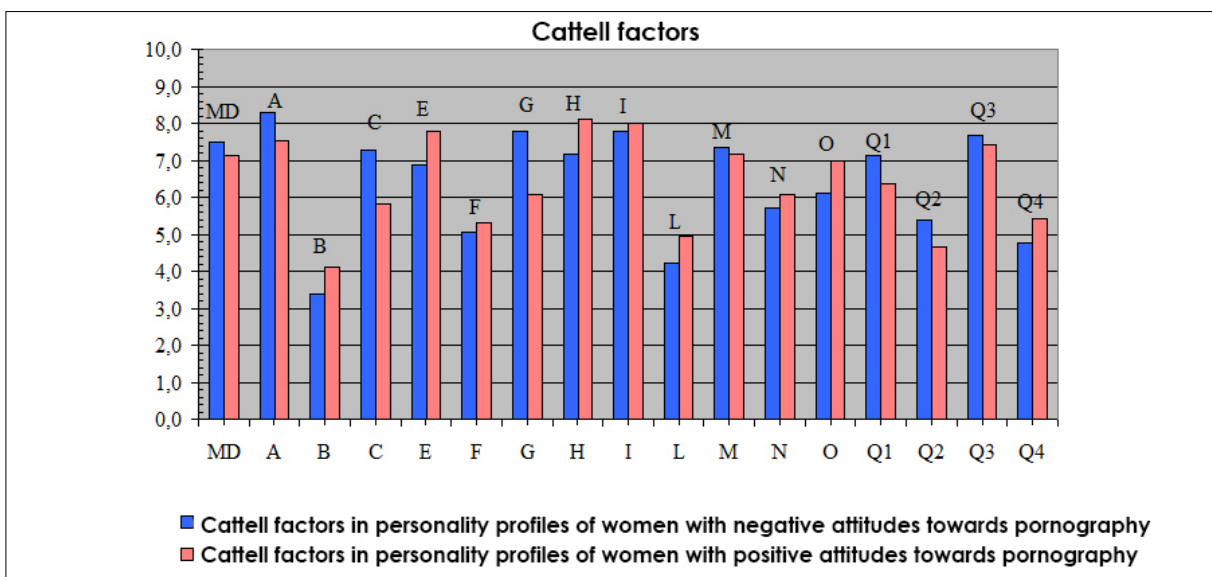


Figure 4. Averaged profiles of women with positive and negative attitudes towards pornography (Cattell Sixteen Personality Factor Questionnaire, 16 PF)

The results for statistical verification of differences are presented in Table 1.

Factor	Designation	$F_{emp.}$	p
MD	Adequate self-esteem / inadequate self-esteem	2,11	0,05
A	Unsociability/sociability	1,55	
B	Concrete (rigid) thinking / abstract thinking	2,11	0,05
C	Emotional instability / emotional stability	1,55	
E	Subordination/dominance	1,27	
F	Self-restraint/expressiveness	0,86	
G	Low-normative behavior / high-normative behavior	1,88	0,05
H	Shyness/courage	2,46	0,01
I	Sensuality/resoluteness	0,21	
L	Suspicion / credulity (compliance)	1,89	0,05
M	Dreaminess/practicality	0,14	
N	Straightness/diplomacy	0,92	
O	Calm/anxiety	0,49	
Q1	Radicalism/conservatism	0,93	
Q2	Conformism/non-conformism	0,16	
Q3	Low self-control / high self-control	0,85	
Q4	Relaxation / emotional tension	0,84	

At the 1 percent significance level we observed significant differences in factor H in the profiles of women with different attitudes towards pornography. At the 5 percent significance level we observed significant differences in factors B, G, L and MD in the profiles of women with different attitudes towards pornography. As mentioned above, these factors are associated with rigidity of thinking, high normative behavior and self-control, shyness, compliance and high self-esteem in the profiles of women with negative attitudes towards pornography.

In addition, at the five percent significance level, we observed significant difference in the ‘femininity/masculinity’ factor between women with different attitudes towards pornography, which is associated with traditional feminine sexual behaviors corresponding to the gender stereotypes described in the literature. These results agree with low scores on the EIAS, including ‘permissiveness’, ‘impersonal sex’, ‘sexual excitability’, and ‘sexual libido’, and with the data obtained from the 16 PF on high-normative behavior, self-control, shyness, and compliance.

It is easy to notice that all these factors correspond to the qualities of a conscientious, responsible person, with a developed sense of duty, who observe generally accepted moral rules and norms but is, however, socially passive, cautious, shy. Such a person finds it difficult to accept the new, especially in the sexual sphere due to some rigidity of thinking and shyness.

In addition to the above stated personality traits, women with negative attitudes towards pornography are sociable, emotionally stable, restrained, sensitive, have a rich imagination, are dependent on the opinions and requirements of the group, are not frustrated. This is also true for women with positive attitudes towards pornography.

The analysis of the distribution of the Cattell sixteen factors in the averaged profiles of women with negative and positive attitudes towards physical sexual contact (Fig. 5) indicated that such personality traits as subordination (E), self-restraint (F), compliance (tolerance) (L), and dreaminess (M) are prevalent in the profiles of women who avoid physical sexual contact. We obtained higher scores on the ‘self-esteem’ scale (MD). The EIAS results enabled us to assume the correspondence to feminine behaviors in sexual issues.

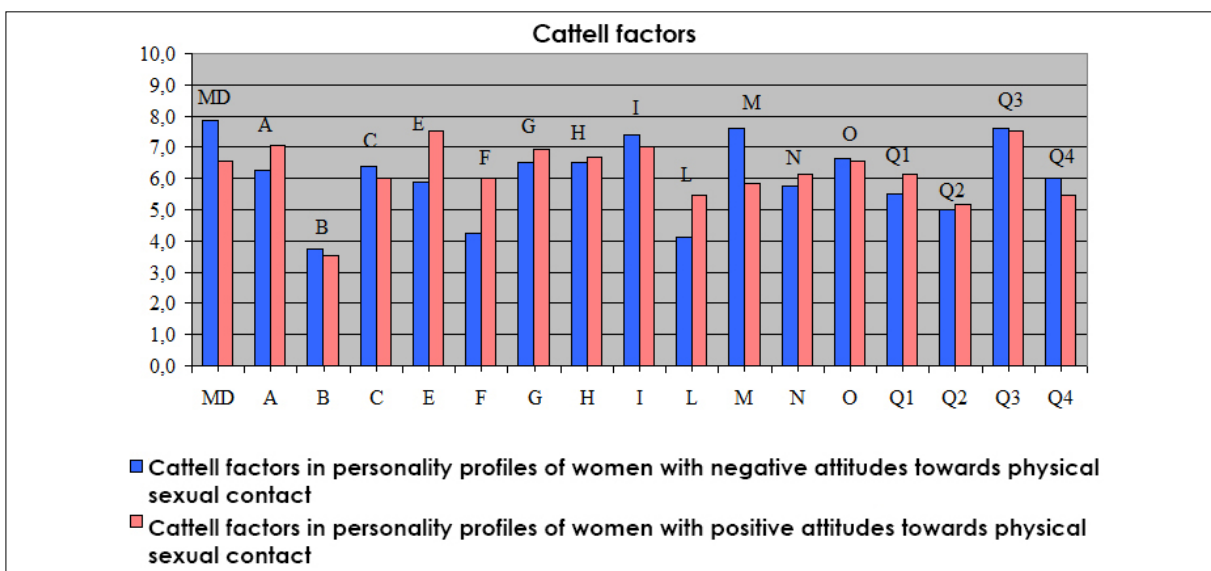


Figure 5. Averaged profiles of women with positive and negative attitudes towards physical sexual contact (Cattell Sixteen Personality Factor Questionnaire, 16 PF)

The results for statistical verification of this aspect of the sexual sphere are presented in Table 2. At the 1 percent significance level we observed significant differences in factors L and M in the profiles of women with different attitudes towards physical sexual contact. At the 5 percent

significance level we observed significant differences in factors E and F in the profiles of women with different attitudes towards physical sexual contact. In the profiles of women who avoid physical sex, these factors are associated with the following characteristics: obedience, submission, shyness, prudence, self-restraint in emotional manifestations, tolerance, compliance, as well as dreaminess and flight into illusions.

Table 2

Empirical values for Fisher's F test in the profiles of women with negative attitudes towards physical sexual contact

Factor	Designation	F_{emp}	p
MD	Adequate self-esteem / Inadequate self-esteem	0,53	
A	Unsociability/sociability	0,7	
B	Concrete (rigid) thinking / abstract thinking	0,1	
C	Emotional instability / emotional stability	0,3	
E	Subordination/dominance	2,26	0,05
F	Self-restraint/expressiveness	2,04	0,05
G	Low-normative behavior / high-normative behavior	0,41	
H	Shyness/courage	0,31	
I	Sensuality/resoluteness	1,44	
L	Suspicion / credulity (compliance)	2,61	0,01
M	Dreaminess/practicality	2,98	0,01
N	Straightness/diplomacy	0,65	
O	Calm/anxiety	0,65	
Q1	Radicalism/conservatism	0,31	
Q2	Conformism/non-conformism	0,29	
Q3	Low self-control / high self-control	0,1	
Q4	Relaxation / emotional tension	1,08	

Such women, as a rule, have their heads in the clouds and wait for their prince. The above factors correlate with each other and correspond to the qualities of a gentle, dependent, flexible woman who is ready to give up her desires for the sake of a partner, but dreams of her one and only one man who will correspond to her inner expectations of romantic relationships. We may assume that women with such a personality portrait are immature and use such psychological defenses as flight into fantasy to protect their fragile inner world.

At the 5 percent significance level we observed significant differences in the ‘femininity/masculinity’ factor between women with negative and positive attitudes towards physical sexual contact. As mentioned above, this factor is associated with traditional female sexual behaviors, adherence to strict moral standards and attitudes, which is also consistent with the data obtained by the 16 PF and low scores on the following scales of the EIAS: ‘permissiveness’, ‘impersonal sex’, ‘sexual excitability’, and ‘sexual libido’.

In addition to the above personality traits, women who avoid physical sexual contact are characterized by emotional stability, rigidity, and the ability to control their emotions and behaviors. Lower scores for factor A indicate difficulties in establishing interpersonal, direct contacts, excessive strictness in assessing people, which may also be associated with the presence of a negative past experience related to violence in a woman’s life. Similarly to women who seek physical sex, those who avoid physical sexual contact are sensitive, diplomatic, calm, conservative, sociable, and non-frustrated.

The analysis of the distribution of the Cattell sixteen factors in the averaged profiles of women with negative and positive attitudes towards manifestations of sexuality (Fig. 6) indicates that such personality traits as shyness (H), sensitivity (I), compliance (tolerance) (L), dreaminess (M), anxiety (O), and higher self-esteem (MD) are more pronounced in personality profiles of women with sexual aversion.

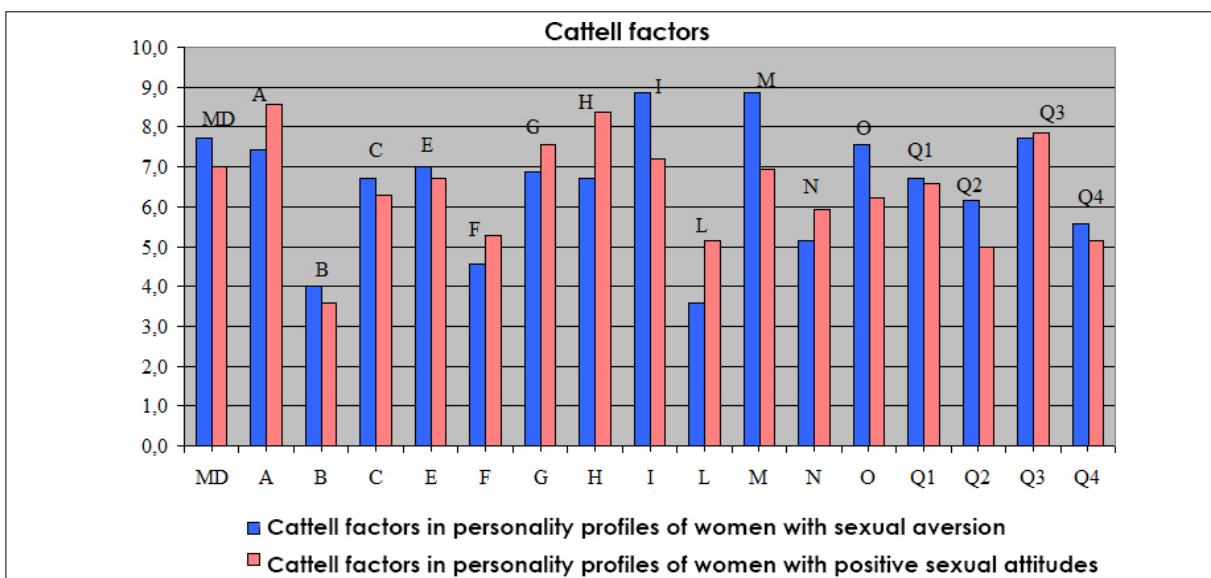


Figure 6. Averaged profiles of women with positive and negative attitudes towards manifestations of sexuality (Cattell Sixteen Personality Factor Questionnaire, 16 PF)

Table 3 shows statistics for this parameter.

Table 3			
<i>Empirical values for Fisher's F test in the profiles of women with sexual aversion</i>			
<u>Factor</u>	<u>Designation</u>	F_{emp}	ρ
MD	Adequate self-esteem / inadequate self-esteem	0,86	
A	Unsociability/sociability	1,23	
B	Concrete (rigid) thinking / abstract thinking	1,37	
C	Emotional instability / emotional stability	1,22	
E	Subordination/dominance	0,25	
F	Self-restraint/expressiveness	0,19	
G	Low-normative behavior / high-normative behavior	0,08	
H	Shyness/courage	1,76	0,05
I	Sensuality/resoluteness	1,94	0,05
L	Suspicion / credulity (compliance)	1,59	
M	Dreaminess/practicality	1,83	0,05

Table 3

Empirical values for Fisher's F test in the profiles of women with sexual aversion

<u>Factor</u>	<u>Designation</u>	F_{emp}	p
N	Straightness/diplomacy	1,18	
O	Calm/anxiety	1,83	0,05
Q1	Radicalism/conservatism	0,08	
Q2	Conformism/non-conformism	0,19	
Q3	Low self-control / high self-control	1	
Q4	Relaxation / emotional tension	0,59	

At the 5 percent significance level we observed significant differences in factors H, I, M, O in the profiles of women with different attitudes towards sexuality.

These factors are responsible for the degree of manifestation of certain traits in the profiles of women, including shyness, timidity, emotional restraint, increased sensitivity, romanticism, dreaminess, focus on one's inner world, anxiety, vulnerability, and tendency towards depression, as described above. Guilt and self-discontent may be also observed. We may assume that women with such a personality profile are excessively sensitive, fearful, feel insecure when communicating with others, find it difficult to establish contacts, especially in partnerships, because of subtle emotionality and, possibly, neuroticism (high scores on scale I). Due to the feeling of vulnerability and excessive claims to a partner, they avoid sexual relations as the most traumatic for their inner world, which correlates with low scores on scale F, which is associated with caution in choosing a communication partner. We may assume a higher cultural level, an artistic type of personality and anxiety as a property of personality in women of the studied group. The above conclusions are consistent with higher scores on the 'sexual neuroticity' scale of the EIAS, which may indicate a certain imbalance or functional changes in the behavior of women with sexual aversion. Low scores on the 'sexual excitability' scale indicate the need for a number of certain conditions to get into a state of sexual arousal, which is associated with high emotionality and sensitivity of women in this group. All of the above may be associated with the presence of a negative experience related to violence in women who avoid physical sexual contact.

Similar to women with negative attitudes towards pornography, in the personal profiles of those with negative attitudes towards the manifestation of sexuality we observed high scores on the

scales of emotional stability (C), normative behavior (G) and self-control (Q3), which determines the degree of volitional characteristics.

On the 'femininity/masculinity' factor we did not observe any significant differences between women with sexual aversion and women with positive sexual attitudes.

Despite a number of significant differences, women with negative attitudes towards manifestations of sexuality and those with positive sexual attitudes are sociable, independent; they are characterized by the independence of judgments, views, and behaviors.

Discussion

Thus, traditional (feminine) views on sexual behaviors, desire to establish personal relationships between partners, desire to save a marriage, and intolerant attitudes towards everything immoral and shameful are prevalent in women with negative sexual attitudes. As a rule, they have low sexual sensitivity and excitability.

Such personality traits as high, sometimes inadequate self-esteem, rigid thinking, high-normative behavior, subordination, shyness, prudence in choosing a partner, self-restraint in emotional manifestations, as well as dreaminess, flight into illusions are prevalent in personality profiles of women with negative sexual attitudes.

Along with the above personality characteristics women with extremely negative sexual attitudes are characterized by increased sensitivity, tendency towards romanticism, anxiety, vulnerability, and tendency towards depression. Guilt and self-discontent may be also observed.

The results confirm the main hypothesis that women with negative sexual attitudes have specific personality characteristics.

The theoretical and practical data obtained in this study may be used in counseling to predict negative sexual attitudes and to develop appropriate correctional programs, as well as in the practice of upbringing and psychological support of teenage girls by leveling the factors that contribute to the formation of negative sexual attitudes.

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Original research article

Professionally Important Qualities of Bachelors in Technosphere Safety

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Abstract

Introduction. Professional development of cadets training under the Technosphere Safety program, 03.20.01 (hereinafter, referred to as bachelors) is largely characterized by the development of professionally important qualities. Professionally important qualities of bachelors are shaped at the university. Educationalists' understanding of such qualities enables them to find the ways to improve the quality of vocational training. To date, this is the first study to distribute professionally important qualities into groups depending on bachelors' operational actions in risk situations.

Methods. These were questioning and analysis of psychological, pedagogical, and specialized literature. The study used the personality-activity approach to analyze and interpret professionally important qualities. The sample comprised of 71 mid-level and high-level commanding officers of the Ministry for Extraordinary Situations of Russia. At the first stage the authors specified 23 professional qualities that are important for bachelors and also four groups of their manifestation. At the second stage, the questionnaire-based data enabled authors to distribute qualities into groups. Each group contained the most important quality.

Results. This section describes the distinguished groups of professionally important qualities, including (a) universal qualities (courage), (b) qualities important for professional activities (speed of assessment of operational situations), (c) qualities providing staff management (leadership), and (d) qualities of self-management (stress tolerance).

Discussion. The authors consider professionally important qualities as a component of bachelors' success in environments with risk factors. The findings of the study are of particular interest to universities. The studied qualities may be used to evaluate graduates' personality and to determine failures in their training. This aspect enables educationalists to purposefully create special conditions for the manifestation of professionally important qualities of a certain group in the educational process.

Keywords

personality, bachelor, professional activity, important qualities, manifestation of qualities, risk factor, stress tolerance, courage, speed, leadership

Highlights

- Professional activity of bachelors requires professionally important qualities.
 - The manifestation of bachelors' professionally important qualities depends on the implementation of operational actions in environments with risk factors, which makes it possible to divide them into groups and to distinguish the most important ones.
 - Modeling professional situations, which enable the manifestation of bachelors' professionally important qualities in risk situations, may be considered as a technology for their formation.
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Introduction

The efficiency of professional activities of officers in the Federal Fire Service ensures the safety of lives of individuals and material assets of the state as well. As practice shows, among all the graduates of universities of the Ministry for Extraordinary Situations bachelors take up the posts related to practical activities more often. Thus, in 2017, more than 80 % of graduates of the Ivanovo Fire Rescue Academy of State Firefighting Service of EMERCOM of Russia were appointed to the position of a guard commander, deputy chief, and chief of the fire and rescue unit. An essential feature of these posts is to provide guard duty in the fire and rescue unit and to carry out the main combat mission.

During emergency response, officers are subjected to excessive physical, psychological, and psycho-emotional stress (Chovdyrova, 2016). Bachelors' identity is influenced by the need to carry out activities at night, in unsuitable for breathing environment, taking into account the conditions and limitations of time resources (Grinchenko & Tarakanov, 2018). In solving professional tasks bachelors should take reasonable risks and be responsible for subordinate personnel when giving orders (Mardakhaev, 2015; Karpov & Karpov, 2016).

The analysis of the relevant literature enabled us to distinguish the following main operational activities of bachelors: (a) decision-making and the realization of these decisions, (b) inclusion in activities while maintaining managerial functions, (c) implementation of professional activities in accordance with official duties, interacting with staff, (d) quick assessment of a situation and analysis of options for possible actions, taking into account tactical capabilities of a unit, and (e) ensuring the reliability of the implementation of tasks in situations of professional risk right up to life sacrificing.

The above operational actions are carried out in the extreme environment, which is characterized by suddenness, scale of the emergency and the duration of the impact of risk factors on individuals. Due to the lack of necessary experience in bachelors, insufficient understanding of the professional situation as a whole, insufficient psychological preparedness and a low level of emotional stability, the process of performing professional activities is disrupted. Stress among bachelors is one of the main factors in the failure to complete the task (Strel'nikova, 2015).

In insufficiently prepared individuals stressful situations provoke such mental states as severe excitement, short-term or long-term stupor, manifested in immobility and silence (Shevchenko & Makarova, 2016). Confusion leads to difficulties in analyzing the incoming information, the implementation of incorrect actions, and a distortion in perceiving time intervals. This leads to reduced efficiency, errors, disruptions, increased likelihood of injury and failure to complete the task (Strel'nikova, 2015; Zhuikova, 2015; Shipilov, Sharabanova, Zeinetdinova, & Kokurin, 2017). We should also note that the duration of the emergency response process requires constant mobilization of bodily resources.

Therefore, the successful implementation of operational actions in situations with risk factors depends on a number of conditions: (a) providing bachelors with information about professional situations, reliability of fire engines, fire fighting equipment and personnel, and (b) developed professional skills, abilities and personality traits that support a person's ability to work when solving tasks in atypical conditions of professional activity (Shoigu & Tarasova, 2017; Hansen, Netteland, & Wasson, 2016).

This study aims to identify professionally qualities important for a bachelor in technosphere safety and to distribute them into groups depending on the provision of operational actions in risk situations.

Methods

Research Design

The study was carried out in 2016. The experts were faculty members of the Ivanovo Fire Rescue Academy and mid-level and high-level commanding officers of the Ivanovo Local Fire and Rescue Garrison (n = 71).

The study was carried out in two stages. At the first stage, we distinguished professional qualities important for bachelors to implement professional activities and the main groups of their manifestation. At the second stage, we distributed the identified professional qualities into groups based on expert assessments. Each group contained the most important quality.

Research Methods

The study used the personality-activity approach that takes into account individual characteristics of each person (Kozhunov, 2016). The personality aspect of this approach ensures that the bachelor fulfills the tasks in the professional environment. The activity aspect prepares bachelors for self-realization when carrying out tasks for a professional purpose. On the basis of this approach, we identified professionally important qualities and their manifestation when bachelors perform tasks in the environment with risk situations.

The selection of professionally important qualities and their distribution into groups was carried out in the process of theoretical analysis of studies, psychological, pedagogical, and specialized literature. We developed a questionnaire to distribute the qualities into groups. The developed questionnaire represents a table. The head row of the table contains groups of manifestations of professionally important qualities; its left part contains a list of qualities. The experts should have marked an unlimited number of qualities necessary for each group of their manifestation. Moreover, the experts were asked to specify the most important quality for each group.

Results

The analysis of the relevant literature showed a close association of the concepts of 'professionally important qualities' and 'professionally significant qualities' (Dushkov, Korolev, & Smirnov, 2005, p. 471). The concept of 'professionally important (significant) qualities' was initially considered in specialized literature and studies on military psychology. Military psychologists emphasize that in order to solve the tasks of military professional activity, training and education, military personnel should have strong-willed character traits, as well as value orientations, motives, attitudes, and physical qualities (Marishchuk, 1982; Barabanshchikov & Fedenko, 1981, p. 90).

This aspect enabled us to distinguish 23 professional qualities important for bachelors, including the speed of assessment of operational situations, speed of decision-making in distracting influences and lack of time, speed of reaction to an unexpected auditory impression through certain actions, fidelity to professional duty, mutual assistance, discipline (manageability), collectivism, leadership, resourcefulness, responsibility in difficult situations, professional skills of observation, resoluteness, self-esteem, independence, courage, quick-wittedness, stress tolerance, exactingness, self-confidence, physical endurance and resistance to physical fatigue, purposefulness in distracting difficulties, and emotional stability.

The analysis of the nature of professional activities of officers of the Federal Fire Service enabled us to distinguish groups of professionally important qualities and provide their qualitative characteristics (Table 1).

No.	Groups of qualities	Qualitative characteristics
1	Universal qualities. Qualities that form the basis for bachelors' personality and enable them to perform actions for professional purposes	Bachelors' propensity for professional purposes
2	Qualities important for carrying out professional activities in risk situations. Predisposition of the bachelor to activities for professional purposes in risk situations	Bachelors' propensity for activities for professional purposes in risk situations
3	Qualities providing personnel management in risk situations	Bachelors' ability to manage personnel in risk situations
4	Qualities important for self-control in risk situations	Moral and psychological stability of bachelors' personality

After the survey of officers we distributed professionally important qualities into groups. Table 2 shows the results.

No.	Professionally important qualities	%
1	Discipline (manageability)	2,7
	Responsibility in difficult situations	4
	Purposefulness in distracting difficulties	9,3
	Resourcefulness	20
	Self-confidence	14,7
	Speed of reaction to an unexpected auditory impression through certain actions	18,7
	Courage	30,7
2	Speed of assessment of operational situations	24
	Professional skills of observation	12
	Quick-wittedness	9,3
	Independence	6,7
	Physical endurance and resistance to physical fatigue	18,7
	Mutual assistance	14,7
	Collectivism	14,7
3	Leadership	46,7
	Speed of decision-making in distracting influences and lack of time	34,7
	Exactingness	18,7
4	Fidelity to professional duty	9,3
	Resoluteness	16
	Selflessness	5,3
	Emotional stability	29,3
	Stress tolerance	38,7
	Self-esteem	1,3

Thus, each group contains the quality that comprehensively characterizes bachelors' personality in the learning process. These qualities are courage (30.7 %), quick assessment of operational environment (24 %), leadership (46.7 %), and stress tolerance (38.7 %).

Discussion

The analysis of the specialized literature and the results of the study enabled us to clarify the concept of 'professionally important qualities' of bachelors in Russian Ministry for Extraordinary Situations. This definition refers to the qualities that determine bachelors' ability and willingness to carry out activities for professional purposes in emergency response, which provide management of personnel and self-management in risk situations, showing fidelity to professional duty, resoluteness, and selflessness.

The review of the relevant literature confirms the findings of the experimental study. Thus, the effectiveness of the implementation of activities is closely interrelated with stress tolerance, courage, and resoluteness (Vlaskina, 2013). Stress tolerance ensures individuals' adjustment to extreme conditions to endure physical, intellectual, volitional, and emotional stress (Shevchenko & Makarova, 2016; Zhuikova, 2015). Courage helps individuals overcome the fear of a real or imagined danger. Resoluteness affects the speed of choice and decision making and also the implementation of subsequent actions (Glazunov & Sidorov, 2016). Leadership provides individuals' self in their consciousness and represents a combination of socio-communicative and socio-psychological means for ensuring the organization of social communities (Lozova, 2017; Martens, 2018). The indications of the development of professionally important qualities include the following skills of bachelors: (a) choosing and making managerial decisions, (b) predicting further actions, (c) analyzing situations, and (d) carrying out operational actions as a fire brigade commander.

Conclusion

The authors of the article do not replace the understanding of the essence of professionally important qualities of cadets-bachelors, but supplement it in the training section at universities of the Ministry for Extraordinary Situations of Russia.

Distribution of professionally important qualities into groups will make it possible to assess the professional development of bachelors' personality in universities of the Ministry for Extraordinary Situations of Russia and ensure its adjustment as a part of a purposeful pedagogical process (Sizikova, Anikeeva, Galkina, Mardakhaev, Starovojtova, & Makarov, 2015; Egorychev, Mardahaev, Rybakova, Fomina, & Sizikova, 2014; Mardakhaev & Makarenko, 2015; Romanov, 2015; Irkhina, Irkhin, Davydenko, Shehovskaya, & Krolevetskaya, 2016; Isaeva, Mamatova, Kovalenko, & Kurganskiy, 2016; Levanova, Sleptsova, Khripunkova, & Mazkina, 2018). To ensure this aspect, the training process should be focused on the development of personal qualities by virtue of motivation for self-development (Migunova, 2016). We should also emphasize that special attention should be paid to the intellectual, volitional, emotional, and physical spheres of personality (Tsilik, 2015). At the same time, faculty members and commanding officers must continuously improve the above specified professionally important qualities of bachelors through operational images of typical and atypical situations (Anikeeva, 2013). To achieve this goal it is necessary to use modeling of professional situations that may contribute to emotional states, ensuring the development of individuals' ability to self-regulation (Vasil'ev, 2017; Popova, 2018).

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No conflict of interest