Features of Semantic Spaces of Students' Mental State Image in Dynamics of Time

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ABSTRACT

An increasing interest of scientists in processes of person's self-knowledge, their place in subject and social world, and representation of this knowledge in human's consciousness determined the relevance of the research. The study of semantic spaces is of specific importance as a mental state represents an individual subjective phenomenon of human mentality, and determination of universal regularities in their representation can also reveal regularities in the formation of world image and structure of ideas about it. The paper concentrates on the identification of semantic spaces of a figurative level of mental representations of students' mental states. The following are the leading methods applied to research this problem: associative experiment, semantic differential and method of subjective scaling to reveal the degree of similarity characteristic to semantic spaces of students' mental states. Content analysis, correlation and factorial analyses, and the assessment of proximity / remoteness of state images according to empirical (average) data on the basis of paired comparison were applied in results processing. The paper provides associative characteristics, categorical grounds and proximity / remoteness of state images in increasing time spans. The comparative analysis of semantic spaces of students' mental states images in different time spans was carried out. The specificity of semantic spaces of states images, their proximity / remoteness, categorization and regularities of structuring in dynamics of time are identified. It is proved that the greatest similarity of actual state image was found with the state image which will occur in a week, and the least – with the state image experienced a year ago. The research results are of practical importance; they explain the mechanism of mental states self-regulation: transition from one mental state to another by means of their semantic spaces proximity in consciousness of students.

Introduction

Mental representations of psychic phenomena make one of the most relevant problems in modern cognitive psychology. It is connected with the study

of the way the individual knows themselves and others, accumulates knowledge of the outside subject and social world, the way this knowledge is presented in consciousness, and is reproduced and changed in the course of activity. Researches in the field of anthropology provide prospects for answering these questions.

In Russian psychology mental representation is studied as a result of reflection of the external in the form of a system of developed representations entering the subject's individual experience. We agree with M.A. Kholodnaya (2002) that mental representations are "… an actual intellectual image of this or that specific event (i.e., the subjective form of "vision" of events)". A psycho-semantic approach is an effective method to study individual experience and mental representations as well; within its frameworks the personality is considered as the carrier of a complex world picture that includes ideas about external objects and mental phenomena (Petrenko, 1983). Ascertainment of states representation regularities in structures of subjective experience can promote the identification of psychological mechanisms forming a world image and the model of psychic (Sergienko, 2014).

Some works of Russian researchers investigate this issue; they reveal the specificity of mental representations of emotions and emotional states. Emotional content of mental images is studied in A.A. Gostev's (1992) work; he specifies a number of subjective characteristics of imagination: image vividness, its controllability and brightness.

Researches of foreign authors proved that the nature of mental representation of emotions is connected with their different modality, intensity and sign (Barrett & Fossum, 2001). Comparing a perceptual image and an image of mental representation Richard (Richard, 1986) identifies that the latter keeps topological properties of objects, is not connected with perceptual modality, is not divided into parts, and due to spatial properties can arrange information which does not have spatial characteristics.

Important results testifying to the dependence of individual knowledge organization on person's emotional states are presented in V.F. Petrenko's (1983) work. It is found out that the world picture can significantly and naturally change under the influence of different emotions: under the influence of strong affective experience the surface layer of world image can be reduced, as a result a person seems to lose the most part of knowledge, and perceives the surrounding world only through a prism of a rating scale well – bad.

Despite some works on figurative characteristics of mental representations of mental states, we will note the lack of data on semantic spaces of images, their saturation, categorization, proximity/remoteness, structural organization, and regularities of changes within time spans. Therefore the objective of this research is to study peculiarities of semantic spaces of state images in students in increasing time spans.

Methodological Framework

The following methods and techniques were applied to study a subjective system of values forming semantic spaces of images of current, past and future states.

Associative experiment (controlled associations)

The general scheme of associative experiment was as follows: the testee was presented a word-stimulus to react and to give associations that come first to their mind. The associative stream was limited to the instruction in our research: we asked testees to describe their feelings, experiences, sensations, physiological changes, and actions in the following states: 1) actual state; 2) last week state; 3) last month state; 4) last year state; 5) a state in a week; 6) a state in a month; 7) a state in a year.

Classical semantic differential by Osgood (Osgood, Suci & Tannenbaum, 1957)

Testees were offered to place according to their own representations each of the states (an actual state) described in the first task on the right or left edge of a scale. They described their states, placing them on each of 25 scales of classical semantic differential.

Method of subjective scaling

Testees estimated the degree of similarity of mental states which they described in previous tasks on a 10-score scale where "0" designates absence, and "9" – the highest degree of similarity of mental states.

50 testees (25 young men and 25 girls) aged between 18 and 27 made the sample of the research. They are students of Kazan universities gaining different specialties. The research was conducted during students' academic activity (at lectures and seminars).

Content analysis, correlation and factorial analyses were applied to process data; proximity/remoteness of state images was assessed according to empirical (average) data on the basis of paired comparison. Statistical program SAPSS 16.0 was used to process research results.

Results

The content analysis of associations of state images in different time spans

Values of semantic spaces of images were divided into 4 groups when associative experiment results were processed: operants relating to mental processes, physiological reactions, experience and behavior.

Most testees defined the following actual ("here and now") states: exhaustion/fatigue (18%), tranquility (18%), pleasure (12%), anxiety (10%). In other words, in comparison with other groups of states – intellectual (12%), volitional (4%) and motivational (10%) –emotional (52%) and psychophysiological (22%) states prevailed.

It was found out that a state image and its understanding are mediated by the intensity of experienced state. States of a higher level of mental activity (pleasure, euphoria, nervousness/anxiety, etc.) are perceived more differentially. The general regularity was revealed: images of those states which are more often actualized in the course of activity and are more intensively experienced have more semantic characteristics. State images of a low level of mental activity (indifference, exhaustion) are less differentiated in consciousness;

numerous crossings of structural peripheries of images including bigger quantity of general operants (drowsiness, passivity, apathy, detachment) testify to this fact. The degree of their semantic similarity is very high.

The analysis of results shows that semantic space of state images in temporary dynamics *from the past to the future* has its specificity:

– operants of mental processes and physiological reactions occupy the greatest volume, and operants of experiences and behavior take the smallest volume in semantic space of an actual state in comparison with spaces in other time samples;

– the more time has passed since the moment the person experienced this or that state, the bigger volume is occupied by operants of behavior in semantic space;

– operants of experience are better depicted in states of past and future than in the image of an actual state;

– operants of physiological reactions are reflected in semantic space of an actual state in more details, and they are poorly presented in remote time spans;

– semantic characteristics of an actual state image are presented most fully; then characteristics of images of the past come; images of the future are least of all saturated; characteristic of images in annual intervals are closer from the point of view of volume.

Factor characteristics of state images

The following factors that make the basis of state images in different time spans were specified at further data processing by means of factor analysis and subsequent expert assessment (Table 1).

Table 1. Factor structure of semantic spaces of mental states images in the temporary continuum *past – actual (present) – future*.

№ of Factor	Actual time	Week ago	Month ago	Year ago	In a week	In a month	In a year
1	Ass.	Ass.	Ass.	Ass.	Rel.	Rel.	Rel.
2	Str.	Act.	Val.	Rel.	Ass.	Ass.	Ass.
3	Comf.	Rel.	Rel.	Comf.	Comf.	Compl.	Act.
4	Act.	Str.	Act.	Act.			
5	Intens.	Comf.	Str.				
6	Compl.	Compl.	Compl.				
7	Dynam.	Or.	Comf.				
8	Novel.	Val.	Or.				

Notes: Ass. – an assessment, Str – strength, Comf. – comfort, Act. – activity, Intens. – intensity, Compl. – complexity, Dynam. – dynamism, Novel. – novelty, Rel. – relation, Or. – Orientation, Val. – value.

Generalizing data of factor analysis, it is possible to note the following main regularities:

- Semantic spaces of actual state images of a week and monthly period are the most volume and rich. The state image of a year period is characterized by a less semantic space and bigger generality. Semantic spaces of images of future anticipated states differ in more simplicity, lack of specificity and differentiation.

- Categorical structures of consciousness that make the basis of states images are especially difficult in images of actual time, and in images of week and monthly period, and they are simple for future.

- Factor "Relation" is present in semantic spaces of states experienced a week, month and year ago and in spaces of all future states though it is absent in an actual state image. Its significance increases with deepening into past; in all anticipated states it is on the first place. The role of this factor, in our opinion, is connected with the state image realization as the response (assessment) to last and future circumstances of being.

- The semantic space of an actual state image is characterized by two unique factors – "Dynamism" and "Novelty"; it is apparently connected with states variability when actual situations of subject's activity change.

- Factor "Strength" is present in the structure of actual state images, week and monthly limitation. It might single out due to the intensity (brightness) of experienced images stored in memory; as a result these semantic spaces are categorizes by the factor "Strength".

- Proximity/remoteness of state images.

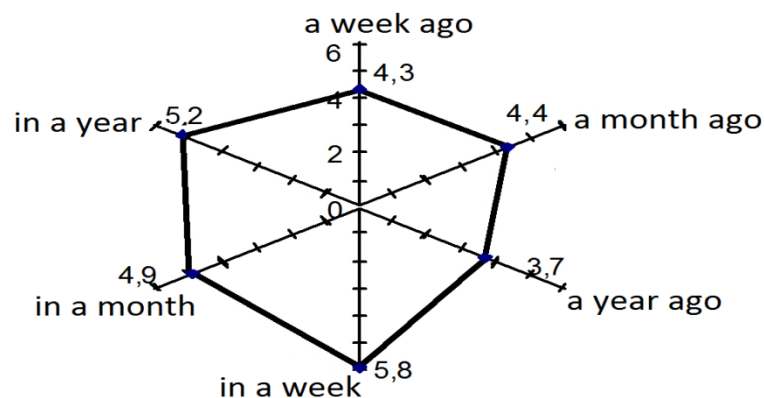- The analysis of proximity/remoteness of state images resulted in the following (Figure 1).

Figure 1. Proximity of an actual state image with state images in the past and future (average values).

The semantic space of an actual state image is more similar to images of anticipated states than to images of the past. The closest semantic space to an actual state image is the state which the individual is eager to experience in a

week, slightly less close – in a year and in a month. The most remote from of an actual state image is semantic space of state image experienced a year ago; the state image experienced a week and a month ago is a bit closer.

In general actual state images have more proximity to images of the future than past; actual states images correspond to anticipated states, and they are direct to them.

Comparative analysis of semantic spaces of mental states images in different time spans

Let us consider non-equilibrium states images of different levels in mental activity. The state image of *nervousness/anxiety* (a high level of mental activity) caused a stream of associations on the part of physiological reactions and behavior, i.e. this state is characterized by the connection of external (behavioral manifestations) and internal (physiological reactivity) types of activity. Awareness of activity of internal experiences and cognitive processes is less expressed; associations are periodic. Thus, intensive experience of nervousness is transformed into external dynamic manifestations.

When correlation relations inside the state image of nervousness/anxiety was considered, it was revealed that structure-forming indicators are states of muscular tone, cardiovascular and respiratory systems, orientation and intensity of experiences, activity, randomness and instability of behavior.

Structuring of the general constellation begins with the emphasis of cognitive processes indicators which, however, are insignificantly connected between themselves, and are mostly attached to central indicators that characterize a scale of physiological reaction. Then, with a monthly time interval in the beginning, the dominance passes to indicators of the scale of experiences, and in the end (an annual interval) centers with indicators on a behavior scale are formed. Thus, the tendency to expand state experience is repeated: from the internal plan of activity into external plan of behavior and actions. It is possible to believe that awareness of nervousness/anxiety image occurs unevenly: it begins with the feeling of "confusion" of cognitive processes, understanding of changes on the part of physiological reactivity, and only then behavioral activity takes place. It has an effect of inconstancy on students' experience of this state.

Associations of the state image *interest* are mostly presented by functioning of cognitive processes and experiences. Associations revealing understanding of behavior when interest in something is experienced appear closer to an annual interval. Some time is probably required to understand behavioral manifestations as an internal action plan is formed at first, and then behavior is actualized.

The correlation constellation of state image of interest testifies that structure-forming indicators are scales of mental processes and physiological reactions, and several behavioral indicators as well. Thus, intensification of all cognitive functions is the cornerstone of state image structure of interest: perception, thinking, imagination, attention, i.e. expressed experience of interest in something deploys all mental resources. Dynamics of a state image structure is characterized more by quantitative changes in the constellation than by qualitative. Image awareness is developed evenly and gradually through time.

The state image of *exhaustion* is associated with depression of cognitive processes and experiences; subsequently it is supplemented with unpleasant physiological sensations. The image of exhaustion is realized (developed) through time gradually and evenly (Table 2) in the same way as the image of interest.

Table 2. Factor structure of semantic spaces of mental states images in the temporary continuum *past – actual (present) – future*.

Parameters of mental state image	minute	24-hour period	month	Half a year	year
Cognitive processes	33%	31%	27%	26%	25%
Experiences	29%	34%	33%	33%	31%
Physiological reactions	17%	15%	19%	23%	23%
Behavior	21%	20%	21%	18%	21%

The structure of a correlation constellation of the image of exhaustion includes thinking, speech, volitional processes, physiological indicators of physical activity, state of mucous in the mouth, color of skin, experience of passivity, drowsiness, inertia, behavior inconsistency and relaxation. Exhaustion is subjectively experienced as decrease in mental processes intensity, passivity in experiences and behavior; that characterizes it as a state of a lower level of mental activity.

Structural characteristics of states images

The analysis of correlation constellations and structure-forming indicators revealed relations clusters, that change with time around separate characteristics. 5 constellations on each of 5 states were created. The comparison of constellations revealed indicators around which a lot of relations were constantly centered, and there were those which appeared once and disappeared without influencing the general structure of the image. We united all constellations in a *complicated* one and designated those correlation relations which arose constantly in each time interval. Indicators around which there are lots of relations with other image characteristics are best of all visible in a complex constellation. They appear to be structure-forming ones (Table 3).

Table 3. The ratio of components in the structure of state images.

Parameters of a mental state image	Euphoria	Anxiety	Interest	Indifference	Exhaustion
Cognitive processes	+	*	+	+	+
Experiences	+	+		+	+
Physiological reactions		*	+	+	+
Behavior		*	*		

Notes: "+" – continuous dominance of a component in the structure of an image; "*" – changeable expressiveness of a component.

Table 3 shows that cognitive processes and experiences are structure-forming in all time spans for the image of *euphoria*, experiences are for the image of *exhaustion/anxiety*, cognitive processes and physiological reactions are for the image of *interest*, cognitive processes, experiences and physiological

reactions are for the images of *indifference/apathy*. These components of semantic spaces structures of images are invariants in time.

Discussions

Previous works (Prokhorov, Chernov & Yusupov, 2015a) have close results; they specified the role of cognitive processes in the general structure of students' cognitive mental states.

When mental representations of psychic states were studied (Prokhorov, Chernov & Yusupov, 2015b) it was found out that the assessment of a mental state reflects subjective evaluative relationships. The latter is dependent on situations. Non-equilibrium and equilibrium (steady) states of average and low levels of mental activity have less expressed evaluative characteristics than states of a high level of mental activity; moreover, evaluations of states of the average level of mental activity are less differentiated between themselves.

Besides, phenomenological features of mental state images are considered: specificity and intensity of manifestation, organization and stability of relations in image structures, etc. Invariant structures of state images promoting preservation of an image in time are revealed. They allow the subject to realize, differentiate and distinguish own states in different temporary contexts and situations of activity. Besides, associative characteristics of mental representations of individual's mental states are shown (Alekseyeva & Chernov, 2015).

At the same time, despite the availability of some works on figurative characteristics of mental representations of mental states, we should have to note the lack of data on images semantic spaces, their intensity, categorization, proximity / remoteness, structural organization and regularities of changes in time spans. The conducted research was urged to eliminate this gap.

Conclusion

So, the conducted empirical research specified features of semantic spaces of mental state images in various time spans. Content analysis identified that semantic space of state images in temporary dynamics from the past to the future has its specificity: semantic characteristics of an actual state image are most fully presented. Besides, with the course of time since the moment of mental state experience, operants of behavior take the increasing volume in semantic space.

Factor analysis revealed that semantic spaces of actual state images of a week and monthly period are most volume and intense.

Components of semantic spaces structures of images that are invariants in time were identified. Thus, cognitive processes and experiences are for the image of *euphoria*, experiences are for the image of *anxiety*, cognitive processes and physiological reactions are for the image of *interest*, cognitive processes, experiences and physiological reactions are for the images of *indifference/apathy*.

The following regularities were determined as a result of research of semantic spaces of students' mental state images in dynamics of time:

1. Semantic spaces of actual states images are the most saturated; they contain the greatest number of lexical units. The farther in the past the image is represented, the less saturated semantic fields are. This regularity does not apply to the future: semantic fields of all anticipated states are simplest and slightly differ from each other in volume.

2. Semantic spaces of actual state images of a week and monthly period are the most complicated and differentiated; they are defined by a set of factors categories. The state image of a past year period is characterized by a simpler semantic space. Semantic spaces of future states images differ in a more simplicity and smaller differentiation, they are categorically simpler.

3. The image of an actual state in the semantic field is closer to an image of anticipated than past states. The greatest similarity of an actual state image was found with a state image which will be in a week, and the smallest with an image of the state experienced a year ago.

4. The specificity of states image structure-forming caused by the quality of states and level of mental activity was identified; regularities of their change in increasing time intervals were revealed.

Recommendations

The materials of this paper may be interesting to psychologists working in education, teachers and students of psychological specialties, and a wide range of specialists-teachers

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