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Cognitive styles and personality

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ABSTRACT

This paper investigates the relationship between cognitive styles and Eysenck personality dimensions. To measure cognitive styles, we developed a special twelve-scale questionnaire based on self-report (Field Dependence/Independence, Narrow/Wide Range of Equivalence, Flexibility/Rigidity of Cognitive Control, Impulsivity/Reflectivity, Concrete/Abstract Conceptualization, Tolerance/Intolerance of Unrealistic Experience). Two hundred and twenty eight second-year students (psychologists and teachers) took part in the study. We revealed four significant factors, one of which covered five cognitive styles and the other three included both cognitive and fundamental personality dimensions which we called "cognitive-personality complexes". The first complex included personality trait Extraversion/Introversion and two cognitive styles Field Dependence and Impulsivity. The second complex covered Psychotic trait and such cognitive styles as Field Independence and Wide Range of Equivalence. The third complex contained Neurotic traits and one cognitive style Intolerance. Thus, we showed the existence of the factor of "authentic" cognitive styles, on the one hand, and three mixed cognitive-personality styles, on the other, in the structure of individual behavior. The data obtained are useful for understanding the nature of the cognitive styles and the sources of human individual differences.

1. Introduction

Most contemporary psychologists regard cognitive style research as a promising approach to studies of personality individual differences (Cools, 2009; Curry, 2000; Kholodnaya, 2004; Riding, 2000; Riding and Rayner, 1998; Rusalov and Volkova, 2015; Sternberg, 2010; Tolochek, 2013; Witkin and Goodenough, 1982). It is known that cognitive styles are connected with many cognitive functions such as perception, learning, problem solving, thinking, intelligence, creativity (Hayes and Allinson, 1994; Kirton, 2003; Kozhevnikov, 2007; Sadler-Smith, 1998; Sternberg, 2010; Witkin et al., 1977). At the same time, Kirton (1994 and others) believe that cognitive styles are a direct expression of fundamental personality traits. Riding and Wigley (1997) claim that human behavior is determined primarily by personality resources (his/her meanings, plans, values, etc.), whereas the cognitive styles play a subordinate role by enhancing or weakening the efficiency of the person's resources. Shkuratova (1994) put forward an extreme point of view arguing that the cognitive styles should be eliminated from the category of "purely" cognitive formations and be referred to the category of personality traits.

Undoubtedly, cognitive styles reflect both intellectual and personality aspects of human behavior. In literature, there are already some data on the relationship between traditional cognitive styles and personality (including temperament and character). Many psychologists (Glicksohn, Naftuliev, and Golan-Smooha, 2007; Rawlings, 1984; Sternberg, 1990, 1994; et al.) refer the given individual properties to personality characteristics. Hodgkinson and Sadler-Smith (2003) maintain that the cognitive style construct permits psychologists to unite cognitive and personality processes into a single whole. Sternberg pointed out that "styles could provide a bridge between the study of cognition (e.g., how we perceive, how we learn, how we think) and the study of personality" (Sternberg, 2010, p.134–135).

However, in any empirical study the question arises of the relationship between personality and cognition aspects of a concrete cognitive style. One can expect three possible versions of their combinations: (a) one combination may include only cognitive styles; (b) the other combination may consist of only personality traits; (c) another combination may cover both cognitive styles and personality traits, i.e. cognitive-personality styles (CPS).

As Kholodnaya (2004) justifiably emphasizes, cognitive styles and personality are complex psychological constructs. They are theoretically well founded, but the empirical data on their interrelationship are still scanty and highly disputable (Cools, 2009; Kholodnaya, 2004; Pervin, 1994).

We think that one of the causes of the controversies in cognitive style research is the lack of adequate methods of their measurement. On the one hand, the tradition remains of cognitive style evaluation using mainly sensory–perceptual laboratory techniques stemming from Witkin's Embedded Figure Test (Witkin, 1950) to measure, for instance, Field Dependence/Independence and Kagan's MFFT (Kagan, Rosman, Day, Albert, and Phillips, 1964) to measure Impulsivity/Reflectivity. Therefore, the existing methods of measurement may result in

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the ambiguity of interrelationships of cognitive style characteristics and personality traits of a higher order.

On the other hand, cognitive styles became interpreted as individual characteristics of the control of higher mental processes harmonizing the individual's needs with his/her requirements of the environment (Klein, 1970). As Federman, (1964) pointed out the cognitive styles are determined not so much by perceptual processes, but by the stable traits of active personality. In this connection, an urgent task appeared of developing new methods of evaluating personality aspects of cognitive styles. These new tools must reflect the newest theoretical views about cognitive styles as coordinating and controlling mechanisms of human individual's behavior (Kholodnaya, 2004).

In psychological literature, a few attempts have been made of creating questionnaires for measuring certain cognitive styles on the level of personality self-report. The comparison of Cognitive style questionnaires with other methods of measuring personality traits showed rather high validity (e.g. Bardi, Guerra, and Ramdeny, 2009; Blajenkova, Kozhevnikov, and Motes, 2006; Budner, 1962; Cools and Van den Broeck, 2007; Haeffel et al., 2008; Kornilova and Chumakova, 2014; Sternberg, 2010). Unfortunately, in these questionnaires the researchers estimated, as a rule, only a limited number of cognitive styles.

We believe that a direct comparison in a concrete experimental setting of cognitive styles, measured with new methodical tools on the level of self-report, with widely known fundamental personality dimensions such as Psychoticism, Extraversion and Neuroticism (PEN) suggested by the Eysencks and others, is rather logical and highly promising for understanding personality aspects of cognitive styles.

H. Eysenck and his colleagues maintain that namely these three fundamental dimensions are universal and inherent in all the representatives of *Homo sapiens*. At present time, there is a plenty of evidence in favor of the notion that Psychoticism, Extraversion, and Neuroticism are genetically determined to a considerable degree (Eaves, Eysenck, and Martin, 1989; Eysenck, 1990).

Evidently, the comparison of the cognitive styles, measured on the self-report level, with PEN will help us to understand deeper the interrelationship between cognitive styles and personality dimensions. In the journal "Personality and Individual Differences", there are several papers devoted to the study of the interrelationships among PEN and cognitive styles. For instance, Rawlings (1984, p. 591) compared Psychoticism with Impulsivity. His results support the Eysencks' view that the P scale of the PEN contains a strong impulsivity component. Glicksohn, Naftuliev, and Golan-Smooha (2007, p. 1175) studied whether performance on a standard task assessing the cognitive style of Field Dependence–Independence, the Group Embedded Figures Task (GEFT), is a function of an Extraversion (E) and Psychoticism (P) interaction. Thus, the authors made a considerable contribution into the understanding of the relationship between cognitive styles and personality traits.

The objective of the present study was to construct of a new method (Cognitive-personality styles questionnaire—CPS-Q) for measuring cognitive-personality styles and to reveal their correlations and factor structure with PEN.

2. Method

2.1. Procedure

We organized testing according to the generally accepted ethical norms.

Participants were volunteers. They filled out CPS-Q and Eysenck PEN-questionnaire in a large auditorium after classes during the first week of spring semester. Researchers helped students if the questions arose. Testing was anonymous.

2.2. Participants

Two hundred and twenty eight students (167 female and 61 male), aged 17–22 (mean 19.28 ± 2.1), took part in the present study. The participants were second-year-students of psychological and pedagogical departments of Moscow universities.

2.3. Measures

We used two following techniques: CPS-Q (Rusalov and Volkova, 2015) and PEN-questionnaire (28 items)—adopted, modified, and shortened Russian version (Akhmetova, Safronova, and Slobodskaya, 2006; Slobodskaya, Knyazev, and Safronova, 2006).

2.3.1. Cognitive personality styles

We used the descriptive behavioral attributes of cognitive styles presented in the Kholodnaya (2004)'s monograph for the construction of CPS-Q. The author regards cognitive styles as individual specific stable ways of information processing (perception, analysis, structuring, categorization, and evaluation of reality), which were acquired during mental experience. As distinct from the traditional unipolar psychological measurements of cognitive styles, widely-accepted in psychological literature, our method (CPS-Q) enabled us to specify Kholodnaya (2004)'s ideas about the "splitting" of cognitive styles into two poles and to evaluate each pole as an independent psychological formation or as an independent scale. The latest Kornilova and Chumakova (2014)'s study confirmed the hypothesis about the relative independence of two opposite poles of Tolerance and Intolerance of Unrealistic Experience.

In the present study, we transformed six main traditional cognitive bipolar styles into twelve unipolar independent scales. This means that theoretically each person, for example, a person with high Field Independence can have any value on the scale of Field Dependence (high, middle or low) and vice versa. The questionnaire contains 60 items (5 items in each scale). We rated each style on 5-point Likert scale. Thus, the concrete scale is a continuum of the individual trait, which varies from 5 to 25 points. The scales have approximately normal distribution. We checked reliability and validity in accordance with usual psychometric procedures on two independent samples (in total, 221 participants). All the scales under study, measured by CPS-Q, have a rather high level of internal consistency. Cronbach's Alpha varied around 0.7–0.9 for different scales. In the present study we used a shorten version CPS-Q-S, which contain the items with maximum values.

Taking into account the fact that in various studies the content of the cognitive styles differ, below we decided to give a short description of the conceptual content of the used CPS scales and examples of the items.

1. Field Dependence (FD) expresses person's orientation to the external world when solving problems. The people of this type trust more in external impressions

   – I easily agree with my friends' opinion.

2. Field Independence (FI) reflects individual's ability to rely on one's own knowledge and experience, ignoring the other people's opinion

   – My own experience is more important for me than the opinion of my friends.

3. Narrow Range of Equivalence (NRE) is characteristic of the individuals who orient themselves to the differences between objects of activity. These people are highly sensitive to details and nuances

– When retelling the content of a movie, I like to describe it in details.

4. Wide Range of Equivalence (WRE) reflects personal bent to find a general strategy, general evaluation of the objects of activity (black/white, good/bad), to classify objects based on certain generalized foundations

– I easily divide people into good and bad.

5. Flexibility of Cognitive Control (FCC) shows person's easiness of passing from some cognitive functions to others (from abstract-verbal to imaginary ones), which ensures a high degree of automation of analysis of the complex environmental influences

– I memorize equally well both pictures and texts.

6. Rigidity of Cognitive Control (RCC) characterizes a degree of individual's difficulty in changing the ways of information processing in situations of solving complex problems

– It is difficult for me to pass from an image to an abstract word and vice versa.

7. Impulsivity (IMP) points out a spontaneous and high tempo of decision making in complex and uncertain situations and his/her orientation to mainly emotionally meaningful attributes. Such persons quickly put forward a great number of hypotheses in choice situations and, as a rule, commit many erroneous solutions

– I often make many decisions at first impression.

8. Reflectivity (REF) indicates a slow decision-making tempo, individual's inclination to a careful systematic check-up of facts, as well as, a use of more elaborate and balanced solving problem strategies

– I carefully check and recheck all the facts before making any decision.

9. Concrete Conceptualization (CC) reflects a person's preference for clear-cut instructions in performing complex tasks

– I prefer performing tasks, which have clear-cut instructions.

10. Abstract Conceptualization (AC) expresses an individual's tendency to cross the limits of the instruction. The persons of this type choose unusual ways of solving problems and easily establish various interrelationships between different objects of reality

– I suggest many versions of solving problems in complex tasks.

11. Tolerance of Unrealistic Experience (TUE) means the individual's inclination to be open to new information. The person evaluates the environment primarily according to its factual characteristics, even if these characteristics contradict or do not correspond to the earlier acquired notions

– I do not object to listening to other people's ideas.

12. Intolerance of Unrealistic Experience (IUE) expresses individual's tendency to perceive information primarily in terms of the expected and the usual. Such persons, as a rule, block the unexpected and controversial elements of information

– People who think differently upset me.

2.3.2. Personality

We evaluated PEN-scales with the help of Russian modified, validated, and shortened version of Eysenck PEN-questionnaire (Akhmetova et al., 2006; Slobodskaya et al., 2006). The questionnaire contains 28 questions, which allow us to estimate extraversion/introversion, neuroticism/emotional stability, psychoticism/kindness, lie/frankness. The researches checked reliability and validity in accordance with usual psychometric procedures. The sample was 1026 participants (455 boys and 571 girls) aged 11 to 17 years (14.4 ± 1.5). All the scales had a rather high level of internal consistency. Cronbach's Alpha varied from 0.74, 0.65, 0.53, and 0.59 for the scales respectively. In our study, we did not use the scale lie/frankness.

Bellow we give a short description of the dimensions used.

1. Extraversion/Introversion (EXTR). Extraverts are sociable, joyful, and lively. They like being in big companies. They are the life of the party. On the other hand, Extraverts are often unreliable. They frequently change friends and sexual partners. They are bored with uninteresting and hard work. Introverts are opposite to extraverts.
2. Neuroticism/Emotional stability (NEUR). Neurotics are emotionally unstable. They have such traits as low self-esteem, depression, anxiety, and guilt feeling.
3. Psychoticism/Soft-heartedness (PSYCO). Psychotics have such behavioral attributes as aggressiveness, stubbornness, goal-directedness, manipulation, sensation seeking, dogmatism, and masculinity.

Thus, the total list for statistical treatments included 15 indexes: 12 styles and 3 personality dimensions.

2.4. Analyses

We used SPSS-10 for obtaining necessary statistical data (means, standard deviations, correlations, and others). We applied factor analysis (Principal Component Method, Varimax Rotation with Kaiser Normalization) for obtaining the structure of interrelationships among cognitive styles and Eysenck Fundamental Personality Dimensions (PEN).

3. Results

Descriptive Statistics (KMO = 0.654; Bartlett sphericity values = 580.716; Df = 105; $p < 0.001$) showed that we have sufficient grounds for applying Factor Analysis.

Theoretically we assumed that there could be no less than three Factors uniting (a) only cognitive styles; (b) only personality traits; (c) one

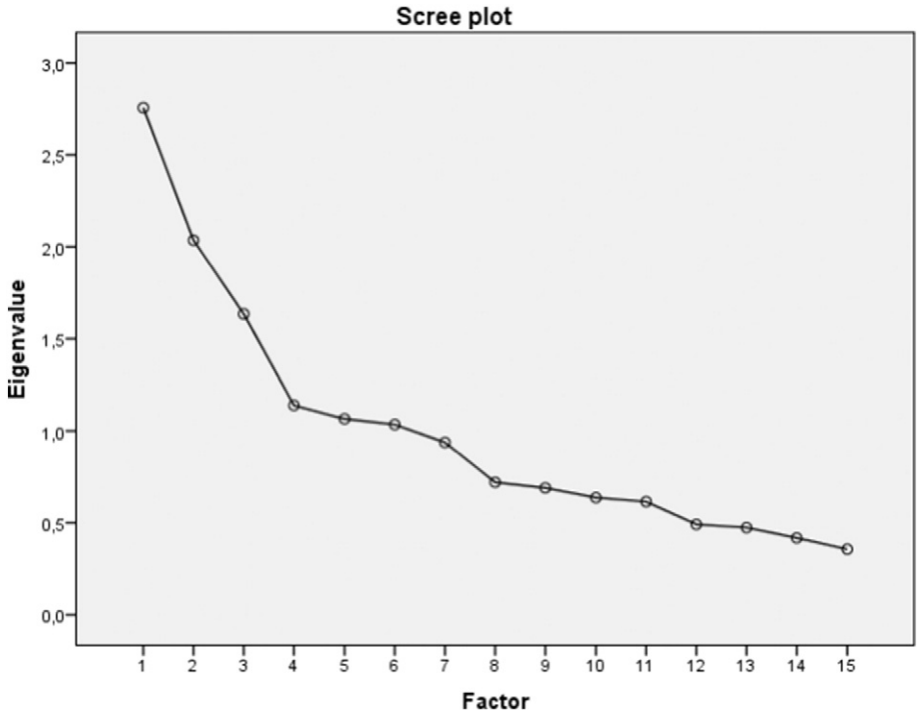

Fig. 1. Cattell's scree test.

or several combinations covering both cognitive styles and personality traits.

Cattell's scree test revealed the existence of four significant Factors (Fig. 1).

The Table 1 shows a factor structure of the indexes under study. We identified four significant factors, which described 50.43% of variance of the correlation matrix. Percentage of explained variance for each factor was 16.949; 12.152; 11.537; and 9.790, respectively.

The first significant factor covered only cognitive styles: Reflectivity (0.732), Abstract Conceptualization (0.728), Tolerance of Unrealistic Experience (0.625), Narrow Range of Equivalence (0.596), and Concrete Conceptualization (0.539). This Factor appears to reflect the functioning of an "Authentic Cognitive Complex" of the mind.

The second, the third and the fourth factors are "mixed", because each of these factors reflects different combinations of cognitive and personality attributes. Apparently, these factors covered different "Cognitive-Personality Complexes" of the mind.

Table 1
Factor structure of interrelationships of PEN and cognitive styles.

Attributes	Factors			
	Factor 1	Factor 2	Factor 3	Factor 4
EXTR	0.281	0.647*	0.011	−0.139
NEUR	0.111	0.119	−0.167	0.787*
PSYCHO	−0.364	0.171	0.538*	0.125
FD	−0.178	0.586*	0.032	0.027
FI	0.337	0.121	0.698*	−0.076
NRE	0.596*	0.433	−0.248	0.105
WRE	0.021	0.036	0.700*	0.221
FCC	0.154	0.449	0.050	0.048
RCC	0.004	−0.080	0.208	0.361
IMP	0.008	0.579*	0.391	0.099
REF	0.732*	−0.217	0.115	0.067
CC	0.539*	−0.319	0.318	0.366
AC	0.728*	0.262	0.028	−0.104
TUE	0.625*	0.219	−0.001	−0.116
IUE	−0.214	0.073	0.245	0.665*

Note: Abbreviations of the attributes are the same as in Materials.
* Is significant factor loading ($p < 0.05$).

In particular, *the second factor* included personality dimension Extraversion (0.647) and two cognitive styles: Field Dependence (0.586) and Impulsivity (0.579). We named this factor a "Cognitive-Personality Extraverted Complex" (CPEC).

The third factor contained personality dimension Psychoticism (0.538) and two cognitive styles: Wide Range of Equivalence (0.700), and Field Independence (0.698). We called this combination of attributes as a "Cognitive-Personality Psychotic Complex" (CPPC).

The fourth factor covered personality dimension Neuroticism (0.787) and only one cognitive style, namely, Intolerance of Unrealistic Experience (0.655). We named this factor as a "Cognitive-Personality Neurotic Complex" (CPNC).

The table also shows that the three Fundamental Personality Dimensions entered, as it was expected, three different factors. These data are in good agreement with the works of Eysenck (1990), and Slobodskaya et al. (2006). Psychoticism entered Factor 3 (0.538). Extraversion entered Factor 2 (0.647). And Neuroticism entered Factor 4 (0.787).

In our work, we could not identify an independent "pure" personality Factor.

4. Discussion

The data obtained in the present paper concerning the structure of cognitive styles do not support the theory of multiple cognitive style structure. According to this theory, each cognitive style is an independent psychological formation (Clauss, 1978; Gardner, Holzman, Klein, Linton, and Spence, 1959; Widiger, Knudson, and Rover, 1980). Rather, our findings support an opposite point of view, according to which there are certain complexes of mental activity, united by certain common mental mechanisms (Paivio, 1971; Richardson, 1977). One of the four identified factors is an "Authentic Cognitive Complex" (ACC), whereas the other three are "Cognitive-Personality Complexes" (CPC). We think that each complex is likely to have its own behavioral manifestations.

The identified Authentic Cognitive Complex reflects a definite type of intellectual behavior. The individuals, having such a complex, are prone to subtle differentiation between various objects of the environment (Narrow Range of Equivalence). The processes of integration of

their mental operations are likely to lag behind their differentiation processes. These individuals use stereotypic ways of solving problems. They rely on situational behavioral patterns (Concrete Conceptualization). They try checking and re-checking of the perceived facts (Reflectivity). Based on the carefully verified facts, these individuals are likely to be capable of going beyond the limits of concrete perception and discover new ways of integration (Abstract Conceptualization), which often results in unusual solutions of trivial problems (Tolerance of Unrealistic Experience).

The second factor that we called a "Cognitive-Personality Extraverted Complex" (CPEC) consists of both personality and cognitive traits. It contains one personality dimension Extraversion and two cognitive styles (Field Dependence and Impulsivity). It is widely recognized that Extraverts are sociable, they like big companies of people, but being easily bored, they quickly change their partners. As for the cognitive sphere, the Extraverts, as our research shows, have a higher level of Impulsivity and Field Dependence. Such individuals orient themselves in their behavior chiefly to emotionally meaningful signals, quickly and recklessly put forward a great number of often-false hypotheses and perform erroneous actions (Impulsivity). They trust external impressions rather than internal ones, in their individual behavior (Field Dependence). The data obtained confirmed Eysenck's view that extraverts should be field dependent (Eysenck, 1982). However, as the paper by Glicksohn et al. (2007) showed the relationship between Extraversion and Field-Dependence is more complex than it was supposed earlier.

The third and fourth factors proved to be also "mixed". The "Cognitive-Personality Psychotic Complex" (CPPC) contains one personality dimension Psychoticism and two cognitive styles such as Field Independence and Wide Range of Equivalence. This fact means that the persons with more pronounced psychotic traits (more aggressive, more prone to manipulation) rely mainly on their own knowledge and experience, ignoring the other people's opinion (Field Independence). The data obtained suggest that these individuals in their behavior, evidently, rely on "raw" evaluation of objects, events and people (black/white, good/bad), i.e. their classification of objects of activity is based on rough generalizations (Wide Range of Equivalence).

The fourth factor is a "Cognitive-Personality Neurotic Complex" (CPNC). It contains personality dimension Neuroticism and only one cognitive style Intolerance of Unrealistic Experience. Individuals with the "Neurotic Complex" are characterized by emotional instability and low self-esteem (Neuroticism). They block unacceptable and controversial information; prefer to perceive current events mainly as the expected and the usual. Such behavioral patterns are inherent in the cognitive style Intolerance of Unrealistic Experience.

Thus, the present paper showed the fruitfulness of the suggested method (CPS-Q). As distinct from the traditional unipolar psychological measurements of cognitive styles, accepted in psychological literature, our method allowed us to specify Kholodnaya (2004)'s ideas about the "splitting" of cognitive styles and evaluate each pole as an independent psychological formation or as an independent scale. At the given work, we presented six main traditional cognitive bipolar styles as twelve unipolar independent scales. The table shows that Kholodnaya's "splitting" idea is confirmed for the majority of cognitive styles. For instance, Field Dependence belongs to Factor 2, (0.586), whereas Field Independence enters Factor 3. The cognitive style Impulsivity enters Factor 2 (0.579), while its "opposite" cognitive style Reflectivity belongs in Factor 1 (0.732).

We do not know yet, when these cognitive scales became independent, and when they form complexes with these or other personality traits. Undoubtedly, all these problems need further research.

Thus, the multifaceted, multidimensional comparison of cognitive styles with fundamental personality traits permitted us to discover one Authentic Cognitive Complex and three common Cognitive-Personality Complexes. We believe that our findings will expand our understanding of the nature of human individual differences.

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