

NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS

As a manuscript

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**INDIVIDUAL CHARACTERISTICS OF PSYCHOLOGICAL REACTIONS TO
SITUATIONS OF UNCERTAINTY**

PhD Dissertation Summary
for the purpose of obtaining academic degree
Doctor of Philosophy in Psychology

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Moscow – 2022

GENERAL SCOPE OF THE RESEARCH

Relevance of the research. Uncertainty is an essential part of the modern world. The development of technologies and the growth of innovations are focused on establishing certainty and improving the security of existence. However, at the same time, the variety of possibilities leads to increased uncertainty. Uncertainty is an interdisciplinary concept that can be described in terms of unpredictability, complexity, and insolubility (Krohne, 1993). It is a subject of study not only in psychology, but also in physics, mathematics, economics, biology, and other sciences. Uncertainty as a phenomenon occurs at all levels of human life: in everyday life, in interpersonal interaction, in intergroup communication, in decision-making situations in educational and professional activities.

The concept of "uncertainty" is described through 8 main categories in the scholarly literature: plurality of judgments; inaccuracy, incompleteness, and fragmentation; probability; lack of structure; lack of information; variability; incompatibility and inconsistency; incomprehensibility (Norton, 1975). Many attempts have been made to consider human behavior in such situations. A person's need for certainty manifests itself in different ways, ranging from religious extremist movements and belief in conspiracy theories to anxiety personality disorders (Leontiev, 2015). Psychological science allows us to consider not only how a person interacts with uncertainty, but also to identify individual differences in attitudes towards uncertainty. These features can be considered both in the register of norm and pathology (Sokolova, 2015), and in everyday life at the level of metapathologies described by A. Maslow (Maslow, 1999). Apathy, depression, alienation, and cynicism as characteristics of this experience, arise as a result of the frustration of higher needs – meta-needs. Such feelings are accompanied by fear of the uncertainty of the future and limit a person's life to past and present. Authentic persons, on the contrary, develop psychological needs to realize their potential. Through the courage they can accept the anxiety of uncertainty associated with the future to which they are oriented (Kobasa, Maddi, Kahn, 1982; Ivanchenko, 2008).

However, interaction with situations of uncertainty can be characterized not only by negative experience, but also by positive one. Thus, the human need to overcome uncertainty is studied within the framework of the meaning maintenance model. A person perceives life events through the prism of mental representations and beliefs that form the individual's expectations regarding the world and relationships with other people (Heine, Proulx, Vohs, 2006). It is shown that when the semantic logic is violated, compensatory mechanisms for asserting meaning in other areas are triggered in a person. French philosopher Alain Badiou introduced the concept of “event readiness”, which describes an attitude of openness to new possibilities and uncertainty (Badiou, 2013). Within the framework of clinical psychology, negative and positive reactions to situations of uncertainty are also distinguished (Sokolova, 2015). Negative type of reaction includes intolerable anxiety, feelings of inconsistency and confusion, lack of access to internal resources of the Self, manic states, and the absence of restraining standards. The positive type includes the experience of curiosity, excitement, and joy.

Despite the wide field of research into the phenomenon of uncertainty and coping with it in psychology, the question remains open, what determines a person's attitude to uncertainty and his/her psychological reactions. The choice of coping strategies largely depends on how a person evaluates and navigates in situations of uncertainty. The study of attitudes towards uncertainty, expressed not simply in terms of accepting/not accepting uncertainty (tolerance-intolerance to it), is an important element in the topic of coping and optimal functioning under conditions of unpredictability. A key issue for general psychology and personality psychology is the mediation of attitudes towards uncertainty by personality characteristics. These characteristics can be presented as resources that provide a more positive perception of situations of uncertainty and successful adaptation. It can be assumed that from a psychological point of view, people have stable individual differences in the ways of perceiving and processing information, which determine the individual specificity of coping with subjective uncertainty (Mospan, Leontiev, 2021). The study of these individual differences related to the functional aspect of the worldview is an urgent task of research.

In order to take into account both objective and subjective aspects of the study of uncertainty, we selected the three most large-scale situations of uncertainty that were relevant in 2020, when the main empirical study was planned. These situations referred to vital, political, and economic aspects of human life. The respondents were to independently evaluate the level of uncertainty of the proposed situations, as well as their orientation in the situations and their emotional state. The aim of this research is to study the contribution of individual characteristics into these three groups of variables in three specific contexts of uncertainty.

The object of the present study is the attitude of a person to situations of uncertainty, which is expressed in the operational construct of psychological reactions. In this research, the term "psychological reactions" is used in a broad non-specific sense. The psychological reactions of a person to uncertainty include three parameters: an assessment of the level of subjective certainty of the situation, the orientation of the individual in uncertain situations, and emotional response to situations of uncertainty. The concept of orientation in this work is used in a commonly used sense and does not imply a reference to specific psychological theories. In our study, orientation included four parameters, which were aggregated into a single indicator of general orientation in a situation of uncertainty: knowledge about the causes of the situation (orientation in the past); an idea of how to act in the situation (orientation in the present); forecasting the further development of the situation (orientation in the future); idea of one's own abilities to cope with the consequences of the situation (orientation in one's own abilities).

This research does not claim the exact definition of uncertainty, nor does it describe the specifics of situations of uncertainty. At the same time, the situation of uncertainty has a number of specific characteristics that distinguish it from similar, but nevertheless different "difficult life situations".

The subject of the study is the role of individual personality characteristics in responding to situations of uncertainty, namely in assessing the level of subjective certainty, in orientation in these situations and in emotional reactions.

The purpose of the research is to study the contribution of individual personality characteristics to human interaction with situations of uncertainty.

Aims of the research:

- To conduct a theoretical analysis of present-day research on the phenomenon of uncertainty in psychology;
- To reveal the relevance of the study of uncertainty as a challenge of our days;
- To consider the theoretical foundations for the study of worldview beliefs about free will, determinism and unpredictability, as well as to adapt and validate the Free Will and Determinism Scale (FAD–Plus);
- To conduct a theoretical analysis of the following concepts: picture of the world, worldview, image of the world, as well as the construction of a picture of the world as a subjective certainty;
- To reveal the phenomenology of appraisal of the situations of uncertainty and coping with it;
- To conduct a comparative analysis of challenging situations of uncertainty of 2020, to consider the dynamics of psychological reactions to these situations over time, and to identify individual differences in psychological reactions to situations of uncertainty.

The general hypothesis:

The psychological reactions of a person to situations of uncertainty, expressed in the subjective evaluation of the situation, orientation in it and emotions, are mediated by personality characteristics.

Empirical hypotheses:

1) The worldview belief in unpredictability is positively associated with the parameters of self-regulation, namely, sensitivity to feedback, attributional optimism, and personal responsibility.

2) Individual differences in psychological reactions to situations of uncertainty are manifested in the appraisal of the subjective certainty of the situation, orientation in it and emotional reactions that change over time.

3) Personality characteristics, in particular tolerance for ambiguity, life position, worldview beliefs in free will/determinism/unpredictability, subjective vitality,

cognitive reflection, hardiness, self-efficacy, a sense of coherence, mediate psychological reactions to situations of uncertainty and their dynamics.

The empirical base of the research. The work consists of a series of studies – two preliminary and one main study.

The first preliminary study on the phenomenology of subjective uncertainty was conducted on a sample of students of the humanities profile of one of the Moscow universities ($N = 101$), aged 18 to 20 years ($M = 18$, $SD = 0.5$), the share of female participants was 81% ($n = 82$), the share of male participants was 19% ($n = 19$).

The second preliminary study was based on the psychometric approach to the investigation of worldview beliefs in free will/determinism/unpredictability. The sample consisted of first-year students of the psychology faculty of Moscow universities ($N = 335$). The share of men was 12% ($n = 41$), the share of women was 88% ($n = 294$), the age of the respondents varied from 18 to 28 years ($M = 19$, $SD = 1,25$).

The main longitudinal study included four data collections. In the first stage, ($N = 219$) a comparative analysis of psychological reactions to situations of uncertainty was presented. The next stage of the analysis included the dynamic analysis of psychological reactions to situations of uncertainty over time on a subsample that participated in all four sections ($N = 52$). The *key* stage of the study offered the analysis of the influence of personality characteristics on the dynamics of psychological reactions to uncertainty over time. It was carried out on a subsample of respondents who filled out the measures of personality characteristics ($N = 180$). The sample of respondents in the third stage of the analysis ($N = 180$) was diverse by regions, the majority of respondents were from Moscow and the Moscow region (63% of the sample). Most of the sample were women ($n = 139$; 77%), the age of the respondents ranged from 18 to 72 years ($M = 40$, $SD = 12.9$), most of them had higher education (73%), and some had academic degrees (13%).

The theoretical and methodological basis. The methodological basis of this study is the functional paradigm (Leontiev, 2016). It postulates the primacy of the process and the actual functioning of the personality in relation to stable morphological and psychological structures. Stable structures, in particular dispositions, are not the

cause, but the result of this interaction. They do not fully determine the actual functioning of living systems. They are included in the cyclic processes of self-regulating activity as a continuous interaction of an individual with the outside world, controlled by feedback systems.

The theoretical basis of the work is based on such general psychological approaches as existential positive psychology (EPP) and the theory of personal constructs. The EPP explores the ability of a person not only to survive, but also to thrive, overcoming existential anxiety and suffering (Wong, 2021). The theory of personal constructs (J. Kelly) postulates that a person uses available cognitive templates for the perception of reality, and at the same time takes the position of an active subject, constructing his own picture of the world. Among the micro-range theories considered in the theoretical study were general psychological views on uncertainty (R. Baumeister, T. V. Kornilova, E. G. Lukovitskaya, E. Frenkel-Brunswick, D. Kahneman, A. Tversky, N. Taleb, D. A. Leontiev and others), the picture of the world and the worldview of the individual (G. Allport, A. N. Leontiev, D. A. Leontiev, E. V. Saiko, M. Koltko-Rivera, etc.).

The basis of empirical research is based on middle-range theories, namely on the concept of personality potential of D. A. Leontiev (T. O. Gordeeva, E. Y. Mandrikova, E. N. Osin, etc.), the self-determination theory (E. Deci, R. Ryan, K. Sheldon, T. O. Gordeeva and others), general psychological theories of uncertainty.

To fulfil the aims and test the hypotheses, a series of studies was carried out - two preliminary and one main study.

In the preliminary study of the phenomenology of subjective uncertainty and coping with it on examples of specific situations of uncertainty, a qualitative data analysis method - Qualitative Document Analysis (QDA) (Altheide, Coyle, Devriese, Schneider, 2008) was used with the participation of three experts.

The second preliminary study was devoted to a psychometric approach to the study of worldview beliefs related to free will/determinism/unpredictability. For constructive validation of the Free Will and Determinism Scale (FAD-Plus), the following methods were used:

- 1) Success and Failure Attributional Style Questionnaire for Adolescents (Gordeeva, Osin, Shevyakhova, 2009);
- 2) Revised Life Orientation Test (Gordeeva, Sychev, Osin, 2010);
- 3) Purpose-in-Life Test (Leontiev, 1992) based on Purpose-in-Life Test by J. Crumbaugh and L. Maholick (1981);
- 4) Positive and Negative Affect Schedule (PANAS) (Osin, 2012);
- 5) Balanced Measure of Psychological Needs (Sheldon, Hilpert, 2012), translated to Russian by E. Osin et al.;
- 6) Satisfaction With Life Scale by Diener (adapted by Osin, Leontiev 2020)
- 7) Personal Life Position Inventory (Leontiev & Shilmanskaya, 2019);
- 8) Feedback Sensitivity Scale (Leontiev, Mospan, Mitina, 2019);
- 9) Personal Responsibility Scale (Sheldon et al., 2018).

For statistical analysis of the preliminary study data, the Jamovi 2.0.1 program (The jamovi project, 2022) was used: confirmatory factor analysis, Pearson correlation test; and MPlus 8: exploratory structural equation modeling method - ESEM (Muthén, Muthén, 2015).

The main study has covered several groups of variables: demographic, subjective assessment of three situations of uncertainty (COVID-19 pandemic, amendments to the Constitution, collapse in oil prices), methods for analyzing the personality characteristics of respondents. The evaluation of three relevant situations included three parameters each: the level of subjective certainty, orientation, and emotional reactions.

The following methods were used to measure personality characteristics:

- 1) Multiple Stimulus Types Ambiguity Tolerance Scale (MSTAT-II: McLain, 2009; Russian version by Leontiev, Osin, Lukovitskaya, 2016).
- 2) Personal Life Position Inventory (Leontiev, Shilmanskaya, 2019);
- 3) Free Will and Determinism Scale (FAD-Plus: Paulhus, Carey, 2011; Russian version by A.N. Mospan, D.A. Leontiev, 2021)
- 4) State Subjective Vitality Scale (SVS: Ryan, Frederick, 1997; Russian adaptation by L.A. Alexandrova, 2014);

- 5) Cognitive reflection test (Frederick, 2005; adaptation by O.N. Rodina, P.N. Prudkov, 2019);
- 6) Hardiness Test (Leontiev, Rasskazova, 2006; Osin, Rasskazova, 2013), based on the Personal Views Survey (Maddi, 1999);
- 7) Generalized Self-efficacy Scale (Schwarzer, Jerusalem, Romek, 1996);
- 8) Sense of Coherence scale (SOC: Antonovsky, 1984; Russian adaptation by E.N. Osin, 2007).

The Jamovi 2.0.1 program (The jamovi project, 2022) was used for statistical data analysis: descriptive statistics (mean, standard deviation, internal consistency), one-way ANOVA, repeated measures ANOVA with post hoc analysis (Tukey's test), Pearson's correlation test; and MPlus: Multilevel Regression Modeling Method 8 (Muthén, Muthén, 2015).

Scientific novelty of the research:

- 1) The Free Will and Determinism scale has been validated and adapted on the Russian sample;
- 2) The contribution of the individual's personality characteristics to the psychological reactions to uncertainty was revealed in three aspects: subjective certainty, orientation and emotional reactions.
- 3) It is substantiated that positive individual characteristics present personality resources that determine the positive dynamics of coping with situations of uncertainty.

Theoretical significance of the research:

- 1) A theoretical analysis of modern research on the phenomenon of uncertainty in psychology has been conducted;
- 2) The relationship among the concepts of the picture of the world, worldview and the image of the world is presented, the idea of worldview as a result of constructing subjective certainty is substantiated;
- 3) Personality resources that contribute to coping with subjective uncertainty have been identified.

The practical significance. The results of the study make a significant contribution to the understanding of the phenomenon of uncertainty, its relevance for

the individual life of a person, as well as the role of personality characteristics as resources for successful adjustment to conditions of uncertainty. The data obtained have great psychotherapeutic potential and can be used in the practice of psychological counseling for working with situations of uncertainty and actualization of personality resources that contribute to the achievement of psychological well-being and inner balance. The author's approach to the study of the picture of the world and worldview as a result of constructing subjective certainty, as well as a theoretical analysis of maladaptive ways of constructing reality, make a valuable contribution to solving the problem of gullibility and perception errors with the prospect of developing positive strategies for coping with uncertainty.

The results obtained can also be useful in working with personnel to develop educational and training programs for the development of personality resources that play a buffer role in crisis situations, for example in changing conditions within organizational environment. The results of the theoretical analysis highlight the contradictions in the conceptualization of the phenomenon of uncertainty and raise the issue of developing relevant methods for the empirical study of uncertainty and attitudes towards it. The results of the work can also be useful in training courses in psychology, as well as in preparing students for psychological specialties.

Reliability of the research results obtained is substantiated by a systematic theoretical analysis of the research problem, the psychometric validity of methods that correspond to the objectives and aims of the study, the sample that meets present-day requirements for data representativeness, the use of qualitative and quantitative analysis methods, as well as a large set of statistical data analysis methods that are relevant to the data and hypothesis of the present study. Mathematical processing and visualization of the obtained results was carried out using MS Excel software version 16.57 (2022), Jamovi 2.0.1 (The jamovi project, 2022) and MPlus 8 (Muthén & Muthén, 2015).

Principles for the defense:

1. Individual characteristics of psychological reactions to situations of uncertainty and coping with it result from differences in the methods of constructing subjective certainty on the basis of objectively ambiguous information.

2. Both maladaptive mechanisms of interaction with uncertainty (e.g. gullibility or rigidity) and constructive mechanisms based on a critical attitude to worldview ideas and continuous testing of reality may manifest in the construction of subjective certainty.

3. Positive personality resources such as self-efficacy, a sense of coherence, subjective vitality, belief in free will, cognitive reflection, and hardiness, perform a buffer function when facing subjective uncertainty, namely, they contribute to a higher level of subjective certainty, better orientation in a situation of unpredictability, more positive emotional background.

4. Personality resources such as tolerance for ambiguity, self-efficacy, belief in free will, provide more successful coping with subjective uncertainty, namely, they mitigate the cognitive and emotional consequences of situations of uncertainty and increase orientation in them.

Approbation of the research.

The materials of the research were discussed at the meetings of the postgraduate research seminar on the specialty 19.00.01 of the Department of Psychology, Faculty of Social Sciences, HSE University, as well as at the meetings of the International Laboratory of Positive Psychology and Motivation (HSE University). The main results of the study were presented at the International Scientific and Practical Conference "Personality in an Era of Change: mobilis in mobili" (Lomonosov Moscow State University, 2018), the Interuniversity Symposium "Psychology of Pandemic Consciousness" (Moscow, HSE University, 2020), the National Scientific and Practical Conference "New Challenges of Uncertainty" (Novosibirsk, 2020), the First Conference of the European Association for Qualitative Research in Psychology (Thessaloniki, Greece, 2021), the International Conference of Young Scientists "Vectors of Russia's Development" (Moscow Higher School of Social and Economic Sciences, 2022), the Sixth International Scientific Conference "Psychology of stress and coping behavior: stability and variability of relationships, personality, groups in an era of uncertainty" (Kostroma State University, 2022).

The content of the PhD thesis is reflected in four publications, which are included in the list of HSE journals recommended for defense.

The structure of the PhD thesis reflects the general logic of the research and consists of an introduction, two chapters, a conclusion, a list of references, which includes 216 titles (129 in a foreign language), and four appendices. The results of theoretical and empirical analysis are presented in 14 tables and 7 figures. The main text of the dissertation is presented on 141 pages. The total volume of the dissertation is 148 pages.

GENERAL CONTENT OF THE RESEARCH

The **introduction** section covers the relevance, problem, object and subject of the PhD research, defines the objectives, aims, general and empirical hypotheses, describes the empirical and theoretical and methodological bases of the study and methods of analysis, reveals the scientific novelty of the work, its theoretical and practical significance, justifies the reliability of the obtained results, formulates principles for the defense, and presents data on the approbation of the research results, the structure of the PhD work is given.

The first chapter consists of seven sections and defines the problem of uncertainty in psychological science, in particular, a theoretical analysis of Russian and international research is presented, and ways of interacting with situations of uncertainty are described.

In **section 1.1**, the phenomenon of uncertainty is considered as a subject of recent research in psychology.

In foreign psychology, uncertainty is represented by two concepts: "ambiguity" – polysemy and ambiguity in the present (Frenkel-Brunswik, 1948; Bhushan, Amal, 1986) and "uncertainty" – uncertainty of the future or lack of awareness (Krohne, 1989; Dugas et al., 2005; Kornilova et al., 2010; Grenier, Barrette, Ladouceur, 2005). According to the theoretical review by Jessica Alquist and Roy Baumeister (Alquist, Baumeister, in press), uncertainty can be considered in two ways: subjective uncertainty and objective uncertainty. Subjective uncertainty refers to the lack of information about the world. Objective uncertainty, on the contrary, is a characteristic of the world itself.

Section 1.2 presents the theoretical basis for the study of worldview beliefs in free will/determinism/unpredictability of one's own life and the surrounding reality. In the 2000s there has been a wave of theoretical (e.g., Baer, Kaufman et al., 2008) and empirical (Nichols, 2006) research on the relationship between free will and determinism. The growing interest in this topic and the lack of an adequate measuring tool prompted D. Paulhus and J. Carey (Paulhus, Carey, 2011) to develop a multivariate model for studying free will and determinism, adding an attitude on unpredictability. The developed questionnaire (FAD-Plus) consists of four scales: belief in

unpredictability, free will, scientific determinism, fatalistic determinism. The FAD-Plus inventory (Freedom/Determinism Beliefs Inventory in Russian) was translated into Russian (D. A. Leontiev) and adapted (Mospan, Leontiev, 2021). The results are presented in the empirical part of this dissertation research (**section 2.2**).

In **section 1.3**, a picture of the world and worldview are considered to be the result of the construction process of subjective certainty. Existential worldview presents a special relevance because it highlights absolute uncertainty of the world. The source of certainty is in the person himself, as he considers the limitations of his own understanding and verifies this understanding in a dialogue with other people (Leontiev, 2016). The **section** presents cultural, philosophical, and psychological approaches to the understanding of a picture of the world, worldview, and image of the world. Depending on the activity of individuals in developing of their own worldview, two forms of worldview can be distinguished: a worldview as a myth and a worldview as an inner activity (Leontiev, 2004). The construction of subjective certainty in terms of inner activity is a reflection process of experience as well as verification of the individual picture of the world for compliance with the surrounding reality. As for the worldview as a myth, a person may encounter a number of internal obstacles, in particular, a tendency to gullibility, stereotyping, prejudice and perceptual errors.

The maladaptive ways of certainty construction are presented in **section 1.4**. The theoretical analysis of the phenomenon of gullibility (Forgas, Baumeister, 2019), covers inaccuracy of judgments, irrationality, and quantitative stereotypes and prejudices (Tversky, Kahneman, 1974). It is assumed that people's need for a definite picture of the world is very strong and, apparently, stronger than the need for adequate contact with reality (Leontiev, 2015). Most people, for this reason, would prefer any certain (even if false) explanation of a complex phenomenon to leaving it unexplained.

Section 1.5 presents a constructivist approach to the study of subjective certainty. The investigation of the mechanisms of construction of subjective certainty is a complex research challenge. It includes the issue of the relationship between the idiographic and nomothetic methods, which represent the polar aspects of methodological knowledge. The optimal research paradigm is constructivism. Its main

advantage is an attempt to integrate the natural scientific and humanitarian approaches in the study (Mospan, 2019). This approach is based on the theory of personal constructs, which was developed by George Kelly (Kelly, 1955). The main method of studying personal constructs is repertory grid technique and the analysis of implicative dilemmas. Initially, these methods were the preferred way to investigate attitudes towards uncertainty in the present work. However, in the process of developing the research methodology, a number of procedural contradictions were discovered – the complexity of the operationalization of the uncertainty phenomenon.

Section 1.6 presents the issue of coping with uncertainty and the role of personality resources in it. Coping in this work means any human activity (including internal) aimed at harmonizing the mental and psychological state. The result of such activity is not necessarily a practical resolution of the situation. Indicators of successful coping in this case can be positive ideas about uncertainty, the availability of ways to deal with crisis situations of uncertainty and its attendant consequences, better orientation, and a more positive emotional background. Uncertainty can be seen as a challenge that requires authenticity, responsibility, and courage to cope with anxiety. The operational construct of such a “courage to be” in conditions of uncertainty is tolerance and intolerance to uncertainty, which is considered in the theoretical review of A.I. Gusev (2011).

Tolerance for ambiguity is not the only parameter that determines a person's attitude to uncertainty and his behavior in uncontrolled conditions. In this context, we can talk about other personality resources expressed in individual psychological characteristics that ensure the successful implementation of activity and a higher level of subjective psychological well-being (Cited in: Ivanova et al., 2018). Personality resources perform a number of functions: first, buffering one, reducing the dependence of subjective well-being on external factors; secondly, filtering one, mediating the perception of life circumstances; thirdly, motivational one, contributing to the appraisal of the situation as a challenge, rather than a problem (Ivanova, 2016).

Section 1.7 sums up the results of the theoretical analysis of the problem of uncertainty in psychology, defines the theoretical and methodological program of the PhD research (Fig. 1).

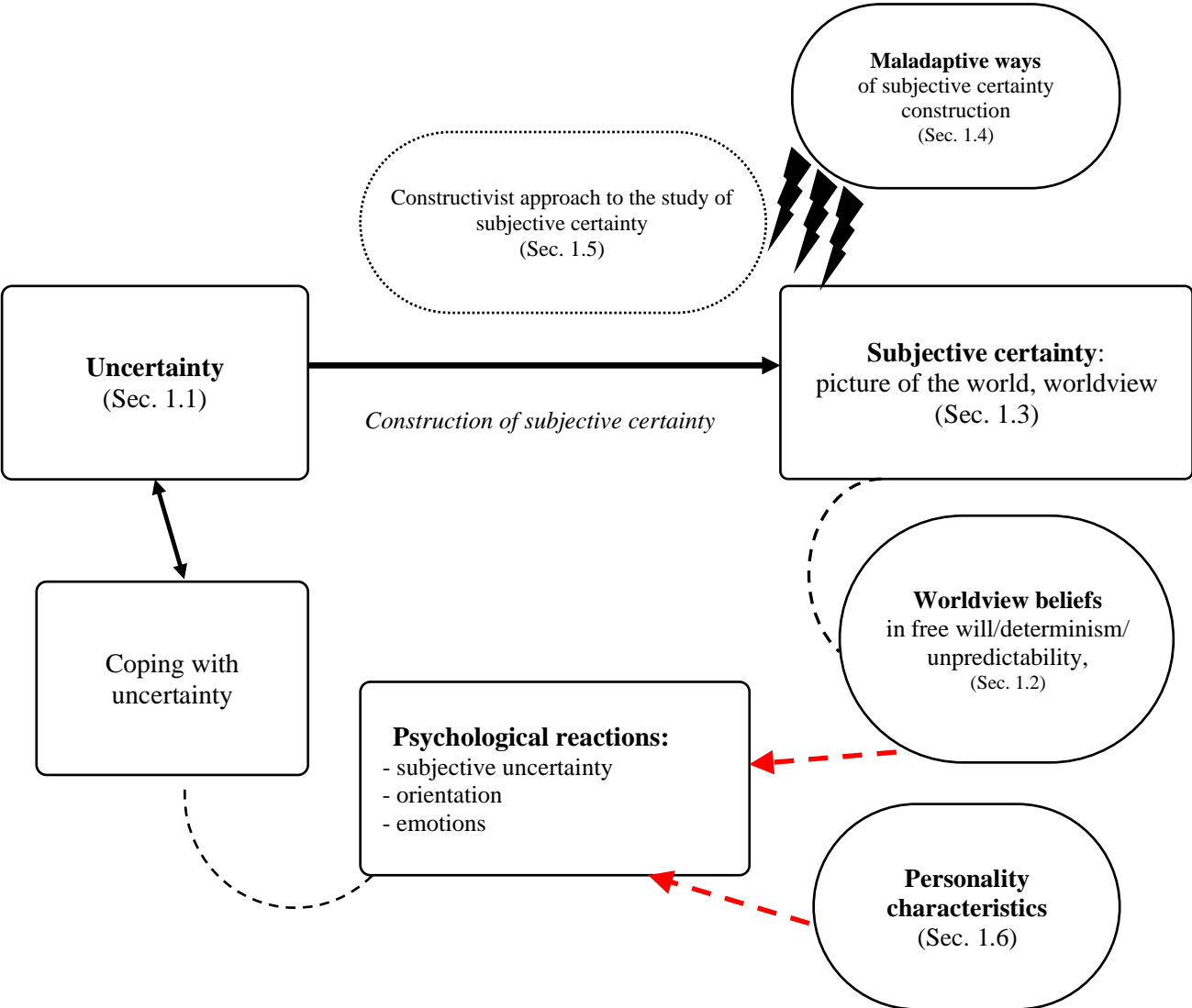


Figure 1 – Main concepts of theoretical analysis

We have selected the most large-scale events of the multiple stress of 2020, which cover the epidemiological, political, and economic aspects of life: the COVID-19 pandemic, amendments to the Constitution, the fall in the market prices of oil. It is assumed that a number of personality characteristics play an important role in the construction of subjective certainty in conditions of objective uncertainty. These characteristics represent personality resources that provide better coping with uncertainty. Individual personality characteristics are represented by the following parameters: tolerance for ambiguity (McLain, 2009); life position expressed in harmony with life, its awareness and subjectivity (Leontiev, Shilmanskaya, 2019); self-efficacy

(Romek, Schwarzer, Yerusalem, 1996); hardiness (Leontiev, Rasskazova, 2006); sense of coherence (Antonovsky, Sourani, 1988); subjective vitality (Ryan, Frederick, 1997); cognitive reflection (Frederick, 2005); worldview beliefs related to the belief in free will, determination and unpredictability of the surrounding and inner world (Paulhus, Carey, 2011).

The second chapter presents three empirical studies of individual characteristics of coping with uncertainty worldviews. In **section 2.1**, an attempt is made to consider the attitude of a person to uncertainty from the phenomenological point of view through the meaning that the respondents put into this concept. The sample of the preliminary study on the phenomenology of uncertainty consisted of students of the humanities profile of one of the Moscow universities (N = 101), aged 18 to 20 years (M = 18, SD = 0.5), the share of women was 81% (n = 82), the share of men was 19% (n = 19). Respondents were asked to answer open-ended questions about how they understand uncertainty and how they deal with situations of uncertainty. The Qualitative Document Analysis method (Altheide et al., 2008) was used to qualitatively analyze the obtained data.

The responses to the first question, concerning perceptions of uncertainty, represented 6 thematic categories. The first category referred to *emotional experiences*, almost exclusively negative, accompanying and marking situations of uncertainty, including doubt, uncertainty, anxiety, discomfort, fear, stress, and others. The following two categories can be defined as *epistemological* and *ontological* understanding of uncertainty – the former connects uncertainty with ignorance, limited knowledge, information, the inability to foresee the future, and the latter indicates the fundamental unpredictability of the life path, the spontaneous and uncontrolled nature of objective reality. A separate category associated uncertainty with *limited self-determination*, uncertainty of one's desires, goals, priorities, misunderstanding of oneself. The sixth category associated uncertainty with the problem of *relationships with other people*, the impossibility of understanding them, predicting, and controlling their behavior. A separate category was made up of answers in which uncertainty was explicitly

associated with a *choice situation* requiring an individual's decision in favor of one of the alternatives (Mospan, Leontiev, Shilmanskaya, 2018).

Answers to the question about how the respondents coped with the situation of uncertainty were divided into 8 categories. Quite often there were references to active actions (experimentation, trial and error), seeking help and support from other people, and, on the contrary, passive waiting in the hope that the uncertainty will resolve itself. The remaining six categories described various forms of inner work, activity of consciousness. Among them were the analysis and search for information, planning and designing one's actions in the future, rethinking and changing attitudes to the situation, often through a change in context, introspection and self-regulation, the desire to bring oneself into an optimal functional state, a compromise between different desires through their combination and intuition (Mospan, Leontiev, Shilmanskaya, 2018).

Section 2.2 presents a preliminary study of worldview beliefs related to free will/determination/unpredictability, the results of adaptation and validation of the Free will/Determinism Beliefs Inventory based on the FAD-Plus (Paulhus, Carey, 2011) are presented. The study was conducted on a pooled sample of first-year students of the psychology faculty of Moscow universities (N = 335). The share of men was 12% (n = 41), the share of women was 88% (n = 294), the age of the respondents varied from 18 to 28 years (M = 19, SD = 1,25). Confirmatory factor analysis was used to analyze the structure of the inventory. The original four-factor structure of the questionnaire, identified by the authors of the original instrument, was confirmed, which includes belief in free will, fatalistic determinism, scientific determinism, and unpredictability. Most of the scales demonstrate sufficiently high reliability in terms of Cronbach's Alpha for research purposes: Free will ($\alpha = 0.777$), Fatalistic Determinism ($\alpha = 0.793$), Unpredictability ($\alpha = 0.689$), Scientific Determinism ($\alpha = 0.675$).

The second stage of the study is a constructive validation of the Freedom/Determinism Beliefs Inventory using correlation analysis of data (Pearson's coefficient), the instruments used for the analysis are described. The section shows the results of the relationship between the parameters of the attributional style and dispositional optimism with the scales of the Freedom/Determinism Beliefs (FAD) Inventory. The only scale

that had significant relationships with dispositional optimism was free will. Belief in unpredictability, as well as belief in determinism, was not significantly related to dispositional optimism. The subscales of the success and failure explanatory style questionnaire were significantly correlated with all scales of the Freedom/Determinism Beliefs Inventory. The optimistic attributional style reflects how the individual explains the success and failure, i.e. focuses on the context of the past or present. Thus, in the case of expectations of the future (dispositional optimism), only beliefs relating to human free will worked. In the context of explaining the causes of specific life situations, all scales of the inventory worked. Based on the significant positive correlations of the free will scale with various parameters of optimism, it can be concluded that belief in free will, which was inherent in a person, favorably affected the attributional style. At the same time, belief in unpredictability of the world, as well as beliefs in the influence of hidden and fateful forces or in scientific determinism, on the contrary, were associated mainly with pessimism, especially for success contribution; for the attribution of failure, most of these relationships were insignificant.

The results of the relationship between the parameters of subjective well-being, emotional state and the scales of the Freedom/Determinism Beliefs Inventory showed that belief in free will had a significant direct relationship with the positive emotional state of the individual and a significant negative correlation with negative affect. Belief in the fundamental unpredictability of the world was not significantly correlated with affects. A high level of life satisfaction was associated with beliefs in the autonomy and responsibility of the individual for decisions made and fatalistic determinism, i.e. belief in hidden forces and destiny. Thus, the subjective well-being of a person could be equally connected with beliefs both in the activity and autonomy of the individual, and in the impossibility of the individual to influence one's fate.

Significant positive correlations between the parameters of meaningfulness and life position with the scale of free will were found. Belief in unpredictability, on the contrary, had significant inverse correlations with the awareness of one's life as a whole and the general indicator of meaningfulness. Belief in the determinism of life by biological and environmental factors (scientific determinism) blocked the activity of the

individual in relation to his/her own life. The scale of fatalistic determinism had ambiguous relationships with life position. Even though it demonstrated significant positive correlations with harmony, it also significantly correlated with low levels of awareness and activity of the individual and blocked his/her locus of control.

The results of the analysis of the relationship between the Freedom/Determinism Beliefs Inventory and the parameters of self-regulation showed that the highest significant correlations were predictably found in the scale of free will with satisfaction of all three basic psychological needs, personal responsibility, and the ability of a person to respond to the success of the activity and its adjustment. Sensitivity to feedback was activated only in the case of belief in free will; the other three types of worldview beliefs reduced this sensitivity. The setting in unpredictability was inversely correlated with personal responsibility, while belief in determinism correlated insignificantly with responsibility.

Initially, the active role of belief in unpredictability was assumed as a factor determining optimism, emotional state, life position and self-regulation of activity. However, belief in free will played a much important role. The results of the preliminary study did not show any relationship between belief in uncertainty (unpredictability) and personality characteristics. However, the adaptation of the Freedom/Determinism Beliefs Inventory made it possible to use worldview beliefs as personality dispositions in the main empirical study.

Section 2.3 presents a longitudinal study of attitudes towards uncertainty. **Section 2.3.1** describes three current challenges of late March-early April 2020, which, according to public opinion experts, were the most disturbing situations of uncertainty affecting the entire country: the COVID-19 pandemic, amendments to the Constitution, falling of oil prices and, as a result, the sharp drop of the ruble.

Section 2.3.2 describes the objectives of the study. The study used a repeated-measures design with three situations and four time points (early April (T1), early May (T2), mid-June (T3), and mid-October 2020 (T4)). It was assumed that higher levels of personality resources would be positively associated with average scores of subjective certainty, orientation, and positive emotions, and negatively with negative emotions. It

was also assumed that people with higher personality resources experience faster (or more pronounced) changes in the direction of successful adaptation (increase in the parameters of situation certainty, orientation, positive emotions) and slower (or less pronounced) changes in the direction that reflects the difficulties of adaptation (negative emotions).

Section 2.3.3 presents the characteristics of the sample. The initial sample of the main study consisted of 219 participants, however, 39 participants did not fully complete the questionnaire (personality inventories module), so the first preliminary stage of data analysis (comparison of psychological reactions, namely evaluations of subjective certainty, orientation and emotions in situations of uncertainty relevant for 2020 according to the first cut) was carried out on a sample of 219 people; the second stage of the analysis (the dynamics of psychological reactions over time) was carried out on a sample of respondents who participated in all four time measurements ($N = 52$); the third *key* stage (analysis of the connection between psychological reactions and stable personality characteristics, as well as the influence of personality dispositions on the dynamics of psychological reactions) was carried out on a sample of 180 respondents. The main sample of respondents ($N = 180$) was diverse by regions (29 regions in total), the majority of respondents were from Moscow and the Moscow region (63% of the sample). Most of the sample were women ($n = 140$, 78%), the age of the respondents ranged from 18 to 72 years ($M = 40$, $SD = 12.9$), most of them had higher education (72.78%), and some – academic degrees (13 %).

Section 2.3.4 describes the study design. The study included four measurement waves on one sample of respondents. Initially, the study was conducted with four data collection time points. However, a longer time interval between the third and fourth measurements (16 weeks), as well as a preliminary descriptive analysis, showed that the situation could undergo qualitative change. Based on this, and because of the smaller sample size in the fourth measurement ($N = 83$), which could reduce statistical power, the stages of analysis concerning the investigation of the contribution of personality characteristics referring to uncertainty were carried out on only three measurements.

Section 2.3.5 presents research methods. The questionnaire consisted of several blocks: demographic, assessment of three crisis situations (“Coronavirus”, “Constitution”, “Oil prices”), methods for analyzing the personality characteristics of respondents (only first measurement). The evaluation of the three crisis situations included an evaluation of the subjective certainty of each situation, orientation in it, and emotional reactions. Personality questionnaires were used to diagnose the parameters of tolerance for ambiguity, life position, belief in free will/determinism/unpredictability, subjective vitality, cognitive reflection, hardiness, self-efficacy, and a sense of coherence.

Section 2.2.5 presents the results of a longitudinal study of attitudes towards uncertainty: a comparison of subjective evaluation of situations of uncertainty, the dynamics of evaluation, an analysis of the influence of personality dispositions on the dynamics of evaluation of situations of uncertainty over time. Situation B (“The Constitution”) was perceived as more certain than the other two situations (“COVID-19” and “Oil Prices”), which were not significantly different from each other. Situation A (“Coronavirus”) was characterized by a gap between knowledge about the causes/consequences of the situation and their own actions under conditions of uncertainty: respondents noted that they knew what to do, even though they poorly understood the causes of the situation and were not sure how it would develop further. The other two situations showed a much smaller gap between these estimates. Across situations, past, present, and self-confidence scores were highest for Situation A (“Coronavirus”), while confidence in future scores were highest for Situation B (“Constitution”). Each of the situations was characterized by its specific background of emotional response. Thus, Situation A (“Coronavirus”) was characterized by positive emotions (mobilization, confidence, interest, excitement, joy, surprise) and passive negative ones (confusion, anxiety, guilt, worry, fear, sadness). In Situation B (“Constitution”), active negative emotional reactions (irritation, anger, disgust) occurred. Situation C (“Oil prices”) was characterized by active and passive negative feelings.

An analysis of the dynamics in appraisals of the situations of uncertainty showed that the assessment of the level of subjective certainty of the Situation A (“Coronavirus”) did not reveal any significant changes between the measurements. However, changes in subjective certainty were significant for situations B (“Constitution”) ($F(3, 153) = 5.54, \eta^2 = 0.046, p = 0.001$) with a post hoc test showing a statistically significant increase in certainty from T2 to T3, and also for situation C (“Oil prices”) ($F(3, 153) = 5.26, \eta^2 = 0.053, p = 0.002$) with a post hoc test showing a significant decrease from T1 to T2 and a significant increase from T2 to T3. The overall orientation in the Coronavirus situation decreased significantly ($F(3, 153) = 4.16, \eta^2 = 0.030, p = 0.007$), while the post hoc test showed significant difference among time points T2 and T4. For situation B (“Constitution”), the dynamics were also found ($F(3, 153) = 2.99, \eta^2 = 0.020, p = 0.033$), while the post hoc test showed a significant increase from T2 to T3, while for situation C (“Oil Prices”) there were no significant changes in time. As for the emotional experiences, in situation A (“Coronavirus”) a decrease in positive emotions was revealed ($F(3, 153) = 4.29, \eta^2 = 0.029, p = 0.006$), in particular, between time points T1 and T3, and T1 and T4. The dynamics of passive negative emotions were also significant ($F(3, 153) = 13.3, \eta^2 = 0.072, p < 0.001$), in particular, the decline in emotions from T1 to T3, from T2 to T3, as well as the growth of passive negative emotions from T3 to T4. Significant changes in active negative emotions were not detected. Situation B (“The Constitution”) and C (“Oil Prices”) did not show any significant changes in emotional reactions over time.

To analyze the influence of personality dispositions on the dynamics in appraisals of the situations of uncertainty over time, the method of multilevel regression modeling was used. According to the results of the correlation analysis between the overall assessment of the subjective certainty of situations and personality dispositions (table 1), the self-efficacy scale showed significant relationships with the slope of the appraisal of subjective certainty in all three situations. At the same time, the assessment of the subjective certainty of Situation A (“Coronavirus”) decreased over time, but for respondents with a high level of self-efficacy and tolerance for ambiguity, this decrease was slower. Situations B (“Constitution”) and C (“Oil prices”), on the other hand,

became more certain over time, and this increase in evaluation occurred faster among respondents with higher levels of self-efficacy. The slope of the assessment of the subjective certainty of Situation B (“Constitution”) was also positively associated with a sense of harmony with one’s own life and belief in free will, while tolerance for ambiguity had a significant positive correlation with the slope of Situation A (“Coronavirus”) and C (“Oil prices”). The intercept of the appraisals of the subjective certainty of Situation A (“Coronavirus”) was higher for participants with a higher sense of coherence and subjective vitality, while for situation B (“Constitution”) it was higher for respondents with higher levels of self-efficacy, belief in free will and cognitive reflection.

Table 1 – Pearson Correlation coefficients between the perceived certainty of Situations A, B, C and personality variables

Personality dispositions	Perceived certainty Situation A “COVID-19”		Perceived certainty Situation B “Constitution”		Perceived certainty Situation C “Oil prices”	
	Slope (dynamics)	Intercept (Mean value)	Slope (dynamics)	Intercept (Mean value)	Slope (dynamics)	Intercept (Mean value)
Self-efficacy	0.234**	0.143	0.150*	0.188*	0.169*	0.042
Harmony with life (Personal life position)	0.119	0.107	0.151*	0.108	0.111	0.034
Sense of coherence	0.111	0.156*	0.144	0.093	0.110	0.056
Subjective vitality	0.142	0.175*	0.068	0.037	0.142	0.015
Tolerance for ambiguity	0.161*	0.139	0.108	-0.029	0.162*	-0.022
Free will (Freedom/Determinism Beliefs)	0.089	0.116	0.230**	0.149*	0.117	0.112
Cognitive Reflection	0.068	0.044	0.056	0.239***	0.001	0.059

Note – the table presents only personality variables for which significant correlations with situation appraisals were found: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The results of a correlation analysis of general orientation in situations of uncertainty with personality dispositions (table 2) showed that in Situation A (“Coronavirus”), the decrease in the level of general orientation was slower among respondents with a high level of self-efficacy and belief in free will.

Table 2 – Pearson Correlation coefficients between the general orientation in Situations A, B, C and personality variables.

Personality dispositions	Orientation in Situation A “COVID-19”	Orientation in Situation B “Constitution”	Orientation in Situation C “Oil prices”
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	Slope (dynamics)	Intercept (Mean value)	Slope (dynamics)	Intercept (Mean value)	Slope (dynamics)	Intercept (Mean value)
Self-efficacy	0.163*	0.311***	0.048	0.193**	0.025	0.136
Sense of coherence	0.046	0.252***	0.126	0.234**	0.089	0.159*
Subjective vitality	0.137	0.377***	0.084	0.214**	0.080	0.237**
Tolerance for ambiguity	0.123	0.233**	0.074	0.142	0.094	0.174*
Free will (Freedom/ Determinism Beliefs)	0.148*	0.219**	0.083	0.158*	-0.058	0.177*
Hardiness	0.093	0.215**	0.074	0.233**	0.069	0.112

Note – the table presents only personality variables for which significant correlations with situation appraisals were found: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

At the same time, the higher the level of belief in free will, tolerance for ambiguity, subjective vitality, self-efficacy, hardiness, sense of coherence, the better the respondents are oriented in all three situations.

The final stage of the analysis was to identify the relationship between personality dispositions and emotional reactions of a person under conditions of uncertainty (table 3). None of the personality dispositions showed significant correlations with the slope reflecting the dynamics of positive emotions in situations of uncertainty. However, in general, respondents with a high level of harmony with life and subjective vitality were more likely to experience positive emotions in all three situations of uncertainty. Tolerance for ambiguity, self-efficacy showed a significant level of correlation with the intercept of positive emotions in Situation A (“Coronavirus”) and B (“Constitution”). The hardiness score was also significantly associated with the intercept of positive emotions in Situation A.

Table 3 – Pearson Correlation coefficients between positive emotions in Situations A, B, C and personality variables.

Personality dispositions	Positive emotions in Situation A “COVID-19”		Positive emotions in Situation B “Constitution”		Positive emotions in Situation C “Oil prices”	
	Slope (dynamics)	Intercept (Mean value)	Slope (dynamics)	Intercept (Mean value)	Slope (dynamics)	Intercept (Mean value)
Harmony with life (Personal life position)	-0.002	0.280***	0.032	0.173*	-0.039	0.197**
Agency (Personal life position)	0.074	0.343***	0.076	0.252***	0.068	0.396***

Subjective vitality	-0.002	0.331***	0.090	0.234**	0.100	0.142
Tolerance for ambiguity	0.044	0.160*	0.022	0.167*	-0.028	0.092
Self-efficacy	-0.034	0.247***	-0.014	0.126	0.010	0.141

Note – the table presents only personality variables for which significant correlations with situation appraisals were found: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Correlation analysis of negative emotions showed significant inverse correlations of mean values (intercepts) of active and passive reactions with a number of personality dispositions (table 4). The general pattern was that a person with a higher level of harmony with life, hardiness, a sense of coherence, tolerance for ambiguity, subjective vitality and belief in free will, experiences active and passive negative emotions in situations of uncertainty to a lesser extent.

Table 4 – Pearson Correlation coefficients between negative emotions (intercepts) in Situations A, B, C and personality variables.

Personality dispositions	Negative emotions in Situation A “COVID-19”		Negative emotions in Situation B “Constitution”		Negative emotions in Situation C “Oil prices”	
	Active	Passive	Active	Passive	Active	Passive
Harmony with life (Personal life position)	-0.232**	-0.236**	-0.168*	-0.218**	-0.178*	-0.303***
Hardiness	-0.335***	-0.428***	-0.240**	-0.266***	-0.254***	-0.381***
Sense of coherence	-0.318***	-0.370***	-0.186*	-0.224**	-0.139	-0.242**
Free will (Freedom/Determinism Beliefs)	-0.184*	-0.179*	-0.094	-0.165*	-0.122	-0.191*
Tolerance for ambiguity	-0.215**	-0.455***	-0.142	-0.115	-0.137	-0.328***
Subjective vitality	-0.247***	-0.401***	-0.139	-0.149*	-0.064	-0.219**
Self-efficacy	-0.148*	-0.266***	-0.091	-0.112	-0.068	-0.197**

Note – the table presents only personality variables for which significant correlations with situation appraisals were found: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The results of the analysis of the influence of personality dispositions on the dynamics of negative emotions (table 5) showed that in the process of changing Situation A (“Coronavirus”), there was a certain decline in passive negative emotions, and belief in free will contributing to this.

Table 5 – Pearson Correlation coefficients between negative emotions (slopes) in Situations A, B, C and personality variables.

Personality dispositions	Negative emotions in Situation A “COVID-19”		Negative emotions in Situation B “Constitution”		Negative emotions in Situation C “Oil prices”	
	Active	Passive	Active	Passive	Active	Passive
Free will (Freedom/Determinism Beliefs)	-0.115	-0.176*	-0.147*	-0.151*	-0.178*	-0.081

Hardiness	-0.088	-0.049	-0.020	-0.222**	-0.041	-0.117
Subjective vitality	0.026	-0.010	-0.011	-0.209**	-0.014	-0.135

Note – the table presents only personality variables for which significant correlations with situation appraisals were found: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Active negative emotions in Situation B (“Constitution”), on the contrary, increased, but with a high level of belief in human free will, this growth occurred more slowly. Also, along with belief in free will, hardiness and subjective vitality slowed down the growth of passive emotions in Situation B. Situation C (“Oil”) was characterized by a general decline in negative emotions, belief in free will slowed down the active reaction of a person, and subjective vitality slowed down the passive one. **In conclusion**, findings, limitations of the empirical study and prospects for further research are discussed.

GENERAL CONCLUSIONS OF THE RESULTS OF THE STUDY

1. Phenomenological descriptions of uncertainty were divided into several categories: emotional experiences, epistemological uncertainty, limited self-determination, ontological uncertainty, uncertainty in relationships and uncertainty of choice. Based on the identified categories, we narrowed the study of uncertainty in a broad sense to subjective uncertainty, which is characterized by emotional experiences, limited information about the world and about oneself, uncontrollable life circumstances, unpredictable choice results and uncertainty in relationships with other people. The data obtained did not allow us to identify universal criteria for situations of uncertainty. This may be due to the fact that uncertainty is a difficult phenomenon to understand and to describe in the absence of a situational context. Taking into account the situational context, on the contrary, confronts us with a wide variety of constructs used to describe uncertainty.

2. Categories of coping behavior under conditions of uncertainty included active actions, seeking help from others, passive waiting, analysis, and search for information, rethinking and changing attitudes to the situation, compromise, introspection and self-regulation, as well as the least frequent but important category of intuition. Despite some specifics, the methods of coping with uncertainty largely overlap with the repeatedly described methods of coping with difficult, or critical situations.

3. The results of a preliminary study of worldview beliefs related to free will/determinism/unpredictability showed some correlations between beliefs and individual personality characteristics. The empirical hypothesis about the connection between belief in unpredictability and the parameters of self-regulation, namely, sensitivity to feedback, attributional optimism, and personal responsibility, was not confirmed. It can be assumed that the belief in the fundamental indeterminacy of the world does not necessarily correspond to the existential understanding of the "courage to be" in the face of uncertainty. Belief in unpredictability in itself does not provide more successful self-regulation of a person. A more important factor was the ability to influence the events of life and take responsibility for the decisions made.

4. A number of individual characteristics of a person had stable correlations with the perception and evaluation of situations of uncertainty, namely, self-efficacy, a sense of coherence, subjective vitality, belief in free will and cognitive reflection correlated with a higher evaluation of subjective certainty. These parameters, together with hardiness and tolerance for ambiguity, corresponded to a more successful orientation in the face of uncertainty. Individual personality characteristics also predicted emotional experiences in response to situations of uncertainty, namely, a higher level of positive emotions and a lower level of active and passive negative emotions with a high level of personality resources.

5. Personality characteristics mediated the dynamics of evaluating the subjective certainty of situations and orientation in them. Self-efficacy, harmony with life, tolerance for ambiguity and belief in free will "slowed down" the decline in the assessment of the subjective certainty of situations due to the general increase in subjective uncertainty. Self-efficacy and belief in free will ensured a slower decline in the event of a decrease in overall orientation in a pandemic situation. Individual personality characteristics had a weaker effect on the dynamics of changes in emotional reactions.

The research was carried out in the International Laboratory of Positive Psychology of Personality and Motivation of the National Research University Higher School of Economics.

List of publications

1. Mospan A.N, Leontiev D.A. Approbation and validation of the freedom/determinism beliefs inventory (FAD-Plus) in the Russian sample //Psychology. Journal of Higher School of Economics. – 2021. – Vol. 18. – № 1. – P. 109-128 (in Russian).

2. Vitali D., Santini A., Sayers L., Mospan A. Implicative dilemmas and symptomatology measures: A practice-based evidence study of existential therapy // Journal of Constructivist Psychology. – 2020. – Vol. 33. – № 4. – P. 351-366.

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4. Leontiev D.A., Mospan A.N. Picture of the world, worldview and definition of the indefinite // Mir Psihologii. – 2017. – № 2. – P. 12-19.

Other Publications

1. Leontiev D.A., Mospan A.N., Mitina O.V. Elaboration and validation of the feedback sensitivity scale //Psychological Studies. – 2019. – Vol. 12. – № 63. – P. 1-13.

2. Mospan A.N., Leontiev D.A., Shilmanskaya (Miyuzova) A.E. Phenomenology of uncertainty // Personality in an era of change: Materials presented at the International conference 17-18 December 2018 / Ed.: E. Patyaeva, E. I. Shlyagina. – Smysl, 2018. – P. 230-232.

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