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TRANSGENERATIONAL ASPECTS OF PSYCHOLOGICAL STRESS IN THE VICINITY OF A FORMER NUCLEAR TEST SITE

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Abstract: *Long-term residence in radiation-contaminated areas gives rise to a specific complex of psychological reactions, classified in modern science as chronic radiation stress syndrome. Unlike acute stress disorders, this phenomenon is driven by the prolonged exposure to an invisible and intangible–yet ever-present–threat. Subjective perception of radiation risk often exceeds objective dosimetric readings, acting as an independent pathogenic factor. An analysis of literature regarding the impact of ionizing radiation on an individual's psychological characteristics as a whole has shown that exposure to adverse environmental factors leads to changes in personality structure and the emergence of traits such as anxiety, aggression, and rigidity, which in turn impair the individual's ability to adapt to the demands of daily life. According to the results of surveys and experimental research, the causes of prolonged psychological stress include the persistent risk of radiation-related health effects, financial hardship, information-related factors, and a lack of public knowledge regarding radiation and its associated biological, medical, and other effects. Individuals in the main study group, who lived under conditions of radio-ecological stress, experienced a breakdown of psychological defense mechanisms and developed states of despair, depression, and confusion. Psycho-emotional stress, maladaptive coping strategies, and patterns of «learned helplessness» that developed in the first generation (direct witnesses of the tests) are transmitted to subsequent generations through family narratives and destructive parenting styles. Consequently, the second and third generations-who were not exposed to direct radiation-exhibit lower levels of psychological well-being and quality of life, comparable to those of their parents. A comprehensive assessment of the psychological status of individuals affected by the activities of a nuclear test site is essential for verifying the mechanisms of socio-psychological adaptation amidst an anthropogenic crisis and for developing scientifically grounded medical-psychological rehabilitation programs.*

Key words: *radiation risk, anxiety, rigidity, distress, disadoptation, phobias, hypochondriacal disorders, psychoprophylaxis.*

Introduction. The health consequences experienced by populations directly exposed to radiation as a result of nuclear weapons testing at the Semipalatinsk Nuclear Test Site have been studied by scientists worldwide for many years. However, the issue of the health and psychological characteristics of the descendants of individuals directly exposed to ionizing radiation remains insufficiently explored.

In this regard, the relevance of the present study is beyond doubt.

Following environmental accidents and disasters, groups of individuals at increased radiation risk may emerge among the exposed population, including children born to irradiated parents. Under such circumstances, there is a need to assess the psychological consequences not only for individuals directly exposed to radiation but also for their descendants.

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At present, the number of individuals belonging to these groups amounts to tens of thousands, which makes the assessment of their health status from a socio-psychological perspective particularly important. The development of programs aimed at assessing the consequences of radiation exposure in descendants and developing rehabilitation measures requires comprehensive clinical and psychological research.

Specialists from the Research Institute of Radiation Medicine and Ecology have calculated the parameters of the radiation-hygienic situation and the effective radiation doses received by the population as a result of most of the known nuclear explosions. These calculations took into account such factors as the magnitude and velocity of radioactive cloud movement, deposition of fresh fission products, external exposure dose and dose rate at ground level, migration of radioactive isotopes through environmental media and food chains, as well as the duration of human exposure in open areas. External gamma-radiation doses were calculated based on radioactive cloud passage, atmospheric fallout, and the time individuals spent outdoors.

Internal exposure doses were estimated based on radionuclides inhaled with air and ingested through food and drinking water.

Based on the calculations performed and depending on the distance of a particular settlement from the epicenter of the nuclear explosion, three dose groups were identified according to decreasing radiation exposure levels. The first dose group comprised individuals exposed to radiation doses ranging from 250 to 500 mSv; the second group included those exposed to 50-249 mSv; and the third group consisted of individuals exposed to doses below 50 mSv.

It was established that the population of 30 settlements located within the administrative territories of the Abay, Beskaragay, and Zhanasemey districts had been exposed to radiation doses of 750 mSv or more. The first dose group included the population of the aforementioned areas; the second group comprised residents of the Borodulikha, Novoshulbinsk, Charsk, and Zharma districts; and the third group included residents of the Kokpektinsky, Aksuat, Makanchinsky, Urzhar, and Taskesken districts. In clinical and epidemiological studies examining the medical and demographic consequences of radiation exposure, the first dose group was classified as having the highest potential for the manifestation of radiation-induced effects, the second as having an increased potential for such effects, and the third as having the lowest potential [1].

The Abay and Abraly districts (southwestern part of the test site), as well as the Zhanasemey and Beskaragay districts (northeastern part of the test site), are located approximately 40–100 km from the experimental field and were affected by radioactive fallout to the greatest extent.

The territories of the Kokpektinsky, Aksuat, Makanchinsky, Urzhar, and Taskesken districts, located in the southeastern part of the test site at distances of approximately 250-800 km from the test site, were practically unaffected by radioactive fallout.

An analysis of the literature devoted to the effects of ionizing radiation on psychological characteristics has demonstrated that adverse environmental factors may lead to changes in personality structure and the development of such characteristics as anxiety, aggression, and rigidity, which, in turn, may impair an individual's adaptive functioning [2].

Public concern regarding radiation safety increased substantially following the Chernobyl nuclear accident. This event resulted in fundamentally different approaches to ensuring population safety following radiation accidents and environmental disasters [51].

The effects of radiation-related factors on individuals are not limited to a single moment but may persist over an extended period [3]. Some authors argue that mental disorders emerging after environmental radiation disasters are caused not only by the direct or indirect effects of physical factors but also by the involvement of somatopsychic or psychosomatic mechanisms directly associated with the consequences of such disasters [4].

The majority of surveyed individuals believe that their actual radiation exposure was several times higher than the dose levels officially established for the region and documented in relevant records [5]. The discrepancy between actual and perceived radiation exposure may constitute an additional source of internal conflict and act as a psychogenic factor contributing to psychological

maladaptation.

Among populations living for prolonged periods in environmentally unfavorable territories, specific psychological characteristics may develop as a result of persistent stress-inducing factors, including perceived threats to life and health and the subjective interpretation of information concerning these threats [6].

An analysis of indicators characterizing the socio-psychological condition of the population, including health-related problems, demonstrates the complexity of the socio-psychological situation in the territories surrounding the former Semipalatinsk Nuclear Test Site [7].

Before the psychological assessment, all participants in the experimental and control groups underwent medical examinations. Diseases of the endocrine system predominated among the participants, accounting for 85% in the Abay district, 75% in Abraly, 80% in Beskaragay, and 80% in Zhanasemey.

In the control group from the Kokpektinsky district, endocrine disorders were identified in 55% of respondents. Cardiovascular diseases ranked second, accounting for 48%, 44%, 44%, and 48% of cases in the respective experimental groups. In the control group, cardiovascular diseases were identified in 28% of respondents.

Diseases of the central nervous system (CNS) ranked third. They were identified in 28% of respondents in the Abay district, 36% in Abraly, 30% in Beskaragay, and 46% in Zhanasemey. In the control group, CNS disorders were identified in 16% of respondents.

Other somatic disorders were also identified, including diseases of the genitourinary system, gastrointestinal tract, respiratory system, and skin, although at lower frequencies. Participants reported various health complaints, the most common of which were general weakness and fatigue, reported by more than 60% of respondents in the experimental groups, as well as allergic reactions, reported by more than 50%.

A study of public opinion among respondents living in territories previously affected by radioactive contamination made it possible to identify the views of residents of the Semipalatinsk Nuclear Test Site region concerning the predominant problems of the studied territories. It also made it possible to identify prevailing radiation-related and psychological factors, as well as additional provoking factors, including somatic diseases, material difficulties, and alcohol use, that may contribute to the development of emotional disorders.

For the majority of respondents (80%), the very fact of living in the territory of the former nuclear test site constituted the principal psychological factor contributing to chronic psycho-emotional stress associated with the perceived increased risk of radiation exposure and its consequences.

When asked, «What worries you most?» (with up to three responses allowed), more than 70% of respondents in the experimental group identified their own health as a major concern; the same issue was also reported in the control group [8].

More than 70% of respondents in the study group identified the environmental situation and elevated background radiation as major concerns, compared with 56% in the control group. In the Abraly and Beskaragay districts, 60% of respondents expressed concern about their financial situation. In the Abraly experimental group, 60% of respondents were dissatisfied with the nature of their employment.

When asked about the health effects of living in the territory of the former nuclear test site, more than 80% of respondents in the experimental group answered affirmatively, compared with 60% in the control group.

When asked whether they believed that the state provided sufficient compensation for the consequences of nuclear testing, more than 68% of respondents in the study group answered that the compensation was insufficient. In the control group, 64% of respondents gave a negative response.

When asked how they had learned about the presence of radiation in the territory of the former Semipalatinsk Nuclear Test Site, 36% of respondents in the study group reported receiving this information from people in their immediate social environment, including neighbors and relatives;

51% reported receiving information through documentation concerning individual radiation doses; and 12% had learned about it from television.

When asked how they intended to respond to the current situation, more than 50% of respondents in the study group stated that they intended to seek benefits provided under the law. Sixteen percent reported that they would seek any available means of assistance.

Based on the results of surveys, interviews, and individual consultations with respondents living in the territories of the former Semipalatinsk Nuclear Test Site, a variety of factors affecting socio-psychological anxiety were identified. Respondents from the former radiation-exposure zones demonstrated subjective psychological concerns related to health and life values, the presence of somatic pathology, financial dissatisfaction, and concern regarding the environmental situation.

These factors were associated with low self-esteem, reduced motivation for self-actualization, the development of dependency-oriented attitudes toward benefits and compensation, depressive and frustration-related manifestations, distress, and social withdrawal.

Materials and methods.

In our work we consider the cognitive characteristics of the people living in the areas of radiation risk in order to identify what is really whether residing in the territory of the former Semipalatinsk nuclear test site, where the level of radiation does not exceed 1 sievert, significantly affects cognitive processes, causing them psychopathological phenomena. We used such techniques as «Involuntary memory», «elimination of concepts», «Simple analogy».

In the experimental group of Abay district of the respondents noted enhanced exhaustion, vital asthenia, internal fatigue and tension, which may serve as an indirect sign of accidental hazards, residence in the contaminated territories. As a result of the research between the experimental group of Abay district and the control group were not revealed significant differences in the methodology of «Simple analogy». Any rigidity in the responses of the subjects, neither the pilot nor in the control groups, have been discovered. Most of the answers were characterized by logic, interconnection, flexibility.

The study of cognitive processes in experimental and control groups showed that there is a slight decrease in the course of the cognitive processes of the respondents of the study group compared with the control group, but they are insignificant. In the experimental groups were identified signs of истощаемости, asthenic manifestations, strain, that allows to speak about the presence of the target groups set of the same type of psychological phenomena, connected with neurotic peculiarities of the survey, the influence of somatic diseases, the presence of психогенного factor (psychoemotional stress), caused by a stay in the territory of the former Semipalatinsk test site; psychopathological disorders cognitive sphere of the subjects of the experimental and control samples is not detected.

Results and Discussion.

In the experimental groups of Abay and Zhanasemey areas ($p \leq 0,01$) indicator personal anxiety in the experimental groups is higher than in the control group. Fixed personal anxiety among the respondents of Abraly and Beskaragai areas, with significant differences ($p \leq 0.05$) compared with the control group, Kokpekty region (district).

The study of the emotional-volitional processes was conducted by the method of «Self-esteem depression.» In the experimental groups of Abay, Beskaragai, Zhanasemey areas in comparison with the control group were identified statistical differences: the anxiety in the experimental groups was higher than in the control group ($p \leq 0,01$). To identify the statistical significance of differences between the level of anxiety of the people in the control and experimental groups was used student's t-criteria. Table 1 presents the results of the method of «Self-rating depression» by the experimental and control groups.

Table 1 – comparative figures by the method of «Self-esteem depression» in the experimental and control groups The critical value of tкр.=2,06 (? 0, 05) tкр.=2,80 (? 0, 01)

Experimental groups(regions)	The control group of Kokpekty
Abay	3,60 Significant p 0,01
Abraly	1,59
Beskaragai	4,01 Significant p 0,01
Zhanasemey	3,55 Significant p 0,01

The existence of the degree of anxiety in the experimental group says about asthenic manifestations, distorting the real self-esteem, justifying social passivity, self-centeredness, indecision, justification of alcoholism, violent behaviour. Individuals with increased anxiety to some extent, more than others, are prone to various forms of desadaptation behavior, they are more likely to occur alcoholism, drug abuse, suicides and other delinquency. These people require special both social and medico-psychological support.

We used the questionnaire «the FPI (form C), with a view to identifying a complex of psychological peculiarities of the personality of the persons living on the territory of the former Semipalatinsk test site. The results of a psychological survey of the experimental group of Abay district and the control group on a multifactor personal questionnaire FPI, show that, on a scale neurotic there were statistically significant differences ($p \leq 0,01$). With a scale of neuroticin the experimental group was higher than in the control. Neurotic state is always associated with a bad mood, stuck on the negative experiences, lack of satisfaction with both physiological, and emotional needs. Has decreased libido. The respondents of the study group revealed a high level of neurotic people, the fixation on their disease, it somatic complaints, increased exhaustion in conjunction with asthenic pole [9].

On a scale neurotic between the experimental group of Abraly and the control group, there were statistical differences ($p \leq 0,05$). It can be assumed that the respondents of Abraly compared with the control high marks, which correspond to the expressed neurotic syndrome. The General condition of the subjects of the experimental group, living in the contaminated areas, can be described as a state of pronounced adaptation and stress, with stuck on the negative experiences, the «care» of the disease, anxious, depressed mood. In the control group identified the lowest scores on a scale neurotic.

We have received significant differences on the scale neurotic(3,45, p less than 0.01), while the level of neurotic higher in the experimental group compared with the control group. Accordingly, respondents of Beskaragai observed a tendency to neurotic reactions, somatic complaints, predisposition to psychosomatic diseases.

Significant differences were obtained on a scale depression (2.10m, $p \leq 0,05$): in the experimental group, the level of depression is higher than in the control group. According to this scale in subjects Beskaragai district dominated disturbing - depressive von with the feeling of an inner weariness. For such persons is characterized by a rather high level of their problems, accompanied by a pessimistic assessment of the prospects and a feeling of hopelessness.

On a scale of shyness revealed significant differences in Beskaragay area of the experimental and control groups (of 3.44, $p \leq 0,01$), and in the experimental group, the level of shyness higher than in the control group. It can be assumed that for the respondents of the study group is characterized by a special form of social anxiety, in which it is stated heightened self-awareness and care about what you will think of others. Respondents Beskaragai district often tortured by unfounded sense of inferiority, and could not maintain contacts with a wide range of people, characterized by restraint in the expression of feelings. The subjects of the experimental group appeared sensitive to any threat, in comparison with the control group. This fact is marked in the works, devoted to the analysis of psychosomatic disorders in workers of the Siberian chemical combine the inability to maintain a

harmonious relationship with the environment [5].

Significant differences on the scale neurotic were identified between the experimental and control groups (2,31, p≤0,05). The respondents of Zhanasemey neurotic was higher than that of the subjects of the control group. High indicators on this scale to indicate the presence of невротизации of the affected people living in radioactively contaminated territories. In the experimental group identifies bad mood due to physical problems, uncertainty, increased anxiety for their own health.

High scores on a scale of irritability were found in the experimental group of Zhanasemey, in comparison with the control (2,06, p≤0,05).

The respondents of Zhanasemey prevails instability of the emotional state with a tendency to emotions, education supervaluable ideas, defining the type of response and behavioral reactions.

The analysis of the indicators by the method of «Multi-personal questionnaire FPI» showed that respondents experimental groups of Abay, Abraly, Beskaragai and Zhanasemey areas in contrast to the control group Kokpekti, experienced anxiety, they have experienced an increased level of невротизации, protective type of reaction «flight into illness», which allows to shift the responsibility for what is happening to others.

In the present study, transgenerational aspects are considered as psychological consequences transmitted from one generation to another through negative experiences endured by family members. Such trauma may manifest in the form of recurring patterns of behavior, emotional reactions, and interpersonal relationships.

From a psychoanalytic perspective, such trauma may be associated with the concept of representation, referring to a set of internal perceptions and images transmitted across generations. Representations associated with traumatic experiences may trigger emotional and behavioral responses that can subsequently be transmitted to descendants.

Such transmission constitutes a historical basis connecting successive generations. At the same time, both the family system and the individual may demonstrate a tendency to remove painful experiences from conscious memory and reject information perceived as threatening to the group as a whole or to relationships within it.

In examining the mechanisms of transgenerational trauma transmission among individuals living under conditions of radioecological stress, we identified the following working model, depending on specific circumstances and patterns of interaction within the family.

To prevent the recurrence of future distress, family members may avoid discussing topics that they believe could trigger discomfort and subsequent symptoms in the parent.

Parents may disclose specific trauma-related information and provide extensive descriptions of traumatic events in an attempt to “prepare” their children for survival in a world that they perceive as dominated by pervasive danger.

Children living with traumatized parents may be continuously exposed to post-traumatic reactions that are unpredictable and frightening. Such children may experience a sense of responsibility for their parents' suffering and may believe that, if they were «good enough», their parents would not currently experience sadness or emotional distress.

Individuals who have experienced trauma may reenact aspects of their traumatic experiences within family relationships, thereby reinforcing the chain of intergenerational and transgenerational trauma.

Conclusions. Of the respondents living in the territory of the former Semipalatinsk nuclear test site, with a high level of anxiety was violated hierarchical nature of the system of values, that is, separation of the latter to the major and the minor. The respondents described the greatest narrowing of the value of the field.

The subjects expressed ideas of their own inferior, insolvency. Most of them were observed popup with a predominance of moral evaluation of their condition, associated with the impossibility to perform his duty, was characterized by the experience of spiritual loss, loss and fear, in connection with the fact that reside in radioactively contaminated territories. This fact also shows the impact in

more information about the presence of radiation because of the objective data, on the territory of the surveyed communities, located on the territory of the former Semipalatinsk test site, the level of radiation does not exceed 1 sievert. The separate part of the subjects of the experimental group was a concern that is eliminated from the hardships of life, in the framework of practical concerns. In the control group, this trend was expressed insignificant. This is confirmed by data of V.E. Kagan, who notes that not having the possibility to change the environment, staying in which painful for him, aware of his own incompetence encourages subject to the transition to the protective behaviours, the creation of semantic and emotional barriers in relationships with others [10, 11]. To reduce the high level of personal anxiety, psycho-emotional stress and depressions among the population, residing on the territories of the former Semipalatinsk nuclear test site, requires the implementation of special measures for the social-psychological rehabilitation of the population, the creation of a special service of socio-psychological assistance to people living in radioactively contaminated territories. In addition to measures of socio-economic problems and the improvement of the medical service of the population, should certainly include activities that contribute to the obtaining of the population with objective information on the radiation situation and recommendations, directed on formation of skills and adequate behavior of people in a real situation.

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БҰРЫНҒЫ ЯДРОЛЫҚ СЫНАҚ ПОЛИГОНЫ МАҢЫНДАҒЫ ПСИХОЛОГИЯЛЫҚ СТРЕСТІҢ ҰРПАҚАРАЛЫҚ АСПЕКТІЛЕРІ

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Аңдатпа: *Радиациямен ластанған аймақтарда ұзақ уақыт тұру қазіргі заманғы ғылымда «созылмалы радиациялық стресс синдромы» деп жіктелетін психологиялық реакциялардың ерекше кешенін тудырады. Жедел стресстік бұзылыстардан айырмашылығы сол, бұл құбылыс көрінбейтін және сезілмейтін, алайда үнемі орын алатын қауіпті фактордың ұзақ уақыт бойы әсер етуімен сипатталады. Радиациялық қауіпті субъективті қабылдау көбінесе объективті дозиметриялық өлшемдерден асып түсіп, дербес патогендік фактор ретінде әрекет етеді. Иондаушы сәулеленудің адамның психологиялық сипаттамаларына жалпы әсеріне қатысты әдебиеттерді талдау көрсеткендей, қоршаған ортаның қолайсыз факторларының әсері тұлға құрылымының өзгеруіне және мазасыздық, агрессия, ригидтілік сияқты қасиеттердің пайда болуына әкеледі; бұл өз кезегінде адамның күнделікті өмір талаптарына бейімделу қабілетін нашарлатады. Сауалнамалар мен эксперименттік зерттеулердің нәтижелеріне сәйкес, ұзаққа созылған психологиялық стресстің себептеріне адам денсаулығына төнетін ұзақ мерзімді радиациялық қауіп, қаржылық қиындықтар, ақпараттық сипаттағы факторлар, сондай-ақ халықтың радиация және оның әсерінен туындайтын биологиялық, медициналық және басқа да салдарлар туралы хабардарлық деңгейінің төмендігі жатады. Радиоэкологиялық стресс жағдайында өмір сүріп жатқан негізгі топтағы адамдарда психологиялық қорғаныс механизмдері бұзылып, үмітсіздік, депрессия және абдырау күйлері пайда болды. Психоэмоционалдық стресс, бейімделуге мүмкіндік бермейтін күресу стратегиялары және бірінші ұрпақта (сынақтардың тікелей куәгерлерінде) қалыптасқан «үйренілген дәрменсіздік» үлгілері отбасылық әңгімелер мен тәрбиелеудің деструктивті стильдері арқылы кейінгі ұрпақтарға беріледі. Нәтижесінде, радиацияның тікелей әсеріне ұшырамаған екінші және үшінші буын өкілдерінің психологиялық әл-ауқаты мен өмір сапасының деңгейі төмендегені байқалады; бұл көрсеткіштер олардың ата-аналарының жағдайымен салыстыруға келеді. Ядролық сынақ полигоны қызметінің әсеріне ұшыраған адамдардың психологиялық жағдайын кешенді бағалау антропогендік дағдарыс жағдайындағы әлеуметтік-психологиялық бейімделу тетіктерін айқындау және ғылыми негізделген медициналық-психологиялық оңалту бағдарламаларын әзірлеу үшін маңызды болып табылады.*

Түйін сөздер: *радиациялық қауіп, мазасыздық, қатып қалу (ригидтілік), күйзеліс, бейімделудің бұзылуы, фобиялар, гипохондриялық бұзылулар, психопрофилактика.*

ТРАНСГЕНЕРАЦИОННЫЕ АСПЕКТЫ ПСИХОЛОГИЧЕСКОГО СТРЕССА В УСЛОВИЯХ БЫВШЕГО ЯДЕРНОГО ПОЛИГОНА

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Аннотаци;. *Длительное проживание на радиационно-загрязненных территориях формирует специфический комплекс психических реакций, классифицируемый в современной науке как синдром хронического радиационного стресса. В отличие от острых стрессовых расстройств, данный феномен детерминирован пролонгированным воздействием невидимого, неосязаемого, но перманентно присутствующего фактора угрозы. Субъективное восприятие радиационного риска зачастую превосходит объективные показатели дозиметрического контроля, выступая в качестве самостоятельного патогенного фактора.*

Анализ литературных данных, посвященных изучению влияния ионизирующей радиации на психологические особенности личности в целом, показал, что под воздействием неблагоприятных экологических факторов происходят изменения в структуре личности, и появляются следующие личностные характеристики такие, как тревожность, агрессия, ригидность, которые в свою очередь нарушают адаптацию жизнедеятельности человека.

Причинами длительного психологического стресса по результатам анкетирования, экспериментального исследования, являются факт существования долговременного радиационного риска для здоровья людей, недостаточность материального положения, информационный фактор, низкий уровень знаний населения о радиации и связанных с ее воздействием биологических, медицинских и других эффектах. У лиц основной группы, проживавших в условиях радиоэкологического стресса, нарушались психологические защитные механизмы и возникали состояния отчаяния, депрессии, растерянности.

Психоэмоциональное напряжение, дезадаптивные копинг-стратегии и паттерны «выученной беспомощности», сформировавшиеся у первого поколения (непосредственных очевидцев испытаний), транслируются последующим поколениям посредством семейных нарративов и деструктивных стилей воспитания. В результате у второго и третьего поколений, не подвергавшихся прямому радиационному облучению, фиксируются сниженные показатели психологического благополучия и качества жизни, сопоставимые с показателями их родителей.

Комплексная оценка психологического статуса лиц, пострадавших от деятельности ядерного полигона, необходима для верификации механизмов социально-психологической адаптации в условиях антропогенного кризиса и разработки научно обоснованных программ медико-психологической реабилитации.

Ключевые слова: *радиационный риск, тревожность, ригидность, дистресс, дезадаптация, фобии, ипохондрические расстройства, психопрофилактика.*

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