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PROTECTIVE BEHAVIOR OF ADOLESCENTS WITH ACQUIRED ORTHOPEDIC DISEASES IN THE CONDITIONS OF REHABILITATION TREATMENT

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Background. Teenagers with orthopedic diseases are in a difficult life situation, accompanied by experiences of an extraordinary level. Adaptation mechanisms play an important role in overcoming emotional difficulties. An important component of the adaptation process is psychological defense mechanisms. The article discusses the structure and effectiveness of the protective disposition of personality in adolescents suffering from various forms of acquired orthopedic diseases.
Aim. This study aimed to determine the structure and effectiveness of the protective disposition of personality in adolescents suffering from various forms of acquired orthopedic diseases.
Materials and methods. The study involved adolescents suffering from acquired orthopedic diseases: juvenile chronic arthritis, idiopathic scoliosis, and adolescents with long-term consequences of physical trauma on the basis of voluntary informed consent. All teenagers received treatment in the children's orthopedic clinic. The study involved 139 adolescents with acquired orthopedic diseases and 36 healthy adolescents aged 12–17 years. Clinical psychological and psychodiagnostic methods were used to survey the respondents.
Results. The general and specific features of the protective system of personality in adolescents with various forms of orthopedic diseases and their healthy peers were revealed. The role of mechanisms of psychological protection in the development of post-traumatic symptoms in adolescents with various forms of acquired orthopedic diseases in the situation of rehabilitation treatment is revealed.
Conclusions. Taking into account the features of the protective disposition of the personality of adolescents with orthopedic diseases allows a differentiated approach to psychological correction at the stages of rehabilitation treatment, to develop individual approaches to providing psychological assistance in a hospital.

Keywords: adolescents; orthopedic disease; mechanisms of psychological protection.

ЗАЩИТНОЕ ПОВЕДЕНИЕ ПОДРОСТКОВ С ПРИОБРЕТЕННЫМИ ОРТОПЕДИЧЕСКИМИ ЗАБОЛЕВАНИЯМИ В УСЛОВИЯХ ВОССТАНОВИТЕЛЬНОГО ЛЕЧЕНИЯ

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Обоснование. Подростки с ортопедическими заболеваниями находятся в трудной жизненной ситуации, сопровождающейся переживаниями экстраординарного уровня. В преодолении эмоциональных трудностей значительную роль играют адаптационные механизмы. Важной составляющей адаптационного процесса являются психологические защитные механизмы. В статье рассмотрены структура и эффективность защитной диспозиции личности подростков, страдающих различными формами приобретенных ортопедических заболеваний.
Цель — изучение структуры и эффективности защитной диспозиции личности подростков с различными формами приобретенных ортопедических заболеваний.
Материалы и методы. В исследовании на основании добровольного информированного согласия приняли участие подростки с приобретенными ортопедическими заболеваниями — ювенильным хроническим артритом, идиопатическим сколиозом, а также с отдаленными последствиями физической травмы. Все подростки получали лечение в условиях детской ортопедической клиники. Были исследованы 191 подросток с приобретенными ортопедическими заболеваниями и 43 здоровых подростка в возрасте 12–17 лет. Для обследования респондентов применяли клинико-психологические и психодиагностические методы.
Результаты. Выявлены общие и специфические особенности защитной системы личности у подростков с различными формами ортопедических заболеваний и у их здоровых сверстников. Установлена роль механизмов психологической защиты в развитии посттравматической симптоматики у подростков с различными формами приобретенных ортопедических заболеваний в ситуации восстановительного лечения.
Заключение. Учет особенности защитной диспозиции личности подростков с ортопедическими заболеваниями позволяет дифференцированно подойти к психологической коррекции на этапах восстановительного лечения, разработать индивидуальные подходы к оказанию психологической помощи в условиях стационара.

Ключевые слова: подростки; ортопедическое заболевание; механизмы психологической защиты.

International and Russian researchers indicate the presence of emotional and behavioral problems in adolescents suffering from chronic diseases, including orthopedic ones [1–4]. A disease that requires complex rehabilitation treatment creates a special situation in the lives of adolescents. An important characteristic and criterion of the level of difficulty of such a situation is the inability of teenagers to satisfy their needs and cope with emotional discomfort with the help of habitual behavioral models [5, 6]. In a difficult life situation, the objective and subjective parameters characteristic of teenagers in a typical social situation are distorted. Typical and extraordinary events of life can become objective characteristics of a life situation. In adolescence, events such as a conflict situation with parents, a breakdown of the life stereotype due to a change in study place, or a change in the reference group of peers can be considered as such typical life events. Atypical (specific) events include various circumstances related to the occurrence and treatment of a serious disease. As a rule, extraordinary events in the lives of adolescents trigger a stressful reaction accompanied by negative feelings, emotional stress, and maladaptive manifestations of an emotiogenic nature.

To analyze the subjective characteristics of a deprived background of adolescents with orthopedic diseases, the concept of post-traumatic stress (PTS) can be applied, which is understood as a continuum of a person's reactions to high-intensity stress accompanied by an experience of fear or helplessness [7]. PTS indicators are manifested as persistent physiological and psychological symptoms indicating mental maladaptation at various levels. High rates of PTS may be associated with clinical manifestations of maladaptation; thus, medical and psychological interventions may be required. Under these conditions, psychological mechanisms to overcome stress are significant. These components of the adaptation process include psychological defense mechanisms and coping behavior strategies (coping strategies) [8, 9]. The use of coping strategies enables a person to cope with stress consciously and purposefully in ways that are adequate to personal traits and characteristics of the situation. Using the psychological defense mechanisms within the psyche unconscious activity, emotional stress is weakened, and the disorganization of the behavior of consciousness and the psyche as a whole is prevented. Psychological defenses are formed in ontogenesis as a result of development and learning. In the early stages of ontogenesis, primitive and immature defenses are created, which represent the formations that are undifferentiated in the sensory space of the individual. Such defense mechanisms are not adequately represented in reality. Mature defense mechanisms are largely fused with cognitive and conscious processes and, according to some authors, partially fulfill the functions of coping strategies [9].

The tension and structure of such patterns of psychological defense are determined by situational and demographic factors [8–10]. The psycho-evolutionary theory of emotions of Plutchik is promising to study the psychological defense mechanisms of adolescents in a difficult life situation due to orthopedic disease [9, 11]. Plutchik considered defense mechanisms in relation to basic emotions and described eight defense mechanisms, ranking them according to the maturity criterion, namely, repression (suppression), negation, regression, compensation, projection, substitution, rationalization, and hypercompensation (reaction formation).

Repression (or suppression) is a psychological defense mechanism in which feelings, thoughts, and desires that are unacceptable for an adolescent, and which cause anxiety, are "forgotten" and become unconscious. In this case, repressed impulses retain their psycho-vegetative component, influencing indirectly the behavior.

Negation is a psychological defense mechanism that negates the events of a life situation that are obvious to the surrounding aspects of the external reality and that cause anxiety. In an orthopedic disease, the negation mechanism of psychological defense can manifest itself in anosognosia of the severity and consequences of the disease, ignoring treatment measures, and denying surgical intervention need.

Regression is a psychological defense mechanism in which teenagers seek to avoid discomfort by moving to earlier stages of mental development. At the same time, feelings and actions occur again, which correspond to the early experience of overcoming negative events in life, when actions were successful, and feelings were experienced as pleasure. This mechanism of psychological protection, being effective in the early stages of mental development, can provoke behavioral disorders and social adaptation difficulties in adolescence.

Substitution (or displacement) is a psychological defense mechanism that discharges suppressed emotions. In this case, the action of anger and hostility is directed to less secure and more accessible objects than those that, in reality, caused negative emotions.

Projection is a psychological defense mechanism in which a person's own thoughts and feelings (most often negative) are attributed to another person. The action of this defense mechanism may be accompanied by aggressive manifestations and impaired adaptation of the life situation associated with the disease.

Compensation is a psychological mechanism that manifests itself in the fact that teenagers are trying to replace a real defect with another trait. The properties and values of another person are assigned, which are accepted without analyzing and restructuring.

Hypercompensation (reaction formation) is a psychological defense mechanism in which unacceptable feelings, thoughts, and actions are leveled by exaggerated development of opposing qualities.

Intellectualization (rationalization) consists of overcoming traumatic feelings when subjectively uncomfortable feelings are leveled with the use of logical attitudes and mental manipulations. At the same time, attempts are made to reduce the value of inaccessible experience.

The works of modern authors are more often focused on the study of conscious strategies to overcome stressful situations, including situations caused by various diseases [12–14]. Some authors consider protective factors used by adolescents to cope with emotional problems in connection with a musculoskeletal system disorder [1–3]. Moreover, the role of defense mechanisms in the overall adaptation process under difficult life situations caused by orthopedic disease and the need for complex rehabilitation treatment are not sufficiently taken into account.

The **study aimed** to analyze the structure and effectiveness of the personal protective disposition in adolescents with various forms of acquired orthopedic diseases.

Materials and methods

Adolescents with acquired orthopedic diseases (juvenile chronic arthritis [JCA], idiopathic scoliosis [IS], and long-term physical trauma consequences [PTCs]) were enrolled in the study, based on voluntary informed consent. All adolescents received treatment in a children's orthopedic clinic. The study included 191 adolescents with acquired orthopedic diseases and 43 healthy adolescents aged 12–17 years. The selection to the study groups by

age was performed based on the criteria adopted at the international congress on age periodization (Moscow, 1965); according to which girls from the age of 12 years and boys from the age of 13 years are considered adolescents [15]. We examined 64 patients with an articular form of JCA, 59 with a severe scoliotic disease (IS), 68 with long-term consequences of mechanical trauma of the upper and lower extremities resulting from an accident or negligence, and 43 conditionally healthy adolescents. Clinical (objective) characteristics of the life situation of adolescents with various forms of acquired orthopedic diseases were described. The study groups excluded pediatric patients with a history of physical or sexual violence and who were in the zone of military operations and man-made disasters and involved in traffic accidents.

JCA is a systemic disease in which an autoimmune process develops as a result of immune deregulation. Reactive manifestations of the disease registered over 6 months are considered chronic. Treatment of JCA involved a child staying in a hospital and may be accompanied by painful medical procedures. With severe joint deformity, surgical treatment is performed. Our study involved pediatric patients with a disease duration of 1 to 6 years (monoarthritis and polyarthritis with a relapsing course) without a history of surgery.

IS is a severe deformity of the spine of unclear etiology, which disfigures the body of patients. The spinal deformity progresses over several years and can reach the stage of surgical pathology (Grades III–IV severity) by adolescence and lead to disability. Our study included adolescents with severe IS, who were admitted for surgical treatment in a children's orthopedic clinic.

Acquired orthopedic diseases include severe consequences of physical trauma, which require surgical intervention. Our study involved adolescents with long-term PTCs (mechanical) as a result of an accident or through negligence (contractures of the joints of the arms and legs, false joints, and post-traumatic deformity of the extremities). The period of mechanical damage since the trauma was from 6 months to 6 years. All children and adolescents admitted to the orthopedic clinic required surgical treatment.

Clinical, psychological, and psychodiagnostic methods were used to examine patients in an orthopedic clinic. Objective characteristics of the life situation of adolescents with orthopedic diseases and those of healthy adolescents were studied. The overall level of intellectual development was assessed using the Slosson test. The study groups included adolescents with an intelligence quotient of at least 90 units. The PTS level indicators were used as obligate signs of maladaptation in a difficult life situation associated with an acquired orthopedic disease [7]. Low values of PTS manifestations were considered as an indicator of the effectiveness of the psychological defense mechanisms. To study the PTS level in adolescents, a modified version of a semi-structured interview was used to assess the traumatic feelings of children and adolescents [7]. The psychological defense mechanisms were studied using the Plutchik–Kellerman Lifestyle Index technique [11].

Mathematical and statistical processing of the data obtained included the analysis of descriptive statistics, the Fisher φ-transformation, the Student *t*-test, the nonparametric Mann–Whitney *U* test, and the calculation of the Spearman rank correlation coefficient *rs*.

Results and discussion

At stage 1 (clinical and psychological) of the study, objective and subjective characteristics of the life situation of adolescents with various forms of orthopedic diseases and those of conditionally healthy adolescents were described.

The results of the analysis of the life situation of adolescents with orthopedic diseases and that of their peers without orthopedic pathology showed that there were events accompanied by a feeling of fear and helplessness in the lives of sick and healthy adolescents (in accordance with criterion A of the Diagnostic and Statistical Manual of Mental Disorders [DSM]-V; Table 1). The general (typical) and specific events in the lives of adolescents with orthopedic diseases and those of conditionally healthy adolescents were identified. The events in the lives of the adolescents examined in all the groups were reported, which include emotional trauma, such as the divorce of parents, death of a loved one, and disharmonious relationships in the family. The event of divorce of parents was significantly more likely to occur in the group of JCA patients ($\varphi = 2.01$; $p < 0.05$) compared with that in conditionally healthy adolescents. All

Table 1

Characteristics of the life situation of adolescents with various forms of orthopedic diseases and of conditionally healthy adolescents

Objective life events of adolescents	Juvenile chronic arthritis, $n = 64$	Consequences of mechanical trauma, $n = 68$	Idiopathic scoliosis, $n = 59$	Healthy, $n = 43$
Accident resulting in injury	–	60 (88.2 %)	–	–
Surgery, repeated surgery	–	68 (100 %)	–	–
Change in appearance	25 (39.0 %)	9 (13.2 %)	53 (89.6 %)	–
Parents divorce	21 (32.8 %)	11 (16.2 %)	12 (20.3 %)	8 (18.6 %)
Death of loved ones	11 (17.2 %)	8 (11.8 %)	8 (13.4 %)	7 (16.3 %)
Family conflict	16 (25.0 %)	13 (19.1 %)	8 (13.4 %)	5 (11.7 %)
Hospitalization	3 (4.7 %)	49 (72.0 %)	19 (32.1 %)	–

Note. n — the number of adolescents examined.

adolescents reported the presence of an event such as prolonged hospitalization. Conditionally healthy adolescents did not mention this event in their reports. The negative event (changes in appearance) was absent in the life situation of the examined conditionally healthy adolescents. Adolescents with severe IS in 89.8% of cases faced this situation in their life. JCA adolescents noted that the disease affected their appearance in 46.3% of cases, and PTC adolescents reported it in 15.4%.

For adolescents with PTC, such events are considered as traumatic as an accident that led to trauma (88.5%), surgery, and repeated surgery (96.2%). This reflects the aspects of complex rehabilitation treatment in post-traumatic orthopedic disorders and is confirmed by medical history. However, the results are not the same for adolescents with IS and JCA, which demonstrates the objective characteristics of their treatment situation (lack of events that resulted in physical trauma and repeated surgical interventions).

Thus, in the life situation of patients in an orthopedic clinic, there are events accompanied by a feeling of fear and helplessness more often than in the life situation of healthy adolescents. These include events such as hospitalization, surgery, a change in appearance, an accident leading to trauma, and emotional trauma. In the lives of JCA adolescents, emotional trauma associated with parental divorce is more often registered. Changes in appearance can cause emotional injuries in adolescents with IS and JCA. Events, including an accident that led to physical damage and surgical interventions, are often traumatic for PTC adolescents. Traumatic events associated with orthopedic diseases can be replicated many times in the life situation of adolescents in the form of eventful and invisible stressors that trigger emotional and behavioral response patterns. Such response features are prenosological or clinical forms of mental maladaptation, which international and Russian authors describe in terms of acute and PTS disorder.

PTS indicators can serve as subjective characteristics in the life situation of adolescents with and without orthopedic diseases [16]. In this regard, we studied the PTS characteristics of adolescents with and without acquired orthopedic diseases. The total PTS index was compared between adolescents with various forms of orthopedic diseases and adolescents who were relatively healthy. The study results showed that in the conditionally healthy adolescent group, the general PTS index revealed low (74.8% of cases) and average values (25.2% of cases). In the group of adolescents with orthopedic disorders, PTS had mainly average and high values. Thus, in JCA adolescents, the average values were recorded in 70.3% of cases, which were significantly more than in conditionally healthy adolescents ($\varphi = 4.31$; $p < 0.01$). In JCA adolescents, 13.0% of cases had high PTS values, and 16.7% had low values. In IS adolescents, PTS symptoms were only moderate and high in severity. The average values of the general PTS index were recorded in 72.7% of IS adolescents, which is significantly different from that of conditionally healthy adolescents ($\varphi = 4.12$; $p < 0.01$). Moreover, 27.3% of IS adolescents showed high values of PTS. In PTC adolescents, the average values of the general PTS index were noted in 65.5% of cases, which is significantly different from that in conditionally healthy adolescents ($\varphi = 3.0$; $p < 0.01$).

Table 2

Comparison of the total post-traumatic stress index in adolescents with acquired orthopedic diseases and in their healthy peers

Juvenile chronic arthritis, $n = 64$	Injury, $n = 58$	Idiopathic scoliosis, $n = 59$	Healthy, $n = 43$	p
19.34 ± 11.02	26.16 ± 10.7	26.05 ± 8.55	6.44 ± 6.86	$p_{0-2} \leq 0.05$ $p_{0-1} \leq 0.05$ $p_{0-3} \leq 0.01$ $p_{2-3} \leq 0.01$ $p_{1-3} \leq 0.01$

Table 3

Comparison of the general index of tension of psychological defense mechanisms in adolescents with various orthopedic diseases and in their healthy peers

Juvenile chronic arthritis, $n = 54$	Injuries, $n = 26$	Idiopathic scoliosis, $n = 59$	Healthy, $n = 36$	p
42.32 ± 8.81	37.43 ± 12.24	48.93 ± 12.83	45.25 ± 10.23	$p_{0-2} \leq 0.001$ $p_{1-2} \leq 0.001$ $p_{1-3} \leq 0.05$ $p_{2-3} \leq 0.05$

Note. n — the number of adolescents examined; p — level of significance of differences.

In adolescents with PTC, high values of PTS were noted in 27.0% of respondents and low values in 7.5%. At that, the intensity of post-traumatic symptoms did not reach the values of PTS disorder in any of the adolescents examined.

Table 2 presents the results of comparison of the total PTS index in adolescents with various acquired orthopedic diseases and in healthy adolescents.

The results obtained indicate that in adolescents with acquired orthopedic diseases, the values of the general PTS index exceeded significantly the values of a similar indicator for conditionally healthy adolescents. In JCA adolescents, the manifestations of PTS are significantly more pronounced than in their healthy peers, whereas the values of this indicator are reduced compared with adolescents with IS and the consequences of mechanical injury.

Thus, adolescents with various orthopedic diseases differ from their peers without orthopedic pathology in significantly more pronounced manifestations of PTS.

The study results revealed that in IS adolescents, the general level of tension of psychological defense mechanisms exceeded that in healthy adolescents (Table 3). In adolescents with JCA and PTC, the general level of psychological defense tension turned out to be lower than the level of defense mechanisms in adolescents with IS and in their healthy peers. JCA adolescents had a tendency to decrease in the general index of tension of the defense mechanisms of the personality. The results obtained may indicate the weakness of the protective disposition of the personality of adolescents with PTC and JCA and represent a risk factor for behavioral and psychosomatic maladaptation. IS adolescents have a higher level of tension in the protective system, which can be an "emergency way" to respond to situations, when emotional stereotypical patterns of behavior are updated, and reflect difficulties in overcoming emotional problems in preparation for complex surgical treatment.

Table 4 presents the results of comparing the frequency of occurrence of psychological defense mechanisms in adolescents with various orthopedic diseases and in their healthy peers.

The frequency of occurrence of various mechanisms of psychological defense was compared in adolescents with various forms of orthopedic diseases. Aspects of the protective disposition (structure) of personality in adolescents with diseases and healthy adolescents were similar. The respondents of the main and control groups involved equally often the mechanism of the negation psychological defense. Unconscious defensive reactions aimed at denying the obvious circumstances of life are typical for persons of this age group. Likely, the prevalence of these psychological defense mechanisms in all groups of subjects reflects the general patterns of adolescence in the formation of a protective disposition of the personality.

Table 4

Comparison of the frequency of occurrence of psychological defense mechanisms in adolescents with various orthopedic diseases and in their healthy peers

Defense mechanism	Juvenile chronic arthritis, $n = 54$	Injuries, $n = 26$	Idiopathic scoliosis, $n = 59$	Healthy, $n = 36$	p
Repression	36.98 ± 17.74	39.23 ± 17.87	43.86 ± 19.01	32.78 ± 17.17	$p_{0-2} \le 0.05$ $p_{2-3} \le 0.01$
Regression	35.0 ± 15.08	32.88 ± 16.20	45.66 ± 20.14	43.75 ± 21.75	$p_{0-2} \le 0.001$ $p_{0-3} \le 0.05$ $p_{1-2} \le 0.01$ $p_{1-3} \le 0.05$
Substitution	33.63 ± 18.32	29.23 ± 22.08	40.63 ± 24.10	36.86 ± 19.82	$p_{1-2} = 0.06$ $p_{1-3} = 0.06$
Negation	49.83 ± 18.46	47.12 ± 18.08	55.44 ± 24.55	47.39 ± 18.13	Difference not significant
Projection	62.03 ± 16.95	56.04 ± 20.56	58.17 ± 21.10	65.47 ± 17.48	$p_{1-3} = 0.08$
Compensation	37.11 ± 17.69	34.38 ± 19.81	48.47 ± 19.46	50.97 ± 21.70	$p_{0-2} \le 0.01$ $p_{0-3} \le 0.01$ $p_{1-2} \le 0.01$ $p_{1-3} \le 0.01$
Hypercompensation	43.50 ± 18.36	28.23 ± 20.49	53.56 ± 25.71	34.81 ± 20.66	$p_{0-1} \le 0.001$ $p_{0-2} \le 0.05$ $p_{0-3} \le 0.05$ $p_{1-2} \le 0.001$ $p_{2-3} \le 0.001$
Rationalization	45.78 ± 19.70	49.81 ± 13.85	54.92 ± 21.87	54.25 ± 16.63	$p_{0-2} \le 0.05$ $p_{0-3} \le 0.05$

Note. n — the number of adolescents examined; p — level of significance of differences.

Compared with their healthy peers, JCA adolescents have decreased indicators of pronouncement of the defense mechanisms of regression, compensation, and rationalization and an increased frequency of occurrence of the hypercompensation defense mechanism. Probably, such a structure of defense mechanisms is associated with difficulties in choosing and verbalizing acceptable ways of responding to negative emotional experiences in a difficult life situation. And in adolescents with a psychosomatic disorder, such a disposition of defense mechanisms indicates the alexithymia style of a protective response in a difficult life situation.

In IS adolescents, in the personality structure, such mechanisms of psychological defense as regression, substitution, and hypercompensation are more often registered. The prevalence of these forms of defense can be associated with the actualization of emotionally immature stereotypical patterns of behavior in difficult life situations associated with treatment.

Adolescents with PTC are less likely to develop psychological defense mechanisms consistent with immature stereotypical behavior (regression, substitution, and projection psychological defense mechanisms). However, difficulties were identified in the development of socially acceptable behavior to relieve emotional stress and reduce subconsciously the feeling of inferiority (compensation psychological defense mechanism).

An important indicator of the maturity of the protective system in adolescence is an indicator of pronouncement of the rationalization psychological defense mechanism. The results of a comparative study showed that IS adolescents and conditionally healthy adolescents use the psychological protection mechanisms rationalization and compensation significantly more often than adolescents with other forms of orthopedic diseases. In both healthy and IS adolescents, in stressful situations, the ability to replace negative emotions associated with various heavy circumstances and other ideas of dereism or accept new thoughts and feelings is actualized more often than in their peers with other orthopedic diseases.

Thus, the general and specific aspects of the protective system (disposition) of the personality were revealed in adolescents with various orthopedic diseases and in their healthy peers.

In healthy adolescents and adolescents with orthopedic diseases, the negation psychological defense mechanism is equally common.

In JCA adolescents, protective dispositions determine the difficulties of updating and verbalizing acceptable ways of responding to negative emotions.

Adolescents with IS have a higher index of psychological defense tension compared with healthy adolescents, as well as adolescents with other orthopedic diseases. In IS adolescents, psychological defense mechanisms are more common, which are accompanied by stereotyped behavioral reactions.

In adolescents with the consequences of physical trauma, protective dispositions of an individuality are manifested in difficulties of updating socially acceptable behavior to relieve emotional stress.

To determine the efficiency of protective disposition of a person in a situation related to an orthopedic disease and the need for complex rehabilitation treatment in a hospital, the defense mechanisms were studied in the context of manifestations of PTS in adolescents with various forms of orthopedic diseases.

The results correlation analysis showed that in the group of IS adolescents, the total PTS index was positively associated with the frequency of occurrence of the regression ($r = 0.354$; $p < 0.05$) and projection defense mechanisms ($r = 0.413$; $p < 0.05$). The indicator reflecting the PTS severity according to criterion B (in accordance with DSM-IV — an obsessive reproduction of a traumatic episode) positively correlated with the frequency of occurrence of the regression psychological defense mechanism ($r = 0.338$; $p < 0.05$). A parameter reflecting the severity of post-traumatic symptoms according to criterion C (avoidance of trauma-related stimuli according to DSM-IV; $r = 0.278$; $p < 0.05$) and an indicator characterizing the severity of PTS symptoms were associated with the frequency of occurrence of the same mechanism of psychological defense according to criterion D (physiological reactivity in situations symbolizing a traumatic event, according to DSM-IV; $r = 0.383$; $p < 0.05$). The PTS index by criterion D also positively correlated with the frequency of occurrence of psychological defense substitution ($r = 0.291$; $p < 0.05$) and projection ($r = 0.383$; $p < 0.05$). The PTS index by criterion F directly depended on the severity of the projection psychological defense mechanism ($r = 0.345$; $p < 0.05$). Negative correlation dependences were registered between the frequency of occurrence of the psychological defense mechanism rationalization and PTS indicators reflecting the severity of symptoms according to criteria D and F ($r = -0.357$; $r = -0.344$, respectively; $p < 0.05$).

The results obtained confirm that the inclusion of immature mechanisms of psychological defense in the adaptation process can determine the severity of PTS symptoms in IS adolescents. Active involvement of the psychological defense mechanism rationalization in the adaptation process at the stages of rehabilitation treatment is associated with a decrease in post-traumatic symptoms in IS adolescents. In the group of adolescents with JCA, the psychological defense mechanisms substitution and projection formed a direct relationship with the PTS indicators (general PTS index; $r = 0.392$; $p < 0.05$ and the severity of the criterion was the presentation of traumatic episode A; $r = 0.436$; $p < 0.05$). The frequency of use by JCA adolescents of the defense mechanism negation was negatively associated with the indicator of post-traumatic symptoms according to the D criterion ($r = -0.442$; $p < 0.05$). In the group of adolescents with PTC, the psychological defense mechanism substitution correlated with the severity of symptoms according to the criteria of PTS A ($r = 0.505$; $p < 0.05$) and F ($r = 0.418$; $p < 0.05$). The indicator of the psychological defense mechanism substitution created direct links with the PTS indicators according to criteria A ($r = 0.538$; $p < 0.05$) and B ($r = 0.586$; $p < 0.05$). An indicator of frequency of occurrence of the psychological defense mechanism projection was directly related to the severity of post-traumatic symptoms according to the criteria D ($r = 0.628$; $p < 0.05$) and B ($r = 0.603$; $p < 0.05$). Lastly, the indicator of the severity of the psychological defense mechanism rationalization depended on the severity of the PTS symptoms according to criterion B ($r = 0.511$; $p < 0.05$).

Thus, the active inclusion of psychological defense mechanisms repression, substitution, and projection in the adaptation process in adolescents with orthopedic diseases is associated with the severity of PTS manifestations, which are markers of maladaptation. For IS adolescents, the use of the psychological defense mechanism rationalization is consistent with a decrease in the PTS manifestations under conditions of complex rehabilitation

treatment. In JCA adolescents, the activation of the psychological defense mechanism negation is associated with a low probability of development of maladaptation disorders in a situation of a chronic disease. In PTC adolescents, psychological defense mechanisms that are actualized in a difficult life situation under conditions of rehabilitation treatment are accompanied by the appearance of post-traumatic symptoms, which support maladaptation disorders.

Conclusion

The general features of the personal protective system of adolescents with various orthopedic diseases and those of healthy adolescents are revealed. These include the predominance of the negation mechanism in the personal protective system, which reflects the laws governing the formation of the protective system in adolescence and is manifested in the negation of obvious events and circumstances that cause anxiety. In sick adolescents in need of rehabilitation treatment, the psychological defense mechanism negation can be expressed in the form of anosognosia of physical disability, severity, and consequences of the disease and ignoring treatment activities. Specific features of the personality protective system of adolescents with various orthopedic diseases are established. These include difficulties of updating and verbalizing acceptable ways of responding to negative experiences in adolescents with JCA and increased index of tension of psychological defenses, the presence of stereotypical behavioral reactions in situations of stress coping, and a tendency to "emergency" way of responding in difficult situations in IS adolescents. In adolescents with PTC, protective dispositions of the personality are manifested in the difficulties of updating socially acceptable behavior to relieve emotional stress. In a hospital setting, such adolescents may violate the medical protective regime and experience difficulties in forming therapeutic motivation and compliance with behavior when communicating with medical personnel. Active inclusion of immature psychological defense mechanisms in the adaptation process in adolescents with orthopedic diseases can contribute to the severity of post-traumatic symptoms in difficult life situations associated with rehabilitation treatment, leading to maladaptation relapses. At the same time, in adolescents with JCA and IS, the activation of negation and rationalization psychological defense mechanisms is associated with a decrease in PTS manifestations and an increase in mental adaptation level in a difficult life situation caused by severe orthopedic diseases and painful rehabilitation treatment. In the process of psychological assistance to adolescents with orthopedic diseases, it is necessary to take into account the characteristics of the protective disposition of the person associated with the specifics of a difficult life situation. This allows a differentiated approach to psychological correction at the stages of rehabilitation treatment and development of an individual approach to the provision of psychological assistance in a hospital, taking into account the personal potential of the adolescent, as well as the characteristics of the adaptation process in a life situation due to acquired orthopedic disease and the nature of rehabilitation treatment.

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Author contributions

G.V. Pyatakova developed the research design, conducted the study, analyzed the research results, and wrote the text.

A.O. Kozhevnikova participated in an empirical study.

S.V. Kudryavtseva performed mathematical processing of research results and edited the text.

All authors made a significant contribution to the research and preparation of the article and have read and approved the final version before its publication.

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