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# Therapeutic physical training as a means of prevention for children with frequent episodes of acute respiratory diseases

**Abstract.** *In the article the author described therapeutic physical training as a means of preventing recurrent acute respiratory diseases in sickly children.* ***Purpose:*** *to describe the main approaches to the appointment of medical physical training as a means of prevention of recurrent disease for children with frequent episodes of acute respiratory diseases.* ***Material and Methods****: analysis of the current literature on the researched topic.* ***Results:*** *the author defines the general and specific objectives of exercise therapy in sickly children, characterized by means of physical therapy appointment procedure for two periods – preparatory and trains, provides approximate complexes of gymnastics and morning hygiene gymnastics for sickly children to training period.*

**Keywords:** *acute respiratory infections, prevention, exercise, children, complexes of the medical physical culture.*

**Introduction.** Influenza and a big group of diseases which are characterized by an overwhelming damage of airways unite under the name "acute respiratory diseases" (sharp respiratory infections – SRI) [12]. Parainfluenza, adenoviral, rhinovirus, respiratory- syncytial, coronaviral, bacterial, mycoplasmic and other infections belong to them, except flu. These diseases are caused by different, mainly virus, etiologic agents and widespread worldwide. Each adult 2 times has flu or other acute respiratory diseases on average in a year, a pupil – 3 times, a child of a preschool age – 6 times [3].

Infectious diseases of a respiratory path are the most widespread infectious pathology at children. Acute respiratory diseases arise, as a rule, monthly at often ill children [3; 12].

A child can be ill on SRI repeatedly. If the disease is registered 4 times ad more for a year, conditionally it is considered that it is a child who is often ill. The number of such children reaches 72,8% at schools [1; 2]. Polyetiologicity of a sickness, airborne way of a transmission of an infection, instability, and a severe body specify of immunity is the reasons of a wide circulation of SRI. SRI is quite often complicated by pneumonia, otitis, and sinusitis; occupying the considerable specific weight among the reasons of the child mortality therefore a fight against these infections has a social value. Many viruses own immunosuppressive activity which is shown by a short-term or long decrease in cellular or humoral immunity at viral diseases. The oppression by a virus of specific immunity can become the reason not only the long course of a process, but also the development of a chronic infection [12]. Frequent SRI promotes the formation of chronic bronchopulmonary pathology, arthritis, tonsillitis, and otitis; promote the formation of allergic pathology and a delay of psychomotor and physical development.

**Communication of the research with scientific programs, plans, subjects**. The problem is developed according to the priority direction which is determined by the Law of Ukraine "About the priority directions of the development of science and technique" by the number 3.5. "Sciences about lives, new technologies of the prevention and the treatment of the most widespread diseases" within the priority thematic direction 3.5.29. "The creation of standards and technique of introduction of a healthy lifestyle, technology of improvement of quality and safety of food", by the subject "Traditional and nonconventional methods of physical rehabilitation at diseases of different systems of an organism and damages of the musculoskeletal apparatus at persons of different degree of fitness". The number of the state registration – is 0111U000194.

Acute respiratory diseases belong to a number of the main reasons which predetermine an incidence of pupils now, a decrease of their intellectual and physical working capacity and, as a result – violations of the teaching and educational process [2].

A specific prevention of SRI (creation of vaccines) is connected with great difficulties because now over 120 different viruses and bacteria which cause these diseases are described. In this regard the methods of a nonspecific protection are moved forward for the prevention of the noted diseases on the first place which are directed on the improvement (the observance of sanitary and hygienic rules, a day regimen, airing and cleaning

of rooms, rational application of disinfection means), and the increase of a resilience of an organism of a child (physical culture and training) [9; 11].

Despite of carrying out a complex of treatment-and-prophylactic actions during the dispensary supervision, the recurrence of a disease arises in 41% of children who are often ill on SRI. After the removal from the dispensary accounting of 19% of children more than 3 times for a year is ill on SRI [1]. Therefore more effective treatment-and-prophylactic and organizational forms of medical examination are necessary which component have to be, first of all, funds of physical culture allocated for the functional renewal, the increase of nonspecific immunological reactivity of an organism, the prevention of repeated diseases.

For the increase of a protective potential, an optimum renewal of the functions broken in the course of diseases, and the increase of efficiency of children in polyclinic conditions is applied a complex of medical-improving actions to which treatment-and-prophylactic medicamentous means, physiotherapeutic procedures, the rational mode of physical activity enter. Physical exercises and trainings of an organism are widely used. Ultra-violet radiations (UVR), hydroionization, vitamins of the group B (thiamine, riboflavin), acid ascorbic, etc. are appointed.

Means of the medical physical culture (MPC) with success are applied at treatment of children, patients, who are ill on SRI. MPC increases the efficiency of the complex therapy of SRI, promotes the normalization of body temperature, faster solution of the inflammatory process, reduces terms of stay of patients in a hospital, and considerably reduces a number of complications [10; 12]. Most of authors consider that the application of physical exercises not only during the sharp period of SRI, but also between repeated diseases as to a prophylactic is perspective.

**The objective of the research:** to characterize the main approaches to the purpose of medical physical culture as to prophylactic of the repeated diseases for children who are often ill on SRI.

**Material and methods of the research**: the analysis of modern special literature on the studied problem.

**Results of the research and their discussion**. The prevention of SRI at often ill children is of great importance because each postponed disease scars even weak organism of a child, negatively influences a number of bodies and systems, first of all, on cardiovascular, respiratory and nervous systems, nonspecific immunological reactivity, etc. [3].

The medical physical culture (MPC) is one of the prophylactics of SRI [1; 6]. Results of the researches of a number of authors testify to considerable changes which take place in an organism of children who are often ill on SRI [2; 3]. These changes begin during the sharp period of SRI and, obviously, are the prerequisite for the repeated diseases.

Hypodynamia influences on a condition of children who are often ill on SRI. It is connected with that a severe restriction of the motive mode is one of the main conditions of modern treatment of SRI therefore children who are often ill, actually most part of their life are in a condition of hypokinesia which negatively influences the growing organism and first of all cardiovascular and respiratory systems. Therefore, at frequent SRI, on the one hand, there is a decrease in compensatory and reserve opportunities of an organism of a child, and on the other hand, – negative influence on it of the compelled hypokinesia [4; 6]. Therefore for the purpose of the elimination of the available violations and the prevention of the repeated SRI it is expedient to appoint MPC during the period between diseases. Especially as now expediency of application of MPC is proved in early terms of SRI as it promotes faster recovery of children [1].

Parents address to children's policlinic when a child is considered almost healthy concerning frequent SRI. However it has considerable changes in a functional condition of cardiovascular and respiratory systems and in morphological composition of blood, the decrease in nonspecific resistance, and an allergic condition of respiratory organs. Therefore MPC should appoint differentiated to such patients. The general tasks of MPC look in such way [5; 7]: the improvement of a subjective state, the increase of resilience of an organism, the development and the improvement of applicate mechanisms to physical activity, the improvement of function of a myocardium, the development and the improvement of a number of basic motor skills (races, walking, climbs, throwing) and physical qualities, the prevention of repeated SRI. Special tasks will be such [6; 7]: the study of children to the correct breath, the strengthening of muscles of a belt of the top extremities, thorax and back, the increase in mobility of a thorax and joints, the correction of postural defects, the normalization lympho-and blood circulation of a nose and throat.

The mechanism of a medical action of physical exercises at children who are often ill on SRI, – neuroreflex

- humoral which is shown by four medical actions: the toning influence, the improvement of trophic processes in an organism of patients, the development of compensations, the normalization of functions [8].

The course of prescription of MPC to often ill children consists of two periods: preparatory and training. The preparatory period includes 4–5 classes of MPC. The methodologist meets a child, studies his reaction to physical activity, and teaches his behavior on classes, walking by a system, to performance of starting positions and orders. Exercises differ in simplicity of a performance during this period. The special attention is paid to breathing exercises and on relaxation. The training period at polyclinic supervision lasts 3–4 months. Classes include the general-developing exercises with more difficult coordination of movements and with physical activity which gradually increases. Classes are directed on the education of endurance, the increase of resilience of an organism, the improvement of physical development during this period.

At the beginning of the course of MPC it is expedient to carry out functional tests. In the presence of a negative reaction to the functional test which often appears at children from decompensate toxic - allergic tonsillitis, adenoiditis, sinusitis, in the first days of the preparatory period before classes excludes run, the general-developing exercises connected with considerable effort, and also intensive outdoor games [6; 7]. Walking, simple exercises during walking; the special respiratory and general-developing exercises are appointed. The main movements are improved. Children are taught the correct breath, ability to combine breath phases with the movement. The increase of pulse is allowed on 20% during this period approximately. If pulse becomes frequent more, than on 20–25% at study of motor skills, the exercise temporarily exclude from a technique of classes (for example, jumps, climb, and others). However physical activity has to increase in the course of treatment. It is especially important to dose correctly loading at transfer of children to the training mode. Physical activities are admissible during this period in the functional relation that cause the increase in HR to 170±3,8 bpm. Therefore it is equivalent to appoint physical activity in the main part of classes which volume causes the increase in HR within 130–170 bpm., that is increase of HR approximately for 75–80% is allowed. The increase in HR to 150±4,8 bpm. is allowed at the development against frequent SRI of allergen of the top airways, that is approximately on 45–55%. The volume of physical activity on classes is regulated by a starting position, amplitude and rate of movements, frequency rate of repetition and a number of the exercises included to a complex.

When carrying out classes the special attention is paid to renewal of nasal breath which in some cases happens was broken as a result of allergen of the top airways (toxic-allergic tonsillitis, pharyngitis, rinosinusit and others). The violation of nasal breath is promoted by anatomic features of respiratory system at children – narrowness of a cavity of a nose, tenderness and tendency, swelling of a slimy cover.

Children are accustomed to breathe a nose therefore comes to lungs of air evenly and in bigger volume during the performance of physical exercises. Passing through the nasal courses, air is cleared, warmed, moistened; irritating nervous receptors, – reflex influences the respiratory center, strengthens a tone of respiratory muscles and increases a breath depth.

The breathing exercises of static and dynamic character directed on the strengthening of respiratory muscles, muscles of the top extremities (assignment of hands in the parties, back, trunk inclinations forward, back, in the parties and others) are used for the achievement of a rhythmical and deep breath. The efficiency of the process of a study to the correct breath of school students depends on observance of the principle of presentation in many respects [4].

Special breathing exercises with loud and long declaration of the hissing and whistling sounds at the full prolonged exhalation are appointed [8; 10]. If during an exhalation there is a cough, duration of an exhalation is reduced. Breathing exercises alternate with general-developing, intended for training of different muscular groups.

When carrying out classes is paid attention to the development of a correct posture. It is promoted by ability to keep correctly, methodically correctly walking, run, climbs, etc. The majority of the correcting exercises are carried out from a starting position, lying on a back and a stomach. The technique of classes join also exercises which promote the strengthening and the correct formation to a foot arch (prevention of platypodia), – walking on tiptoe, on an outer edge of a foot, raising on socks, etc.

Outdoor games include in classes of MPC. At first they are simple and easy for the performance, and then they gradually become complicated, physical activity increases.

Classes of the remedial gymnastics (RG) are given during the period between the transferred SRI. It consists of three parts: preparatory, main, final.

The task of the preparatory part is: the creation of an emotional preparedness and interest in classes at children, the check of attention degree at them, the gradual preparation of an organism of a child to more hard work in the main part of classes which is reached by inclusion in a technique of walking and the exercises during walking intended for training of muscles of a belt of the top extremities, the renewal of function of the respiratory system, the prevention of violations of a bearing and platypodia.

The general and special tasks of MPC are solved in the main part of classes. At the beginning and in the middle of this part fast walking, transitional in run which comes to the end with walking during which sounds are said is applied: "s-s-s", "sh-sh-sh" and others, and also become the movements by hands: through the parties – up, through the parties – down. The general-developing exercises (GDE) from different starting positions, ball games, medicine-ball (a mass of 1 kg), relays, and elements of sports games are used. GDE are carried out with sticks, balls. Exercises are selected so that big groups of muscles gradually got into a gear, promoting the increase of a functional condition of an organism. Exercises for the development and strengthening of muscles of a belt of the top extremities, the formation of a correct posture and the normalization of processes of breath, then for the development and strengthening of muscles of an abdominal tension, the lower extremities, a back and a spine column are carried out. GDE alternate with the relaxation exercises and special exercises which are directed on the improvement of function of the respiratory device and elaboration of breath through a nose. GDE, strengthening a work of cardiovascular and respiratory systems, as if prepare a child's organism for even bigger loading – participation in an outdoor game which, besides, causes an emotional lift in children.

In the final part of classes the loading gradually decreases to the level close to day off which is reached by the use of special exercises, – respiratory, on attention and relaxation. Duration of classes of MPC – is 40–45 min [7]. Classes are given every other day. Further we provide a model complex of physical exercises and a complex of morning hygienic exercises for children who are often ill on SRI, for the application in a mid-sickness state in the training period (see tab. 1, 2).

*Table 1*

**A model complex of physical exercises for an application in out-patient conditions for children of 12-14 years old who are often ill on SRI (the training period)**

| № | S. p. and the content of an exercise | Dosing | Rate of performance | Methodological indications |
|---|---|---|---|---|
| 1. | Construction | 1 min | | |
| 2. | Walking: on tiptoe, hands up on heels, hands behind a head, on an outer edge of a foot; hands are pressed to shoulders, roundabouts by elbows back | on 20 s | in an average rate | To hold a chin highly, to watch a bearing |
| 3. | Walking | 30 s | in a quick rate | The same |
| 4. | Run | 1–1,5 min | in a temperate rate | The same |
| 5. | Walking with a declaration of sounds ("s-s-s", "sh-sh-sh" but other), breakthroughs by hands back during walking | 1 min | in a slow rate | The same |
| **Exercises with a gymnastic flail** | | | | |
| 6. | S. p. – standing, a gymnastic flail is in hands. Accounting 1 –to put flail on a shoulder, – accounting 2 - hands up with a flail, to rise on tiptoe, accounting 3-4 to return to s.p. Accounting 3-4 – a little prolonged exhalation | 8 times | average | To control breath |
| 7. | S. p. – standing, feet on width of shoulders. To hold a gymnastic flail for the ends. Accounting 1 – a trunk inclination sideways with a flail in outstretched arms, accounting 2 – to return to s.p. | 6 times to each side | average | To make an exhalation at an inclination of a trunk |

*table 1 continued*

| № | S. p. and the content of an exercise | Dosing | Rate of performance | Methodological indications |
|---|---|---|---|---|
| 8. | S. p. – feet together to hold for the ends of a gymnastic flail. Accounting 1 – to raise hands up – a breath, accounting 2 – a trunk inclination forward, to put a flail on a floor – an exhalation, accounting 3 – to become straight – a breath, accounting 4 – a trunk inclination forward, to take a gymnastic stick in a hand – an exhalation | 6 times | average | Not to bend a knee, becoming straight to cave in a waist |
| 9. | S. p. – standing, feet on width of shoulders, a gymnastic flail lies at feet. Accounting 1 – to raise hands to axillary poles – a breath through a nose, accounting 2 – is weakened to lower hands down – an exhalation through a mouth | 6 times | average | To control breath |
| 10 | S. p. – standing, feet together, a gymnastic flail in the lowered hands, hands one from another are on 15–20 sm., accounting 1-2 – to bend forward, to cross through a flail between hands, to become straight (a gymnastic flail behind the back), accounting 3-4 – to bend forward, to cross through a flail between hands, to become straight (a gymnastic flail ahead below) | 6 times | average | After each step through a flail it is obligatory to become straight a trunk sharply. Breath is free |
| 11. | S. p. – standing, a gymnastic flail lies at feet. accounting 1 – an emphasis, having sat down, accounting 2 – a jump an emphasis, lying, into account 3 – a jump an emphasis, having sat down, into account 4 – to return to s.p. | 6 times | average | Breath is free |
| 12. | S. p. – standing, feet on width of shoulders, the case is inclined forward, a gymnastic flail in hands. The rhythmical pendulum movements by hands to the right – to the left | 25 s | average | Breath is free |
| 13. | S. p. – lying on a back, a gymnastic flail in hands over a head. – to sit down accounting 1-2, a gymnastic flail in hands extended forward, accounting 3-4 – to return to s.p. | 8 times | average | In situation, sitting, to watch a bearing |
| 14. | S. p. – lying on a back, the ends of a gymnastic flail in hands. The middle tenacious touches a stomach. accounting 1-2 – a breath to stick out a stomach, to lift a gymnastic flail, accounting 3-4 – an exhalation, to pull in a stomach, to lower gymnastic flail | 6 times | average | To control breath |
| 15. | "Swallow". S. p. – lying on a stomach, a gymnastic flail in the hands extended forward (to hold for the ends). Accounting 1-2 – to cave in in chest and lumbar sites; hands with a gymnastic flail and to lift straight feet, hold into two accounts, to return to s.p. | 8 times | average | As much as possible bending, breathing free |
| 16. | S. p. – lying on a back, to part hands in the parties with palms up, gymnastic flail for the chairman. Accounting 1-2 – to embrace itself for shoulders – an exhalation through a mouth, accounting 3-4 – to return to s.p. – a breath through a nose | 6 times | temperate | Feet together |
| 17. | S. p. – lying on a back, hands with a gymnastic flail (to hold for the ends) over the head. Accounting 1-2 – hands with a gymnastic flail forward, accounting 3-4 – to carry by through feet, to lower hands and to arrange a flail over knees, accounting 5-6 – to carry by feet through a flail in the opposite direction, to return to s.p. | 6 times | temperate | It is obligatory to be straightened, breath is free |

*table 1 continued*

| № | S. p. and the content of an exercise | Dosing | Rate of performance | Methodological indications |
|---|---|---|---|---|
| 18. | S. p. – lying on a stomach, hands in an emphasis, a gymnastic flail on a floor in the face of at distance of outstretched arms. Accounting 1-2 – to become straight hands in elbow joints, to cave in, look at a ceiling, accounting 3-4 – to return to s.p. | 8 times | average | Feet together, a stomach concerns a floor. Breath is free |
| 19. | "Worm". S. p. – lying on a back, a gymnastic flail in outstretched arms (for the chairman). The child moves ahead at distance of 3-4 m, without bending a foot in knee joints and without leaning on five | 30 s | temperate | Breath is free |
| 20. | S. p. – standing. Walking on the hall at fast speed, hands are bent in elbow joints | 1 min | average | Accounting 1 – inhalation, accounting 2–3–4 – exhalation |
| 21. | Run | 1–1,5 min | average | Breath is free |
| 22. | Walking with movements of hands through the parties – up, through the parties – down with declaration of sounds of "s-s-s", "sh-sh-sh" and others | 1–1,5 min | temperate with a transfer on average | To control breath |
| **Exercises with a ball** | | | | |
| 23. | S. p. – standing. Dribbling on a hall (basketball elements) | 3 min | average | Not to bend strongly |
| 24. | S. p. – standing. In the general system during walking to throw a ball up and to catch | 1 min | average | To control breath |
| 25. | S. p. – standing facing wall bars, a ball in hands. Accounting 1 – to lift a ball over the head – a breath through a nose, accounting 2 – to return to s.p. – an exhalation through a mouth | 6 times | average | Not to bend forward |
| 26. | S. p. – standing facing wall bars. Loudly considering to 6, to take 6 steps forward and behind of a head to throw a ball into flight of wall bars | 6 times | average | To control breath |
| 27. | S. p. – standing a back to wall bars, feet on width of shoulders, a ball in hands. –Hands up. Accounting 1 up – a breath, accounting 2 – to return to s.p. – an exhalation, – to raise hands. Accounting 3 up – a breath, accounting 4 – having bent forward, to throw a ball between feet into wall bars | 6 times | average | To aspire that a ball doesn't slide on a floor, and flies |
| 28. | S. p. – standing. Walking | 30–40 s | average | During walking, hands behind a head –a breath through a nose, hands down – an exhalation through a mouth |
| 29. | Outdoor game | 5–6 min | average | To control breath |
| 30. | S. p. – standing. Walking, with a performance of exercises on attention | 1,5 min | average | Not to hold breath |
| 31. | Inflation of rubber toys | 1 min | | Not to hold breath |

*Table 2*

**A complex of morning hygienic exercises for children of 12-14 years old who are often ill on SRI**

| № | S. p. and the content of an exercise | Dosing | Rate of performance | Methodological indications |
|---|---|---|---|---|
| 1. | Walking | 30–40 s | average | A slow breath |
| 2. | Run | 1 min | temperate | The same |
| 3. | S. p. – standing, heels together, socks separate, fingers are slightly squeezed in a fist at the level of shoulders. – to raise hands, accounting 1 up, to become straight fingers, to turn palms in the middle, slightly to rise on tiptoes, accounting 2 – to return to s.p. | 6–8 times | average | The same |
| 4. | S. p. – standing, feet on width of shoulders. Hands are bent in elbows; hands are squeezed in a fist. Accounting 1-2 – vigorously to throw out hands («Boxer») forward. To repeat each hand | 10 times | average | The same |
| 5. | "Woodcutter". S. p. – standing, feet on width of shoulders, a breath. Accounting 1-2 – sharply to bend – the deep exhalation, accounting 3-4 – to return to s.p. – a breath, to lower hands | 6–8 times | average | Not to hold breath |
| 6. | Knee-bend. S. p. – standing, hands on a belt. Accounting 1-2 – to sit down on a full foot, to extend hands forward, accounting 3-4 – to rise, to put hands on a belt | 6–8 times | average | Not to hold breath |
| 7. | S. p. – Standing, a jump rope in hands. Jumps with a jump rope | 1–1,5 min | average | Not to hold breath |
| 8. | Walking | within 1 min | average | During walking to carry out breathing exercises |

**Conclusions:**

1. It is established that functions of central nervous, cardiovascular, respiratory, muscular and other systems decrease in much bigger measure at school students who are often ill on SRI, even postponed benign, than at children who are seldom ill.

2. The prevention of SRI is of great importance at children because each postponed disease scars a deep sign in not yet strong organism of a child, negatively influences a number of bodies and systems, first of all, on cardiovascular, respiratory and nervous systems, nonspecific immunological reactivity, etc.

3. The medical physical culture which is appointed by two periods is one of the prophylactics of SRI: preparatory and training in a mid-sickness state.

**Prospects of the subsequent researches** consist in the development of the comprehensive program of physical rehabilitation for children of middle school age that transferred SRI, taking into account a distribution of the period of a recovery on clinical and biological stages.

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