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METHODS

# Method and Computer-Aided System of Intensive Health Recovery for Estimation and Correction of the Psychophysical Condition of an Individual

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**Abstract**—A method for evaluating psychophysical condition and behavioral optimization of lifestyle, including selection of training loads, was developed on the basis of questionnaire data and simple physiological parameters such as muscle strength, load intensity, blood pressure, heart rate, and expiratory breath holding time at rest, during graded exercises, and during recovery. For evaluating the functional condition, an original variant of the bicycle ergometric test or step test was used as the basic method and standard tests with training equipment and routine exercises were used as additional methods. The method was implemented as a computer program, Health Regulator.

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One of the most complicated tasks facing a health care specialist is to evaluate the intensity and volume of an optimal training load and general movement regimen. Data obtained with threshold and subthreshold loading (e.g., a standard bicycle ergometric test) often do not correspond to the optimal training loads and movement regimen [1]. The development of an effective rehabilitation or health-improving program is often impossible without considering the whole of a subject's activity, including professional and everyday activities. The optimal training load depends on the functional condition of the body and a set of external factors. Individual specific features (anthropometric data, behavior pattern or lifestyle) often lead to the necessity of specifying the intensity of optimal training loads for particular exercises or training equipment. The refined parameters of the training loads allow the effectiveness and safety of the rehabilitation to be improved.

We have developed a method for evaluating psychophysical condition and behavioral optimization of lifestyle on the basis of questionnaire data and simple physiological parameters such as muscle strength, load intensity, blood pressure, heart rate, and expiratory breath holding time at rest, during graded exercise, and during recovery [2–4]. For evaluation of the functional condition, an original variant of the bicycle ergometric test or step test was used as the basic method and standard tests with training equipment and routine exercises were used as additional methods. The method includes the following modules.

1. Monitoring of physical and psychological condition and psychological attitudes: evaluation of fitness group and training limits; estimation of the index of physical functional health status (IPFHS), muscle strength, flexibility, coordination, and psychological stability; evaluation of psychophysical balance and the leading correction program; and evaluation and modification of psychological attitudes to health and of the patient's motivations.

2. Evaluation of the influence of physical and mental loads and treatments on the psychophysical health level: estimation of the overload for each factor, development of recommendations on behavioral correction (graded intensity and volume of a certain load), and estimation of the therapeutic effect of different rehabilitation treatments.

3. Selection of loads for the main types of training (running, walking, swimming, skiing) and training equipment (treadmill, rowing machine, stepper, gym equipment); calculation of specified training loads for each exercise or type of training equipment; development of individual training programs for three types of dynamic training (special physical training, health-improving physical training, and health crisis prevention); and development of individual training programs for three types of training with muscle-strengthening equipment (athletic training, health-improving psychomuscular training, and musculoskeletal recovery).

4. Optimization of daily loads: general motor activity, everyday loads, medical and preventive measures and their behavioral correction, estimation of the effec-

**Table 1.** Main modules and the functions of the computer-aided system Intensive Health Recovery

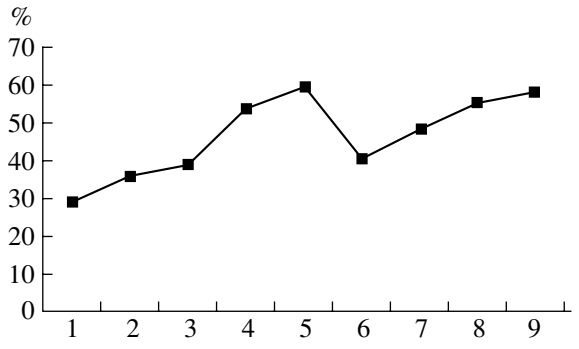
| Module | Patient's card | Test | Evaluation of condition | Correction | Report |
|---|---|---|---|---|---|
| Module function | Card completion | Functional health | Actual condition | Dynamic training | Health passport |
| | Card correction | Psychological stability | Overload | Athletic training | Psychophysical balance |
| | Database | Coordination and flexibility | Recovery | Daily regimen and energy consumption | Risk factors |
| | | Attitudes | | Psychological training | |
| | | Biological age | | | |

**Table 2.** Main results of the Intensive Health Recovery method

| Anthropometry | Biochemistry | Functional status | Psychological and behavioral status |
|---|---|---|---|
| Weight normalization | Normalization of cholesterol, triglyceride, and glucose levels | Improvement of exercise tolerance | Reduction of interpersonal conflicts |
| Improvement of muscles and figure correction | | | Improvement of psychological stability |
| Normalization of blood pressure and heart rate at rest | Reduction of atherogenic index | | Normalization of sexual activity |
| Improvement of the vital capacity | Normalization of albumin-globulin index | | Reduction of anxious and depressive tendencies |
| Improvement of flexibility and coordination | | | Sleep improvement |

tiveness of recovery and relaxation methods, development of recommendations on psychological self-regulation, evaluation and correction of the volume of everyday motor activity, and optimization of dietary intake (proteins, lipids, carbohydrates, and fiber).

The efficiency of evaluation of the condition and the generation of individual correction programs is ensured by a computer-aided system, Health Regulator, including five main modules, each consisting of several separate programs (Table 1).




Individual changes in the index of physical functional health status (%) during rehabilitation at a sanatorium. Abscissa, number of session: (1) initial test; (2–5) effective recovery; (6) violation of recovery program; (7–9) recovery after violation.

The method described has proved helpful for the development and implementation of individual health programs designed for prevention of chronic noninfectious diseases and early aging; for recovery of subjects with myocardial ischemia, myocardial infarction, essential hypertension, osteochondrosis, stomach ulcer, urolithiasis, neurosis, and psychosomatic disorders [2]; for development of positive psychophysical features in healthy subjects; and for monitoring and correction of the health status and psychophysical condition in students, athletes, and individuals on whom high requirements for psychophysical aptitude are imposed [5–7]. A list of positive results of applying this method is given in Table 2.

Data on monitoring of the IPFHS in a 52-year-old subject with coronary heart disease during his rehabilitation at a sanatorium are given as an example (figure). The optimal training loads were estimated for each test.

In the middle of the recovery program, a sharp decrease in the IPFHS (and, correspondingly, training loads) occurred as a result of thermal overload in a sauna. Simultaneously, the subject complained of feeling unwell. The subjective health impairment was confirmed by clinical data (fluctuation of blood pressure, increased heart rate at rest) and the ECG.

## CONCLUSIONS

The proposed method may be applied for

(1) recovery after chronic noninfectious diseases (rehabilitation centers, sanatoriums, preventive treatment centers);

(2) complex psychophysical health recovery (health centers at companies and educational institutions, fitness centers);

(3) individual prevention of early health problems (home mini-centers);

(4) monitoring and correction of psychophysical condition in athletes (sports centers and clubs).

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