

Spine Condition Improvement. Health Training Plan for Persons with a Movement Deficit

ABSTRACT

Background: Physical activity is the cheapest way the prevention of diseases of civilization, the increase of the utilitarian physical fitness and the improvement of well-being of adults. The participation of people in health training (HT) should be a priority of social policy today, because it contributes to minimizing the cost of the incapacity of the employee to work. In addition, better physical condition of working age group can revive the labor market.

Aim: The objective of this study is to model of design a HT in accordance with modified principles and criteria of sports training design. The presented HT project is aimed at strengthening of the postural muscles and the improvement of mobility of the musculoskeletal system.

Materials: The materials research concerns the literature on the methodology of exercises from different physical activity areas.

Methods: This is a conceptual work. Systems designing were used in line with the concept of Gerard Nadler and adopted by Łasiński to the training planning area.

Results: The result of this work is a comprehensive development of an annual plan HT (macrocycle) for people with passive and active musculoskeletal system dysfunctions.

Conclusions: The health training is a system that requires planning and control.

Incomplete execution of the planned HT may improve the well-being of participants, may reduce absenteeism at work as well as enhance their activity on a labor market and in social life, even if they fail to achieve the training objective.

Keywords: training systems design, health training, spine fitness improvement.

1. INTRODUCTION

The health training (HT) is becoming one of the more significant areas of physical culture mainly due to the changing demographic proportions in developed countries [1,2 p.9, 3]. Its objectives concern the performance of activities aimed at the prevention of civilisation diseases as well as the improvement of physical fitness and well-being [4, 5]. The benefits arising from regular exercises are well documented [6-13]. Therefore, there arises a question why, considering the general knowledge of the impact of physical exercises on the human health, many people worldwide have health problems resulting from the movement deficit?

Polish studies show that the largest group of people who do not work for health-related reasons are adults aged 54+ [14]. Their readiness to work and their belief that they may still continue to discharge their professional duties [2 p.388] allows one to suppose that education related to the ability to plan and execute a self-regulated HT programme could bear fruit in the form of increased labour market participation.

The health-related objectives of the society can be achieved by various methods. Their propagation, in particular amongst the health promoters and the trainers, may greatly contribute to the improvement of attendance in health programmes for working age people.

1.1. Health Training Process Planning

The health training is a process the effects of which are observed over a longer period of time. The process of changes consisting in the introduction of appropriate modifying activities is closely correlated

with the time over which they are spanned. Therefore, the training process planning consists in the execution of a number of subsequent activities the effect of which is a set of data making up a training cycle plan and leads to the achievement of the objective set. The plan should not comprise any detailed solutions (least of all solutions related to the selection of training means) because in case of such a detailed approach to training load planning, usually it is the exact performance of the training plan that becomes the main training objective rather than the objective pursuit [15 p.6,16].

When designing the plan, one should take into account particular system components. The HT structure is close to the structure of other areas of physical culture, however it has significant differences which define the training planning manner (Table 1). The basic difference is the purposefulness of activities and the size of training loads applied. The number of similarities, however, allows one to use the methodologies from other areas of physical culture to achieve the HT objective. In the detailed part of the training planning, one should consider the appropriate selection of training means, forms and methods as well as the ways to control the training effects. The control methods may originate from all areas of the motor activity of a human being. They must only meet the appropriate effectiveness criteria as regards the objective foreseen for the participants. The above description entails that a trainer orientated at conducting a health exercise programme should have extensive knowledge concerning the application and methodology of exercises from various areas of the physical culture. He/she should demonstrate considerable creativity when it comes to putting that knowledge to practice.

Using the sports training cycle planning principles, which require an execution of the planning algorithm steps described in the literature [15-19] the authors analogically propose the following chain of activities to constitute a basis for the development of the HT planning algorithm. That chain could comprise the following steps:

- definition of needs and of parameters describing the health state and the physical fitness of the person intending to start the HT.

- performance of a full diagnosis of the health and the physical fitness of the person (group of people) the design is addressed to. The diagnosis should then become a basis for the determination of training objectives and for the selection of appropriate means of their pursuit. At this stage, one should also determine contraindicated exercises. In case of a group diagnosis, the needs should be determined on a quantitative basis in order to select the prevailing training means at the mesocycle level.

- development of HT objective structure in accordance with the participants' needs and possibilities. When determining the objectives for the group, one should allow for the minimum and the maximum.

- construction of the training time framework (structure of macrocycle, mesocycles, microcycles), which will be used to ensure the achievement of the pre-defined training objectives;

- definition and classification of training means which will be used to pursue the objectives as well as development of strategies of the use of such means in particular elements of the training cycle time framework;

- design of the training process control system that would be adequate to the training objective structure

- design of supporting and, possibly, logistic activities that the HT participant will pursue individually on his/her own.

Table 1. Similarities and differences between the components of various areas of physical culture - author's description on the basis of [16 p.292].

Table 1. Similarities and differences between the components of various areas of physical culture - author's description on the basis of Kałwa et al. [16, p.292].

Areas of Physical Culture Process Components	Sports training	Health training	Physical education	Physical recreation	Motor rehabilitation (mainly kinesitherapy)	Physiotherapy exercises (corrective exercises and compensation)
Objectives – general, overall objective	Maximization of sports results, maximization of the athlete's training parameters (as appropriate for the given sports discipline).	Improvement of the health state, prevention of civilization diseases, improvement of the utilitarian physical fitness, improvement of the body aesthetics, improvement of movement symmetry.	Education and promotion of positive attitudes towards all areas of physical culture by active and non-active participation in physical exercises. Education for an active and hygienic lifestyle.	Promotion of well-being by the introduction to and/or participation in various forms of physical exercises. Improvement of the health state, prevention of civilization diseases, improvement of the utilitarian fitness, improvement of the movement aesthetics.	Restoration of the passive and active functions of the musculoskeletal system, elimination of the consequences of overloading, local improvement, support of the musculoskeletal system treatment process or elimination of pathological conditions of the musculoskeletal system or removal of its symptoms by the available physical and motoric system-related means, frequently by ensuring a parallel participation of such means.	Mitigation of the passive and active musculoskeletal system dysfunctions and/or reduction of effects of spinal curvatures, improvement of the body aesthetics, improvement of movement symmetry. Education for a healthier lifestyle.
Participants	Exceptionally talented individuals with an impeccable health condition.	Each adult with regard to whom no absolute physical effort contraindications have been issued.	Any person without exceptions.	Each adult with regard to whom no absolute physical effort contraindications have been issued.	Persons for which a certain type of dysfunction has been identified.	Children and growing young adults as well as adults for whom malformations or spinal curvatures have been diagnosed and, at the same time, no absolute physical effort contraindications have been issued.
Size of physical load	Submaximal and maximal load.	Small, moderately submaximal load - triggering adaptation processes.	From no load (theoretical instruction) to submaximal loads.	From small loads to submaximal loads.	Moderate, submaximal and maximal load.	Moderate, submaximal and maximal load.
Participation frequency	Systematic, cyclical (presence of large, medium and small training cycles)	Systematic, cyclical (presence of large, medium and small training cycles)	Systematic, not cyclical	Both individual and systematic, no cyclical work.	Systematic, precisely defined by the physiotherapist over a defined period of time. Cyclical work maintained.	Systematic, cyclical (presence of large, medium and small training cycles)
Multiplicity of forms of activity	One, selected sports discipline (possibly a few of its sub-disciplines).	Limited number of forms (two or three - selected taking into account the objectives)	Multiple forms (as many as possible)	Multiple forms (as many as possible)	One leading individual form adjusted to the patient plus a few supporting forms.	A number of forms selected taking into consideration the objectives.
Activity Effectiveness Criteria	Victory in a major competition, achievement of the planned training results or parameters.	Improvement of the resting homeostasis parameters, improvement in fitness, beneficial body composition change, improvement in movement symmetry, improvement of coordination reflected in balance maintenance skills.	Growth of self-awareness as regards education for physical culture. Assessment of the development process through the improvement of physical fitness and capacity parameters	Improvement in well-being and self-evaluation, increased physical fitness indicators, including coordination skills.	Increase in the morphofunctional efficiency of the organism and the simultaneous limitation of pains. Restoration of utilitarian fitness.	Knowledge of hygienic habits and ability to maintain the correct body posture. Progress in correction and compensation of certain spinal curvatures. Improvement in movement symmetrisation.

Does it have properties of an operating system?	Yes	Yes	Yes	Yes	Yes	Yes
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2. WORK OBJECTIVE AND RESEARCH QUESTIONS.

The objective of this study is to design a health training in accordance with modified principles and criteria of sports training design. The presented HT project is aimed at the strengthening of postural muscles and the improvement of mobility of the musculoskeletal system adults. In order to pursue this objective, the following research questions have been formulated:

1. How to set HT objectives for a selected research group?
2. What may be the time framework of a HT macrocycle for that group, assuming its needs and training performance possibilities?
3. What elements can make up the HT control system?

3. RESEARCH METHODS

Nadler's system analysis method [20] (Ideal Design of Effective and Logical System - IDEALS) in transposed by Łasiński to the area of the system training planning/designing [21] and Krupski [22] were used in the planning. Gasparski's system design assumptions [23] were also utilised.

4. RESEARCH RESULTS.

The result is a comprehensive HT cycle plan/design for persons with musculoskeletal system dysfunctions stemming from the movement deficit in accordance with the modified analytic design methods - activity algorithm:

4.1. Definition of parameters describing the health and physical fitness as well as determination of the needs of training participants.

If the HT has a determined objective, usually pre-selected persons appear. Their change-related needs have been defined by the trainer (synthetic model). However, one may apply a reversed objective setting method, consisting in the preparation of a group diagnosis in order to set, at a later stage, the priority training lines (analytical model) (Table 2).

Table 2. Determination of the group's training needs (example).

Participant number	BMI>25	Poor flexibility	Muscles of the lower limb	Muscles of the upper limb	Abdominal muscles	Low endurance	Back muscles	Glutes	Poor balance	Pain of cervical spine	Pain of thoracic spine	Pain of lumbar spine	Pain of sacrum	Pain of head	Pain of shoulders	Pain of knee
1	x	x	x		x	x	x	x		x		x		x		x
2		x	x	x	x	x	x	x	x	x		x		x		x
3	x		x		x	x		x	x			x			x	
4			x	x	x	x	x		x		x		x			
5		x	x		x		x	x					x		x	
6	x	x		x	x	x		x	x			x	x			x
7			x	x	x	x		x	x		x	x				x
8			x	x	x		x	x	x	x		x	x	x		x
9		x		x		x	x			x		x	x			
10			x	x	x		x	x	x		x	x	x			x
11	x				x	x		x					x			
12		x	x	x	x				x	x		x	x	x		x
13				x	x	x	x	x					x			
14	x	x		x	x	x	x		x							

15	x	x	x		x	x	x	x				x				
16		x	x					x		x		x	x		x	x
17		x	x	x			x	x	x		x	x	x			x
18				x	x	x	x		x			x	x			
19	x		x	x	x	x	x	x								
20		x	x		x	x		x		x		x	x		x	
sum	7	11	14	13	17	14	13	15	11	7	4	14	13	4	4	9
Priority in training* [%]	35	55	70	65	85	70	65	75	55	35	20	70	65	20	20	45
*The higher the value, the more directional exercises should be included in the training																

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97 **4.2. Health training participant characteristics.**

98 The health training is addressed to men and women aged 35-65. The participation prerequisite is the lack
99 of absolute effort contraindications such as: lasting injuries, pathological spinal curvatures that hamper
100 the maintenance of correct postures during exercises, identified cardiovascular diseases and respiratory
101 diseases requiring outpatient treatment or pharmacological treatment, post-operation conditions etc. The
102 said dysfunctions require rehabilitation. Such difficulties may temporarily disqualify from the health
103 training participation. After a successful health recovery and in consultation with a medical doctor, the
104 health training described below may be commenced/resumed.

105 **4.3. Structure of training objectives**

106 The training objectives have been set in accordance with Matusiak's concept [24] and expressed by
107 means of parameters described by Kosendiak: deadline and values [15 p.12].

108 IDEAL: Maintenance of good physical fitness well into the old age.

109 INTENTION: Improvement of the static force and strengths of the postural muscles. Improvement of work
110 effectiveness owing to exercise techniques learned and physical fitness acquired. Improvement of the
111 spine mobility in all planes and rotational mobility in the longitudinal axis. Increased range of body
112 mobility. Balance improvement.

113 MAIN OBJECTIVE - final for the macrocycle (F): Improvement of the spine condition by increasing the
114 efficiency of postural muscle contraction and flexibility in all trainees having the minimum attendance
115 record of 60%:

- 116 - average increase in the level of static force of postural muscles by 15-18%
- 117 - average improvement of the strength and physical fitness by 10-20%.
- 118 - average improvement of the spine mobility symmetry in the frontal plane and two-way rotation
- 119 (alternative assessment).
- 120 - average improvement of the balance by increasing the tolerance of the gravity centre swing from
- 121 the body's longitudinal axis.

122 The better psychophysical fitness should be reflected in (objectives from F1 to F8):

123 *F1* - An individually better result in the modified Kraus-Weber test evaluating the minimum muscle fitness.

124 *F2* - An individually better result in the FMS test

125 *F3* - An individually higher working speed when making the cardiac stress test using the stationary
126 exercise bicycle ergometer (standard test).

127 *F4* - An individual improvement of mobility, especially as regards shoulder joints and hip joints, maximum
128 body anteflexion on straight legs, degree of body support in prone position, symmetry (on both legs) and
129 degree of body forward inclination in the cross legged position, symmetry of body side bends, symmetry
130 of body rotation.

131 *F5* - An individually better result in the modified abdominal muscle strength test.

132 *F6* - An individually better tolerance for the body's centre of gravity swings - evaluation of the balance
133 improvement.

134 *F7* - An individually better change of the body composition (a 0-1 system evaluation)

135 *F8* - Individually lower HR values in a standard test.

136 Expected additional effects (these are not the objectives):

- 137 - Increased day-to-day life activeness (subjective evaluation).
- 138 - Body weight reduction and circumferential reduction (evaluation of the average value).
- 139 - Ability to select exercises fit for one's needs and their self-execution (subjective evaluation)

140 INTERMEDIATE OBJECTIVES (*A,B,C,D,E,G*): These objectives were given together with a time
141 framework because their pursuit is closely related to the structure of particular periods of time making up
142 a macrocycle. The plan allows for those training effects (intermediate objectives) which arise in
143 consequence of the accumulation of periodically recurring training accents and yield desirable and
144 relatively lasting changes. Therefore, during the performance of a single training session, the instructor
145 must choose the training means considering the achievement by the trainee of the objectives of the given
146 mesocycle. One-off, random activities that are not consistent with the assumptions made for the given
147 period of time do not produce significant benefits. They may move away, if not disrupt in total, the health
148 training process from the point of view of evaluation of its effects. The objective performance deadlines
149 have been given in table 3a and table 3b.

150 TASKS – understood here as objectives of particular training sessions - constitute the structure of a
151 training microcycle, but in reality they pursue the objectives of the given mesocycle. A description of the
152 tasks (training session objectives) has been given in table 4a,4b in item 'microcycle'.

153 **4.4. Time structure of the training macrocycle:**

154 The structure of the macrocycle has a clearly defined division of time. In the present case assumes a 10
155 month cycle of varying intensity exercises and a 2 month break (Table 3a and 3b). Each intermediate
156 time structure of the macrocycle pursues the intermediate objectives leading to the achievement of the
157 main objective - final for the given macrocycle (*F*). The design utilizes the HT methodology as per the
158 sport training principles and the principles concerning the learning and improvement of activities involving
159 movement as well as the principles of self-regulated training [25, 26-28]:

160 Training methods: repetitions, continuous with varying intensity, interval-based.

161 Training form: a layout allowing participants to do the exercises freely.

162 Motor activity teaching methods: synthetic and complex.

163 Teaching methods - group of acquisition methods: exact task-based and copy-task based,
164 programmed learning and improvement.

165 4.4.1. Preparatory period

166 *Assumptions:* Learning of exercise techniques and principles. General preparation of organisms to
167 exercises with additional load expressed by the ability to copy the technique shown by the trainer in
168 accordance with the imposed speed.

169 *Intermediate objectives:*

170 A_1 - Maintenance of the speed of 80-100 bpm for 12 x each exercise; operation of large muscle groups.

171 A_2 - Maintenance of the rhythm of 100-120 bpm in 2 series of 24 x (without resistance) and 16 x (with a
172 symmetrically distributed resistance of 0.5 kg).

173 B_1 - Learning the exercise techniques with the maintenance of the muscle stress involving large body
174 parts.

175 B_2 - Performance of all exercises planned for the given period of time, maintaining the stress for 8-10
176 seconds.

177 4.4.2. Principal period 1-4

178 *Assumptions:* Exercise execution and trainer's speed maintenance in universal exercises and exercises
179 resulting in local fatigue at gradual load increases.

180 *Intermediate objectives:*

181 C_1 - Execution of all exercise series without load but with increased work dynamics of 120-130 bpm.

182 C_2 - Execution of all exercise series together with the trainer with a load.

183 C_3 - Mastery of techniques of non weight bearing exercises with an elastic band and a non-elastic band
184 (TRX).

185 C_4 - Mastery of exercise techniques in semi high and low positions.

186 D_1 - Mastery of unstable exercise techniques.

187 D_2 - Execution in a combined technique of: Klapp unstable exercises, unstable exercises of the 4th
188 strategy of balance maintenance, static force unstable exercises, non weight bearing unstable exercises,
189 etc.

190 E - Muscle suppleness and flexibility exercises (dynamic and permanent stress exercises).

191 F - MAIN OBJECTIVE (final goal) - i.e. $F=\{F1,F2,F3,F4,F5,F6,F7,F8\}$ - a set of skills and performance
192 improvement as evidenced by the results of the various tests obtained at a given time.

193 4.4.3. Transitional period

194 *Assumption:* Psychophysical rest from the planned systematic training. Participation in physical
195 recreation.

196 *Intermediate objective:*

197 *G* – Transient decrease in the endurance and strength effort ability, maintenance of the level of
 198 suppleness. Active and passive rest.

199 4.4.4. Activity organization

200 Group activity: Group size: 40 persons Place: Sports arena of the University School of Physical Education
 201 in Wrocław.

202 Date: October – July: Mondays and Wednesday, time: 15.30-17.00

203 Research organization: quarterly measurements in a laboratory.

204 Registration of measurements in the training log.

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Table 3a. Structure of the health training macrocycle aimed at: The improvement of the spine fitness. (Darker color means increasing training loads).																									
Period	Preparatory period 1			Preparatory period 2					Principal period 1										Principal period 2						
Month	October			November				December					January				February			March					
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Objectives				A1			A2		C1, C2			C4			B1				B2			C3			D1
Control	Initial studies: all						p2 - p7								S				t5,t7						
Tests	t1-t9; tK, skills, bms (the initial attempt)														bms, HR			t3_2							
Mesocycle	MPG1			MPG2			MPG3			Mesocycle directed 1					Mesocycle directed 2						Mesocycle directed 3				
Type of microcycle	m1			m2			m3	m4	m3	m4	m3	m4	mR - Regeneration	m5			m6_a, m6_b			m6_c, m8					
n sessions	2												0		2										
Session time [min]	35		40	45	50	60	65			70	75		Christmas pause		60	75		85	90						
Direction of action/ motor abilities	Aerobic capacities			General endurance + strengthening exercises					Strengthening exercises, elongation and retraction exercises			Relax	Leisure	Static force		Strengthening exercises, elongation and retraction exercises			Static force on the ground unstable						
Type of tr. session	Preparatory 1			Preparatory 2					Preparatory 3			Active leisure		The shaping											
Training resources / forms tr. = exercises .	Greatest possible			4 - 6 groups of muscles (including always the front and back leg muscles group, calf, foot)					Strength and strength endurance (glutes and hips, abdominal muscles) + exSP; Rb			Recreation + exSP		Asymmetric exercises (with respect to the long axis of the body) within subiculum - Klapp exercises		Resistance training + flexibility and mobility exercises; Rb			Asymetric ex. + Symetric exercises (Relative to transverse axis of the body) - Klapp ex. + abdominal m. ex.						
Repetitions	of 4 to 6	8	12	between 12 and 16			of 16 to 20	of 24 to 32			of 16 to 20		Any		8	12		Tension maintenance 4-6s							
Series	of 1 to 2	to 3	3	1	2	3	of 2 to 3	3	4	3		4			2	of 2 to 3	3	Lack		of 2 to 3					
Intensity	Low			Moderate		Medium large							Low		Medium lerge	Lerge			Submaximal (principle of muscle confusion)						

Accessories	Lack, exercises free	Sensorimotor airbag - low positions, elastic strap, dumbbell 0,5 kg	Lack	Body weight	Sensomotoric airbag, elastic band, TRX
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Table 3b. Structure of the health training macrocycle aimed at: The improvement of the spine fitness – semester II																												
Period	Principal period 2					Principal period 3								Active transition period			Passive transition period											
Month	April				May				Juni				Juli				August					September						
Week	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
Objectives						D2								E			F							G		H,K		
Control													p1-p8	bms														
Tests								t1-t3					t2, HR	t4	t5-t9										tK		t3_4	
Mesocycle	Mesocycle directed 3					Mesocycle directed 4						Mesocycle control			Regenerative mesocycle							Preparatory period 4						
Type of microcycle	m7					m8		mR		m8				Recreation/ active leisure				mR				Active leisure						
n sessions	2													Any				0				2						
Session time [min]	90					90		60		90			60			45		Lack					30	45				
Direction of action / motor abilities	Ednurance strenght on the unstability ground + traction exercises					Strenghtending		Recreation		Strenghtending abdominal m. + mobility of spine and flexibility				Flexibility+ deep muscles of pelvic									Aero	All formsof fitness + Straching				
Type of training session	The shaping						Active leisure		The shaping				Maintenance		Maintenance - Regeneration		Maintenance - Regeneration											
Training resources / forms tr. =exercises	Core stability - position half-high and high, 1 i 3 support points					CT+ ShAb		Any		CT, ShAb	CT, ShAb, Rb			Joga, Stretching, Kegel exercise									Greatest possibility					
Repetitions	Tension maintenance 5 -10 s.					16	24	Any		36	3			1		1							Any	Recreation				

Series	3	3	4		3	4	Lack				
Intensity	Submaximal (principle of muscle confusion)	Large	Moderate		Medium large		Moderate	Low		Low	
Accessories	Sensomotoric airbag, gymnastic bal, TRX									Lack	

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210 Legend:

Abbreviations used tables 3a and 3b:

Overall objective (Final objective): F - Streamlining postural muscles. Mastering technique to stabilize the spine;

Intermediate objectives (specific objectives): A-D - Exercise self-control techniques are manifested in the skills s1- s9; E - Improving mobility and flexibility; G - Maintenance of change achieved; H - Improve the aesthetics of the body; K - Improve the level of knowledge about principles the health training and self-regulation loads

Tests: 1 - Ruffier test; 2 - Ballance test; 3 – FMS; 4 - 20s abdominis; 5 - Kraus-Weber test; 6 – dynamometer; 7 - Patrick test; 8 - monitoring HR; 9- Cylkoergometr 5 minutes 100 W; tK-Knowledge about the training; bms - body mass and structure;

Skills: s1- exercises with different with accessories; s2 - Strengthening exercises - self-control techniques; s3- Adapting to the rhythm of work; s4 - Adapting to the changing pace of work to keep the load; s5 - mastering the techniques of static exercises ; s6- multiple repetition of static exercises; s7 - ability to use techniques for static and dynamic exercises; s8- mastering basic techniques TRX exercises; s9- mastery of the basic techniques of exercises on unstable ground;

Motor abilities: S- strenght; E- endurance; P- power; R- resistance; M- mobility; B- ballance; Es- endurance with strenght training elements; Areo – efficiency; Flex – flexibility;

Training resources / forms: exSP - always at the end of the session you should do exercises stabilizing the pelvis by three strategies; ShAb- Shaping the abdominal muscles; CT- comprehensive training; Rb- exercises with the rotation of the body;

Mezocycles: MPG 1-4 - Mesocycle preparing a general; MD 1-4 - Mesocycle directed; MC - Mesocycle control;

Microcycles: m1- comprehensive training; m2- strenghtening training; m3- Pre-training on unstable ground; m4- core stability training; m5- training of motor skills; m6- Isokinetic tension in the working concentric (a), excentric (b) and mix 50/50 (c); m7- isometric tension + mobility of spine; m8- abdominal m., mobility of spine training + flexibility muscles; mR- regeneration;

Personal objectives: p1 - to improve muscle flexibility and agility; p2 - improve of sleep; p3 - muscle adaptation to exercise; p4 - accelerating restitution after workout; p5 - social the objective; p6 - educational purpose; p7 - movement to maintain form and aesthetic of body; p8 - strengthening the abdominal muscles; p9 - weight loss.

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213 4.4.5. Control of training effects

214 In case of the health training, it is sufficient to control the training effects at two levels: evaluation of
 215 current effects and cumulative effects. The current effects recede in consequence of the lack of a training
 216 stimulus. They are evaluated during the exercises or immediately afterwards, and the correction concerns
 217 current comments such as: work speed, quality of exercise execution, expected body reactions,
 218 movement accuracy, method of exercise improvement, other. The cumulative (summary) effect control, in
 219 turn, is a result of the overlapping of transitory effects (current and extended ones) and concerns the
 220 training adaptation and training degree [26]. The training plan below takes into account the evaluation of
 221 cumulative effects at the mesocycle level (Table 4).

Table 4. A complete set of cumulative effect control in the health training plan for the purpose of: Improvement of the spine condition by increasing the efficiency of postural muscle flexibility in all trainees having the minimum attendance record of 60%:

Symbol	Objective	Measurement type	Measurement method
B1, B2, C3, C4, F1, F5	Increase in the level of postural muscle strength by 15-18%	Minimal physical fitness 1.Strength of abdominal and thigh muscles 2.Strength of back and gluteal muscles 3.Strength of leg muscles 4.Endurance of abdominal muscles	Modified Kraus-Weber test: 1 and 2 - Evaluation of the angle of lying torso and lower extremities raise exercises in prone and supine positions and the muscle stress maintenance time [s] and [s] 3 - Dynamometer [kg] 4 - Modified 30 s test – Torso raise from supine position with the lumbar section pressed to the ground [n/30"]
A1 A2, B1, C1, C2, C3, F3, F8	Improvement of the strength endurance and physical fitness by 10-20%.	Endurance in cyclical movements with resistance and physical fitness	5 minute test with a permanent load of 100 W at the minimal speed of 80 cycles /min. 1. HR _{max} and tHR _{max} 2. LA max 3. VO ₂ max 4. Ruffier test (self-evaluation)
E, F4	Muscle suppleness and flexibility improvement	1. Spine mobility symmetry in the frontal plane and two-way rotation. 2. Maximal torso antelexion 3. Abdominal muscle flexibility, mobility degree of the lumbar section (if the trainee feels pain, the exercise must be discontinued).	Goniometer measurement at the maximal rotational movement of the torso and a lateral bend: 1. Absolute value of the difference between the lateral torso bend angles (degrees) (left-right) and two-way torso rotation in the following positions: standing and sitting $ d_{st} = \angle X_{r_{left}} - \angle Y_{r_{right}};$ $ d_{si} = \angle X_{r_{left}} - \angle Y_{r_{right}}$ $ d_{sl} = \angle X_{s_{left}} - \angle Y_{s_{right}}$ 2.1. Distance of the middle finger from the ground in a standing forward bend position [cm]. The distance should decrease. 2.2. Degree of torso inclination in a cross legged sitting position [angle] (with a leg crossing change) 3. Torso support in the prone position - torso raise angle – Expected result: higher torso raise, hips resting.
F6	Balance improvement	Increased tolerance for the centre of gravity swings from the body's longitudinal axis	Kistler platform
F2	Evaluation of the body functions	Decrease in the risk of injuries during exercises	FMS (Functional Movement System) test
F7	Somatic effects	Body mass and circumferences BMI, Body composition: percentage decrease of the fat tissue share and increase of the active tissue share.	Martin's technique Near-infrared photo-optical method.
A1, A2	Rhythmicity	Speed maintenance at 80-130 bpm	Trainer's movement copying for the given exercise with varying work speed

B1, B2, C4, E	Mastery of static exercise techniques	Demonstration of acquired techniques concerning particular body parts using accessories	Execution of techniques without the trainer's demonstration. Self-evaluation, self-control
C1, C2, C3	Mastery of core-stability training techniques	Demonstration of acquired unstable exercise techniques	Execution of techniques without the trainer's demonstration. Self-evaluation, self-control
C4, D1, D2 E	Ability to merge techniques from various areas of physical culture	Demonstration of acquired exercises concerning specific body parts	Execution of techniques without the trainer's demonstration. Self-evaluation, self-control
G E	Temporary effort minimization. Maintenance of training parameters	Recreational activity. Execution of acquired techniques.	Percentage of maintained training effects

Legend: X,Y- Values; r – rotation; s – slope; d_{st} - difference in standing position; d_{sl}– difference in sitting position; d_{sl} – difference slope

5. DISCUSSION

From the praxeological perspective, the pursuit of health improvement and maintenance among the population of working people can be deemed a strategic management of activities aimed at delaying the ageing society processes. Therefore, it must be accompanied by an appropriate plan, i.e. a vision of the future we aspire to have. Over the last several years, there have appeared a number of concepts describing the improvement of the process of organisation and management in various companies [22,29-32]. Among the planning methods that can be applied to the area of health sciences, or - more precisely - to the health training planning, one can distinguish the following system analysis and synthesis methods (after: Krupski [22], after: Griffin [32]), and among them, the theory Ideal Design of Effective and Logical System proposed by Gerard Nadler [20] (after: Bieniok [30]).

The system design, both synthetic and analytic, may lead to similar effects. It is assumed that the analytic approach is a longer path towards achieving the designated goal. It requires both more time to be devoted by the process manager and a maintaining determination on the part of the participants. In the sports theory, the holistic concept of searching the optimal way to prepare an athlete to a competition has prevailed for many years, since the problems of an efficient training management is a sports success priority [19, 21, 26, 34-38]. In the light of classical concepts, the training periodisation is a result of the training process planning in accordance with certain models [15, 17, 35]. According to Kosendiak, the periodisation must result from the objectives set for the given athlete. Therefore, the sports training system planning is a creative process adjusted to the needs of the given athlete and *'there are no better or worse periodisation models, but one can rather speak about a better or worse adjustment of the model to the needs of the given athlete'* [15, p.154]. One cannot disagree with this statement, especially in view of the fact that the sports training concerns talented, pre-selected and specialised individuals focused on achieving the best result possible. In the health training the aspirations are also quantified, however they concern another – also individual – level of skills and achievements that manifest themselves not as a single result but as results of various tests from different areas of the physical culture.

This paper proves that the flow diagram of the analytic and synthetic design method [38, p. 33] may be used in the health training planning by setting training priorities for the given group (Table 2). In this understanding, the health training process periodisation may be the essence of the search for an efficient performance of health-focused training programmes by teachers, personal trainers, fitness instructors, recreation animators and health promoters. It should be also noted that the very fact that a participant takes part in physical exercises is an objective inherent to the HT. Therefore, when creating a comprehensive training plan for a specified group of people, one should adopt a minimum of effects at the minimal attendance record of participants. Such a training plan makes the participant aware of the objective of their participation in the exercise programme (synthetic approach) or in specified exercise types (analytic approach). It will most probably cause a considerable improvement of selected health parameters and will motivate the participants to have a high attendance record.

6. SUMMARY

In the light of consequences of demographic changes in Europe and worldwide [1-3] the improvement of the health of working age people and people excluded from the labour market in result of their health deficit should constitute an important goal the social policy aspires to achieve. Actions aimed at ensuring the fitness of people aged 40+ who are not active enough should be as important as the family-friendly policy, the policy improving the health of women of childbearing age or the policy to activate the disabled. [2,14]. A change of this phenomenon, the reinforcement of the labour market participation of middle-aged and older adults as well as the maximum use of their professional potential will contribute to lowering the social costs. To achieve this, you should implement hospitals-independent programs to improve function of body, as noted by Petit et al. [39]. With the support of the public health promoters, the flow diagram of a system of planning the pro-health activities (here: a health training) may change the health policy and define the direction of actions ancillary to the social policy.

7. CONCLUSIONS

The health training is a system and requires designing objectives planning and control.

A rational planning and execution of the health training process may prove an effective tool in the combat against the musculoskeletal system dysfunctions caused by the deficit of physical exercises amongst adults.

The execution of the planned training programme may improve the psychophysical well-being of participants as well as the degree of their labour market and social life participation,

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