British Journal of Medicine & Medical Research
11(10): 1-15, 2016, Article no.BJMMR.20549
ISSN: 2231-0614, NLM ID: 101570965

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

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Authors' contributions

This work was carried out in collaboration between both authors. Author MK performed the conception and design, analysis of methodic of exercises, drafting the manuscript and revising intellectual content, description of the training plan, review and preparation of literature. Author TS performed the consulting of training methodic in designing process, final approval of the version to be published.

Article Information

DOI: 10.9734/BJMMR/2016/20549
Editor(s):
(1) Panagiotis Korovessis, Chief Orthopaedic Surgeon, Orthopaedic Department, General Hospital "Agios Andreas" Patras, Greece.
Reviewers:
(1) T. J. Ellapen, University of KwaZulu-Natal, South Africa.
(2) Jerzy Bełtowski, Medical University, Lublin, Poland.
(3) Diana C. Tapia-Pancardo, National Autonomous University of México, Mexico.
Complete Peer review History: http://sciencedomain.org/review-history/11949

Policy Article

Received 31st July 2015
Accepted 1st September 2015
Published 23rd October 2015

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.

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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 civilization 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.

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	Systematic, cyclical (presence of large, medium and small	Systematic, not cyclical	Both individual and systematic, no cyclical work.	Systematic, precisely defined by the physiotherapist over a defined period of time. Cyclical	Systematic, cyclical (presence of large, medium

Areas of physical culture / Process components	Sports training	Health training	Physical education	Physical recreation	Motor rehabilitation (mainly kinesitherapy)	Physiotherapy exercises (corrective exercises and compensation)
	large, medium and small training cycles)	training cycles)			work maintained.	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					

- 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.

2. AIM OF WORK AND RESEARCH QUESTIONS

The purpose 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. 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 utilized.

4. 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).

4.2 Health Training Participant Characteristics

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

health training described below may be commenced/ resumed.

4.3 Structure of Training Objectives

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

4.3.1 Ideal

Maintenance of good physical fitness well into the old age.

4.3.2 Intention

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

4.3.3 Main objective

Final for the macrocycle (F): Improvement of the spine condition by increasing the efficiency of postural muscle contraction and flexibility in all trainees having the minimum attendance record of 60%:

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

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

F1 - An individually better result in the modified Kraus-Weber text evaluating the minimum muscle fitness.
F2 - An individually better result in the FMS test
F3 - An individually higher working speed when making the cardiac stress test using the stationary exercise bicycle ergometer (standard test).
F4 - An individual improvement of mobility, especially as regards shoulder joints and hip joints, maximum body ante flexion on straight legs, degree of body support in prone position, symmetry (on both legs) and degree of body forward inclination in the cross legged position, symmetry of body side bends, symmetry of body rotation.
F5 - An individually better result in the modified abdominal muscle strength test.
F6 - An individually better tolerance for the body's centre of gravity swings - evaluation of the balance improvement.
F7 - An individually better change of the body composition (a 0-1 system evaluation)
F8 - Individually lower HR values in a standard test.

Expected additional effects (these are not the objectives):

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

4.3.4 Intermediate objectives (*A,B,C,D,E,G*)

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

4.3.5 Tasks

Understood here as objectives of particular training sessions - constitute the structure of a training microcycle, but in reality they pursue the objectives of the given mesocycle. A description of the tasks (training session objectives) has been given in Tables 4a, 4b in item 'microcycle'.

4.4 Time Structure of the Training Macrocycle

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

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

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

Motor activity teaching methods: Synthetic and complex.

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

4.4.1 Preparatory period

4.4.1.1 Assumptions

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

4.4.1.2 Intermediate objectives

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

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

B_1–Learning the exercise techniques with the maintenance of the muscle stress involving large body parts.

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

4.4.2 Principal period 1-4

4.4.2.1 Assumptions

Exercise execution and trainer's speed maintenance in universal exercises and exercises resulting in local fatigue at gradual loan increases.

4.4.2.2 Intermediate objectives

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

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

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

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

D_1– Mastery of unstable exercise techniques.

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

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

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

4.4.3 Transitional period

4.4.3.1 Assumption

Psychophysical rest from the planned systematic training. Participation in physical recreation.

4.4.3.2 Intermediate objective

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

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

Participant number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	**sum**	**Priority in training* [%]**
BMI>25	x		x			x					x			x	x	6	40
Poor flexibility	x	x			x	x			x			x		x	x	8	53
Muscles of the lower limb	x	x	x	x	x		x	x		x		x	x		x	11	**73**
Muscles of the upper limb		x		x		x	x	x	x	x		x	x	x		10	**67**
Abdominal muscles	x	x	x	x	x	x	x	x		x	x	x	x	x	x	14	**93**
Low endurance	x	x	x	x		x	x		x		x		x	x	x	11	**73**
Back muscles	x	x		x	x			x	x	x			x	x	x	10	**67**
Glutes	x	x	x		x	x	x	x		x	x		x		x	11	**73**
Poor balance		x	x	x		x	x	x		x		x		x	x	10	67
Pain of cervical spine	x	x						x	x			x				5	33
Pain of thoracic spine				x			x			x						3	20
Pain of lumbar spine	x	x	x			x	x	x	x	x		x			x	10	**67**
Pain of sacrum		x		x	x	x		x	x	x	x	x	x			10	**67**
Pain of head	x	x						x				x				4	27
Pain of shoulders			x		x											2	13
Pain of knee	x	x				x	x	x		x		x				7	47

**The higher the value, the more directional exercises should be included in the training*

Table 3a. Structure of the health training macrocycle aimed at: The improvement of the spine fitness

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									
Direction of action/ motor	Aerobic capacities			General endurance + strengthening exercises						Strengthening exercises, elongation and			Relax	Leisure	Static force			Strengthening exercises, elongation and retraction exercises				Static force on the ground unstable			

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**
abilities										retraction exercises															
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				Asymmetric + Symmetric 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 16 to 20			Any		8	12									
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									
Accessories	Lack, exercises free						Sensorimotor airbag - low positions, elastic strap, dumbbell 0,5 kg						Lack		Body weight			Sensomotoric airbag, elastic band, TRX							

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**				**June**				**July**					**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]									60	90			60				45		Lack					30	45		
Direction of action / motor abilities	Endurance strength on the unstability ground + traction exercises						Strengthening		Recreation	Strengthening abdominal m. + mobility of spine and flexibility					Flexibility+ deep muscles of pelvic									Aero	All forms of fitness + Stretching		

Period	**Principal period 2**								**Principal period 3**									**Active transition period**					**Passive transition period**												
Month	**April**						**May**					**June**							**July**					**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**									
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							16	24	Any		3					1		1						Any	Recreation										
Series	3						3	4		3	4					Lack																				
Intensity							Lerge		Moderate	Medium lerge							Mederate	Low						Low												
Accessories	Sensomotoric airbag, gymnastic bal, TRX						Lack																	Lack											

Legend:

Abbreviations used Tables 3a and 3b:

***Overall Objective** (Final objective): F - Streamlining postural muscles. Mastering technical 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 - Balance test; 3 – FMS; 4 - 20s abdominis; 5 - Kraus-Weber test; 6 – dynamometer; 7 - Patrick test; 8 - monitoring HR; 9- Cykloergometr 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- strength; E- endurance; P- power; R- resistance; M- mobility; B- balance; Es- endurance with strength 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 - Mesocykle control;*

***Microcycles**: m1- comprehensive training; m2- strengthening 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.*

4.4.4 Activity organization

4.4.4.1 Group activity: Group size: 40 persons Place:

Sports arena of the University School of Physical Education in Wrocław.
Date: October – July: Mondays and Wednesday, time: 15.30-17.00
Research organization: Quarterly measurements in a laboratory.
Registration of measurements in the training log.

4.4.5 Control of training effects

In case of the health training, it is sufficient to control the training effects at two levels: evaluation of current effects and cumulative effects. The current effects recede in consequence of the lack of a training stimulus. They are evaluated during the exercises or immediately afterwards, and the correction concerns current comments such as: work speed, quality of exercise execution, expected body reactions, movement accuracy, method of exercise improvement, other. The cumulative (summary) effect control, in turn, is a result of the overlapping of transitory effects (current and extended ones) and concerns the training adaptation and training degree [26]. The training plan below takes into account the evaluation of 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 [∡] 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_2max 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 anteflexion 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 $\lvert d_{st} \rvert = \measuredangle Xr_{left} - \measuredangle Yr_{right}$; $\lvert d_{si} \rvert = \measuredangle Xr_{left} - \measuredangle Yr_{right}$ $\lvert d_{sl} \rvert = \measuredangle Xs_{left} - \measuredangle Ys_{right}$ $2._1$. 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)

Symbol	Objective	Measurement type	Measurement method
			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; dst - difference in standing position; dsi– difference in sitting position; dsl – 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 organization 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 periodization is a result of the training process planning in accordance with certain models [15,17,35]. According to Kosendiak, the periodization 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 periodization 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 periodization 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.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Whereas further studies to determine the effects of health training according to the presented concept, authors have received permission Ethics Committee of University for the implementation of this plan.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/11949